Cadabra

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Chapter 1

Cadabra

Author

Kasper Peeters

Version

2.x series

See also

http://cadabra.science

This repository holds the 2.x series of the Cadabra computer algebra system.

Cadabra was designed specifically for the solution of problems encountered in field theory. It has extensive functionality for tensor computer algebra, tensor polynomial simplification including multi-term symmetries, fermions and anti-commuting variables, Clifford algebras and Fierz transformations, implicit coordinate dependence, multiple index types and many more. The input format is a subset of TeX. Both a command-line and a graphical interface are available.

To get started with the source code documentation, navigate to the modules overview.

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Chapter 7

Module Documentation

7.1 Core

7.1.1 Module Description

All computer algebra functionality in the form of C++ classes.

Modules

- Cleanup

  Functionality to clean up expressions so that they satisfy the requirements of a consistent expression tree.
- Expression comparison

  Functions to compare and match expressions stored in exptree objects.
- Python Core

  Python wrapper around the C++ core module, making the entire functionality of Cadabra accessible from Python.
- Scalar algebra

  Functionality to make Cadabra interface with the SymPy computer algebra system.
- Algorithms

  Containing all algorithms acting on symbolic expression trees.
- Properties

  Containing all properties that can be attached to symbolic expressions.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Classes

- class cadabra::Algorithm

  Base class for all algorithms, containing generic routines and in particular the logic for index classification.
- class cadabra::Ex_is_equivalent

  Basic comparison operator for tree iterators, so we can use them as keys in maps.
- class cadabra::index_iterator

  An iterator which iterates over indices even if they are at lower levels, i.e.
- class PermutationException

  Generic permutation group material.
- class preprocessor

  Preprocessing class which takes infix mathematical notation with all sorts of maths shortcuts and transforms it into a string which is properly formatted in prefix notation.
- class cadabra::property

  Base class for all properties, handling argument parsing and defining the interface.
- class cadabra::Properties

  Class holding a collection of properties attached to expressions.
- class cadabra::str_node

  Elementary building block for a mathematical expression.
- class cadabra::Ex

  Basic storage class for symbolic mathememetical expressions.
- class cadabra::nset_it_less

  Compare two nset iterators by comparing the strings to which they point.
- class cadabra::DependsBase

Functions

- void cadabra::do_list (const Ex &tr, Ex::iterator it, std::function< bool(Ex::iterator)> f)

  Apply a function on every element of a list, or if the iterator 'it' does not point to a list, only on that single element.
- Ex::iterator cadabra::do_subtree (const Ex &tr, Ex::iterator it, std::function< Ex::iterator(Ex::iterator)> f)

  Apply a function on every node in the tree at and below the given node, depth-first.
- Ex::iterator cadabra::find_in_list (const Ex &tr, Ex::iterator it, std::function< Ex::iterator(Ex::iterator)> f)

  Returns an iterator to the first element for which 'f' does not return tr.end().
- Ex::iterator cadabra::find_in_subtree (const Ex &tr, Ex::iterator it, std::function< bool(Ex::iterator)> f, bool including_head=true)

  Returns an iterator to the first element for which 'f' returns 'true', or 'tr.end()'.
- Ex cadabra::make_list (Ex el)

  Ensure that the tree is a list, even if it contains only a single element.
- void cadabra::multiply (rset_t::iterator &, multiplier_t)

  Helper functions for manipulation of multipliers.
- template<typename T >
  bool cadabra::is_in (const T &val, const std::initializer_list< T > &list)

  Bare output operator for Ex objects, mainly to provide a simple way to generate debugging output.

7.1.2 Function Documentation

7.1.2.1 void cadabra::do_list (const Ex & *tr*, Ex::iterator *it*, std::function< bool(Ex::iterator)> *f*)

Apply a function on every element of a list, or if the iterator 'it' does not point to a list, only on that single element.

Handles lists wrapped in an node as well. It is safe to remove the node pointed to by 'it' in 'f'. If your 'f' returns false, the loop is aborted immediately.

7.1.2.2 Ex::iterator cadabra::do_subtree (const Ex & *tr,* Ex::iterator *it,* std::function< Ex::iterator(Ex::iterator)> *f*)

Apply a function on every node in the tree at and below the given node, depth-first.

Return an iterator to the top node, which replaces 'it' (may be the same).

7.1.2.3 Ex::iterator cadabra::find_in_list (const Ex & *tr,* Ex::iterator *it,* std::function< Ex::iterator(Ex::iterator)> *f*)

Returns an iterator to the first element for which 'f' does not return tr.end().

7.1.2.4 Ex::iterator cadabra::find_in_subtree (const Ex & *tr,* Ex::iterator *it,* std::function< bool(Ex::iterator)> *f,* bool *including_head* = `true`)

Returns an iterator to the first element for which 'f' returns 'true', or 'tr.end()'.

7.1.2.5 template<typename T > bool cadabra::is_in (const T & *val,* const std::initializer_list< T > & *list*)

Bare output operator for Ex objects, mainly to provide a simple way to generate debugging output.

Does not do any fancy formatting; just prints a nested list representation. For more fancy output, look at DisplayTeX, DisplaySympy and DisplayTerminal.

7.1.2.6 Ex cadabra::make_list (Ex *el*)

Ensure that the tree is a list, even if it contains only a single element.

7.1.2.7 void cadabra::multiply (rset_t::iterator & , multiplier_t)

Helper functions for manipulation of multipliers.

7.2 Cleanup

7.2.1 Module Description

Functionality to clean up expressions so that they satisfy the requirements of a consistent expression tree.

Classes to handle printing of expressions in various formats.

There are several different requirements for printing, depending on whether output is to the console, the graphical notebook, or to a different computer algebra system.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Classes

- class cadabra::DisplayBase

  Base class for all display classes.

7.3 Expression comparison

7.3.1 Module Description

Functions to compare and match expressions stored in exptree objects.

These can involve wildcards and dummy indices, and matching may depend on the properties attached to symbols. This is an important bit of functionality used widely throughout the Cadabra core. All substitution and component evaluation logic depends on this module.

Classes

- class cadabra::Ex_comparator

  A generic tree comparison class which will take into account index contractions and will also keep track of a replacement list for all types of cadabra wildcards.

Functions

- int cadabra::subtree_compare (const Properties *, Ex::iterator one, Ex::iterator two, int mod_prel=-2, bool checksets=true, int compare_multiplier=-2, bool literal_wildcards=false)

  Basic building block subtree comparison function for tensors without dummy indices, which determines whether two tensor subtrees are equal up to the names of indices.

7.3.2 Function Documentation

7.3.2.1 int cadabra::subtree_compare (const Properties * , Ex::iterator *one*, Ex::iterator *two*, int *mod_prel* = `-2`, bool *checksets* = `true`, int *compare_multiplier* = `-2`, bool *literal_wildcards* = `false`)

Basic building block subtree comparison function for tensors without dummy indices, which determines whether two tensor subtrees are equal up to the names of indices.

This uses NO property information whatsoever; when indices are compared, they are simply compared based on their name, not on the index set they may belong to. In most cases, this is NOT what you want.

In MOST cases, the use of Ex_comparator below is recommended instead, as it can do much more complicated matching and will also keep track of the relation between symbols in the pattern and symbols in the object to be matched.

Examples:

```
A_m                       equals  A_n                       up to index names
\diff{A*B_g*\diff{C}_k}_m equals  \diff{A*B_h*\diff{C}_r}_s up to index names
```

return	meaning
0	structure equal, and all indices the same name
1	structure equal, index names of one < two
-1	structure equal, index names of one > two
2	structure different, one < two
-2	structure different, one > two

Parameters

mod_prel	see below
checksets	ignored FIXME: remove
literal_wildcards	whether to treat wildcard names as ordinary names.

The mod_prel variable determines whether parent relations are taken into account when comparing: FIXME: now that subtree_compare does not use properties anymore, a lot can be simplified.

```
  -3: require that parent relations match, unless indexpos=free.
  -2: require that parent relations match (even when indexpos = free)
  -1: do not require that parent relations match
 >=0: do not require parent relations to match up to and including this level
```

Similar logic holds for the compare_multiplier parameter.

7.4 Python Core

7.4.1 Module Description

Python wrapper around the C++ core module, making the entire functionality of Cadabra accessible from Python.

Classes

- class BaseProperty

  Helper class to ensure that all Python property objects derive from the same base class.
- class Property< T >

  Property is a templated wrapper around a C++ property object.

Functions

- void pull_in (std::shared_ptr< cadabra::Ex > ex)

  Replace any objects of the form '@(...)' in the expression tree by the python expression '...' if it exists.
- bool __eq__Ex_Ex (const cadabra::Ex &, const cadabra::Ex &)

  Comparison operator for Ex objects in Python.
- bool __eq__Ex_int (const cadabra::Ex &, int)

  Comparison operator for Ex objects in Python.
- std::string Ex_str_ (const cadabra::Ex &)

  Generate the Python str() and repr() representation of the Ex object.
- std::string Ex_latex_ (const cadabra::Ex &)

  The Python 'print' function always calls the 'str' member on objects to be printed.
- cadabra::Ex operator+ (const cadabra::Ex &ex1, const cadabra::Ex &ex2)

  Add two expressions, adding a top-level node if required.
- cadabra::Ex operator- (const cadabra::Ex &ex1, const cadabra::Ex &ex2)

  Subtract two expressions, adding a top-level node if required.
- cadabra::Kernel * create_scope ()

  Setup of kernels in current scope, callable from Python.
- void inject_defaults (cadabra::Kernel *)

  *Inject properties directly into the Kernel, even if the kernel is not yet on the Python stack (needed when we create a new local scope: in this case we create the kernel and pass it back to be turned into local **cdbkernel** by Python, but we want to populate the kernel with defaults before we hand it back).*
- cadabra::Kernel * get_kernel_from_scope ()

  Get a pointer to the currently visible kernel.
- void call_post_process (cadabra::Kernel &, cadabra::Ex &ex)

  Run the post-process Python function (if defined) on the given expression.

7.4.2 Function Documentation

7.4.2.1 bool __eq__Ex_Ex (const cadabra::Ex & , const cadabra::Ex &)

Comparison operator for Ex objects in Python.

Since comparison operators need a Properties object, we cannot have such operator== things in C++, but we can in Python since we can get the kernel in the current scope.

7.4.2.2 bool __eq__Ex_int (const cadabra::Ex & , int)

Comparison operator for Ex objects in Python.

See __eq__Ex_Ex for more.

7.4.2.3 void call_post_process (cadabra::Kernel & , cadabra::Ex & *ex*)

Run the post-process Python function (if defined) on the given expression.

7.4.2.4 cadabra::Kernel* create_scope ( )

Setup of kernels in current scope, callable from Python.

When the decision was made to graft Cadabra onto Python, a choice had to be made about how Python variable scope would influence the visibility of Cadabra properties. It clearly makes sense to be able to declare properties which only hold inside a particular function. However Cadabra expressions and properties do not directly correspond to Python objects. Rather, declaring a property is more like a function call into the Cadabra module, which leaves its imprint on the state of the C++ part but does not change anything on the Python side, as you typically do not assign the created property to a Python symbol. Therefore, properties do not naturally inherit Python's scoping rules.{This is different from e.g.∼SymPy, in which mathematical objects are always in one-to-one correspondence with a Python object.} A more fundamental problem is that properties can be attached to patterns, and those patterns can involve more than just the symbols which one passes into a function.

In order to not burden the user, properties are therefore by default global variables, stored in a single global Cadabra object |__cdbkernel__| which is initialised at import of the Cadabra module. If you add new properties inside a function scope, these will go into this already existing {global} property list by default. If you want to create a local scope for your computations, create a new |__cdbkernel__| as in {verbatim} def fun(): **cdbkernel** = cadabra.↩ create_scope(); [your code here] {verbatim} Now computations will not see the global properties at all. If you want to import the global properties, use instead {verbatim} def fun(): **cdbkernel** = cadabra.create_scope_from_global() [your code here] {verbatim} It is crucial that the |__cdbkernel__| symbol is referenced from within Python and visible to the bytecompiler, because it is not possible to create new variables on the local stack at runtime. Internally, the second version above fetches, at runtime, the |__cdbkernel__| from the globals stack, copies all properties in there into a new kernel, and returns the latter.

Both versions above do populate the newly created kernel with Cadabra's default properties. If you want a completely clean slate (for e.g.∼testing purposes, or because you really do not want default rules for sums and products), use {verbatim} def fun(): **cdbkernel** = cadabra.create_empty_scope() [your code here] {verbatim} Note that in all these cases, changes to properties remain local and do not leak into the global property list.

All Cadabra algorithms, when called from Python, will first look for a kernel on the locals stack (i.e.∼what |locals()| produces). If there is no kernel available locally, they will then revert to using the global kernel.

7.4.2.5 std::string Ex_latex_ (const cadabra::Ex &)

The Python 'print' function always calls the 'str' member on objects to be printed.

This one is required to produce output which looks readable but is also still valid input. In order to produce proper LaTeX output, this is therefore not the right function to use, because Cadabra only reads a restricted subset of LaTeX (for instance, we output spacing commands like '\,' but do not accept it on input). So we have a separate *latex*() member on each object, which internally uses DisplayTeX to do the actual printing.

7.4.2.6 std::string Ex_str_ (const cadabra::Ex &)

Generate the Python str() and repr() representation of the Ex object.

7.4.2.7 cadabra::Kernel* get_kernel_from_scope ( )

Get a pointer to the currently visible kernel.

7.4.2.8 void inject_defaults (cadabra::Kernel *)

Inject properties directly into the Kernel, even if the kernel is not yet on the Python stack (needed when we create a new local scope: in this case we create the kernel and pass it back to be turned into local **cdbkernel** by Python, but we want to populate the kernel with defaults before we hand it back).

7.4.2.9 cadabra::Ex operator+ (const cadabra::Ex & *ex1,* const cadabra::Ex & *ex2*)

Add two expressions, adding a top-level node if required.

7.4.2.10 cadabra::Ex operator- (const cadabra::Ex & *ex1,* const cadabra::Ex & *ex2*)

Subtract two expressions, adding a top-level node if required.

7.4.2.11 void pull_in (std::shared_ptr< cadabra::Ex > *ex*)

Replace any objects of the form '@(...)' in the expression tree by the python expression '...' if it exists.

Rename dummies to avoid clashes.

7.5 Scalar algebra

7.5.1 Module Description

Functionality to make Cadabra interface with the SymPy computer algebra system.

Functions

- boost::python::object Ex_to_Sympy (const cadabra::Ex &)

  Convert a Cadabra 'Ex' to a Sympy expression.
- cadabra::Ex * sympy::map_sympy (const cadabra::Kernel &, cadabra::Ex &, const std::vector< std::string > &wrap, const std::string &args, const std::string &method)

  Functionality to act with Sympy on all scalar parts of an expression, and keep the result in-place.
- cadabra::Ex::iterator sympy::apply (const cadabra::Kernel &, cadabra::Ex &, cadabra::Ex::iterator &, const std::vector< std::string > &wrap, const std::string &args, const std::string &method)

  Functionality to act with Sympy functions on (parts of) Cadabra Ex expressions and read the result back into the same Ex.
- cadabra::Ex sympy::invert_matrix (const cadabra::Kernel &, cadabra::Ex &ex, cadabra::Ex &rules)

  Use Sympy to invert a matrix, given a set of rules determining its sparse components.

7.5.2 Function Documentation

7.5.2.1 cadabra::Ex::iterator sympy::apply (const cadabra::Kernel & , cadabra::Ex & , cadabra::Ex::iterator & , const std::vector< std::string > & *wrap,* const std::string & *args,* const std::string & *method*)

Functionality to act with Sympy functions on (parts of) Cadabra Ex expressions and read the result back into the same Ex.

This duplicates some of the logic in PythonCdb.hh, in particular make_Ex_from_string, but it is best to keep these two completely separate.

7.5.2.2 boost::python::object Ex_to_Sympy (const cadabra::Ex &)

Convert a Cadabra 'Ex' to a Sympy expression.

This first converts the Cadabra expression to a string, and then reads that back in by calling sympy.parsing.sympy↩_parser.parse_expr. Is mapped to a '*sympy*()' function on each Ex object. When you feed an Ex object to a Sympy function, the Ex gets converted to a Sympy object in 'sympy.sympify' because the latter attempts to call **sympy** on every object that you feed it.

7.5.2.3 Ex sympy::invert_matrix (const cadabra::Kernel & *kernel,* cadabra::Ex & *ex,* cadabra::Ex & *rules*)

Use Sympy to invert a matrix, given a set of rules determining its sparse components.

Will return a set of Cadabra rules for the inverse matrix.

7.5.2.4 cadabra::Ex* sympy::map_sympy (const cadabra::Kernel & , cadabra::Ex & , const std::vector< std::string > & *wrap,* const std::string & *args,* const std::string & *method*)

Functionality to act with Sympy on all scalar parts of an expression, and keep the result in-place.

This is a higher-level function than 'apply' below.

7.6 Algorithms

7.6.1 Module Description

Containing all algorithms acting on symbolic expression trees.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Classes

- class cadabra::canonicalise

  Canonicalise the index structure of a tensorial expression.
- class cadabra::collect_components

  Collect terms inside a sum, merging their substitution rules.
- class cadabra::collect_factors

  Collect symbolically equal factors in a product.
- class cadabra::collect_terms

  Collect symbolically equal terms in a sum.
- class cadabra::complete

  Complete a set of coordinate rules so that they also cover related tensors.
- class cadabra::decompose_product

  Decompose a product of tensors by applying Young projectors.
- class cadabra::distribute

  Distribute factors over a sum, that is, $(A+B)C \to AC+BC$.
- class cadabra::einsteinify
- class cadabra::factor_in
- class cadabra::factor_out
- class cadabra::integrate_by_parts

  Integrate by parts away from the indicated derivative object.
- class cadabra::map_sympy

  Functionality to act with Sympy on all scalar parts of an expression, and keep the result in-place.
- class split

  Split an expression into terms or factors.
- class cadabra::substitute

  Generic substitution algorithm.
- class cadabra::vary

  Generic variational derivative algorithm.

7.7 Properties

7.7.1 Module Description

Containing all properties that can be attached to symbolic expressions.

Classes

- class cadabra::Accent

  Turns a symbol into an accent.
- class cadabra::DependsInherit
- class cadabra::EpsilonTensor
- class cadabra::Integer

  Property indicating that a symbolic object always takes integer values.

7.8 Client-Server

7.8.1 Module Description

Base classes (independent of any GUI toolkit) to write Cadabra clients and servers.

All clients use two threads. One is the main thread and runs most of the logic in the DocumentThread object. The other one is a thread which communicates with the server process; code for this thread is in the ComputeThread object. One typically subclasses the former into a full-fledged object driving the graphical user interface.

All functionality that deals with GUI updates is isolated in GUIBase. A client should derive from this abstract base class and implement the methods there. Clients should also derive from DocumentThread, but there are no abstract virtual members to implemented from this base class.

All actual updates to the document stored in the DocumentThread::dtree member are made on the GUI thread as well. The compute thread merely puts requests to change the document onto a stack, and then requests that the GUI updates the document.

In order to enable undo/redo, all updates to DocumentThread::dtree are made by putting objects derived from ActionBase onto the action stack. See DocumentThread::queue_action for details. These ActionBase objects (among which ActionAddCell, ActionRemoveCell, ActionInsertText, etc) get executed on the GUI thread, and contain the actual logic to perform updates to the document and related GUI elements.

Classes

- class cadabra::ActionBase

  All actions derive from the ActionBase object, which defines the interface they need to implement.
- class cadabra::ActionAddCell

  Add a cell to the notebook.
- class cadabra::ActionPositionCursor

  Position the cursor relative to the indicated cell.
- class cadabra::ActionSetRunStatus

  Update the running status of the indicated cell.
- class cadabra::ActionRemoveCell

  Remove a cell and all its child cells from the document.
- class cadabra::ActionSplitCell

  Split a cell into two separate cells, at the point of the cursor.
- class cadabra::ActionInsertText

  Add a text string (can be just a single character) at the point of the cursor.
- class cadabra::ActionEraseText

  Remove a text string starting at the indicated position, and with the indicated length, from the indicated cell.
- class cadabra::ComputeThread

  Base class which talks to the server and sends Action objects back to the DocumentThread.
- class cadabra::DataCell

  DataCells are the basic building blocks for a document.
- class cadabra::DocumentThread

  A base class with all the logic to manipulate a Cadabra notebook document.
- class cadabra::GUIBase

  Abstract base class with methods that need to be implemented by any GUI.
- class Server

  Object representing a Cadabra server, capable of receiving messages on a websocket, running Python code, and sending output back to the client.

7.9 Front-end

7.9.1 Module Description

All code which implements graphical front-end notebook interfaces.

Modules

- Gtk+

  Notebook user interface implemented using gtkmm.
- OS-X

  Notebook interface implemented using the native OS-X Cocoa toolkit.

Classes

- class cadabra::TeXEngine

  TeXEngine is used to convert LaTeX strings into PNG images.

7.10 Gtk+

7.10.1 Module Description

Notebook user interface implemented using gtkmm.

Classes

- class cadabra::CodeInput

  A text cell editor widget with support for editing Python and LaTeX.
- class cadabra::ImageView

  An image viewing widget.
- class cadabra::NotebookWindow

  Each notebook has one main window which controls it.
- class cadabra::VisualCell

  Structure holding a pointer to one of the possible GUI widgets that can appear in a document.

7.11 OS-X

7.11.1 Module Description

Notebook interface implemented using the native OS-X Cocoa toolkit.

Classes

- class cadabra_osx::NotebookWindow

  Objective-C++ class implementing DocumentThread and providing an OS-X notebook interface.

Chapter 8

Namespace Documentation

8.1 cadabra Namespace Reference

Class to display expressions in a format that Sympy can parse.

Namespaces

- symbols

Classes

- class Accent

  Turns a symbol into an accent.
- class ActionAddCell

  Add a cell to the notebook.
- class ActionBase

  All actions derive from the ActionBase object, which defines the interface they need to implement.
- class ActionEraseText

  Remove a text string starting at the indicated position, and with the indicated length, from the indicated cell.
- class ActionInsertText

  Add a text string (can be just a single character) at the point of the cursor.
- class ActionPositionCursor

  Position the cursor relative to the indicated cell.
- class ActionRemoveCell

  Remove a cell and all its child cells from the document.
- class ActionSetRunStatus

  Update the running status of the indicated cell.
- class ActionSplitCell

  Split a cell into two separate cells, at the point of the cursor.
- class Algorithm

  Base class for all algorithms, containing generic routines and in particular the logic for index classification.
- class AntiCommuting
- class AntiSymmetric
- class canonicalise

Canonicalise the index structure of a tensorial expression.

- class CodeInput

  A text cell editor widget with support for editing Python and LaTeX.
- class collect_components

  Collect terms inside a sum, merging their substitution rules.
- class collect_factors

  Collect symbolically equal factors in a product.
- class collect_terms

  Collect symbolically equal terms in a sum.
- class combine
- class Commuting
- class CommutingAsProduct
- class CommutingAsSum
- class CommutingBehaviour
- class complete

  Complete a set of coordinate rules so that they also cover related tensors.
- class ComputeThread

  Base class which talks to the server and sends Action objects back to the DocumentThread.
- class Coordinate
- class DAntiSymmetric
- class DataCell

  DataCells are the basic building blocks for a document.
- class decompose_product

  Decompose a product of tensors by applying Young projectors.
- class Depends
- class DependsBase
- class DependsInherit
- class Derivative
- class Diagonal
- class DifferentialForm
- class DifferentialFormBase
- class DiracBar
- class DisplayBase

  Base class for all display classes.
- class DisplaySympy
- class DisplayTerminal
- class DisplayTeX
- class Distributable
- class distribute

  Distribute factors over a sum, that is, $(A+B)C \to AC + BC$.
- class DocumentThread

  A base class with all the logic to manipulate a Cadabra notebook document.
- class drop_keep_weight
- class drop_weight
- class einsteinify
- class eliminate_converter
- class eliminate_kronecker
- class eliminate_metric
- class epsilon_to_delta
- class EpsilonTensor
- class evaluate
- class Ex

  Basic storage class for symbolic mathemematical expressions.

- class Ex_comparator

  A generic tree comparison class which will take into account index contractions and will also keep track of a replacement list for all types of cadabra wildcards.
- class Ex_is_equivalent

  Basic comparison operator for tree iterators, so we can use them as keys in maps.
- class Ex_is_less
- class exchange
- class expand
- class expand_delta
- class expand_diracbar
- class expand_power
- class ExteriorDerivative
- class factor_in
- class factor_out
- class fierz
- class FilledTableau
- class flatten_product
- class flatten_sum
- class GammaMatrix
- class GammaTraceless
- class GUIBase

  Abstract base class with methods that need to be implemented by any GUI.
- class ImageView

  An image viewing widget.
- class ImaginaryI
- class ImplicitIndex
- class index_iterator

  An iterator which iterates over indices even if they are at lower levels, i.e.
- class IndexInherit
- class indexsort
- class Indices
- class Inherit

  If a property X derives from Inherit<Y>, and get<Y> is called on an object which has an X property (but no Y property), then the get<Y> will look at the non-index child of the object to see if that has a Y property.
- class Integer

  Property indicating that a symbolic object always takes integer values.
- class integrate_by_parts

  Integrate by parts away from the indicated derivative object.
- class InverseMetric
- class join_gamma
- class keep_terms
- class keep_weight
- class Kernel
- class keyval_t

  Arguments to properties get parsed into a keyval_t structure.
- class KroneckerDelta
- class labelled_property
- class LaTeXForm
- class list_property

  Something cannot be both a list property and a normal property at the same time, so we can safely inherit without virtual.
- class lr_tensor
- class map_sympy

Functionality to act with Sympy on all scalar parts of an expression, and keep the result in-place.

- class Matrix
- class Metric
- class NonCommuting
- class NotebookCanvas
- class NotebookWindow

  Each notebook has one main window which controls it.
- class nset_it_less

  Compare two nset iterators by comparing the strings to which they point.
- class NumericalFlat

  Property indicating that an operator is numerically flat, so that numerical factors in the argument can be taken outside.
- class order
- class Parser
- class PartialDerivative
- class pattern
- class product_rule
- class Properties

  Class holding a collection of properties attached to expressions.
- class property

  Base class for all properties, handling argument parsing and defining the interface.
- class PropertyInherit

  PropertyInherit is like Inherit<T> for all properties.
- class reduce_delta
- class rename_dummies
- class replace_match
- class rewrite_indices
- class RiemannTensor
- class SatisfiesBianchi
- class SelfAntiCommuting
- class SelfCommuting
- class SelfCommutingBehaviour
- class SelfNonCommuting
- class sort_product
- class sort_spinors
- class sort_sum
- class SortOrder
- class Spinor
- class split_gamma
- class split_index
- class str_node

  Elementary building block for a mathematical expression.
- class substitute

  Generic substitution algorithm.
- class sym
- class Symbol
- class Symmetric
- class tab_basics
- class Tableau
- class TableauBase
- class TableauSymmetry
- class take_match
- class TerminalStream
- class TeXEngine

TeXEngine is used to convert LaTeX strings into PNG images.

- class TeXView

  TeXView is a widget which knows how to turn a string into a LaTeX-rendered image and display that.
- class Traceless
- class tree_equal_obj
- class tree_exact_equal_mod_prel_obj
- class tree_exact_equal_obj
- class tree_exact_less_for_indexmap_obj

  Compare for indexmap_t.
- class tree_exact_less_mod_prel_obj
- class tree_exact_less_no_wildcards_mod_prel_obj
- class tree_exact_less_no_wildcards_obj

  Compare two trees exactly, treat wildcard names as ordinary names.
- class tree_exact_less_obj

  Compare two trees exactly, i.e. including exact index names.
- class tree_less_modprel_obj
- class tree_less_obj

  Compare two trees by pattern logic, i.e. modulo index names.
- class unwrap
- class vary

  Generic variational derivative algorithm.
- class VisualCell

  Structure holding a pointer to one of the possible GUI widgets that can appear in a document.
- class Weight
- class WeightBase
- class WeightInherit
- class WeylTensor
- class young_project
- class young_project_product
- class young_project_tensor

Typedefs

- typedef void(∗ dispatcher_t) (const Kernel &k, Ex &, Ex::iterator &it)
- typedef mpq_class multiplier_t
- typedef std::set< std::string > nset_t
- typedef std::set< multiplier_t > rset_t
- typedef uintptr_t hashval_t
- typedef tree< DataCell > DTree

Functions

- std::string escape_quotes (const std::string &)
- std::string cdb2python (const std::string &)
- std::string convert_line (const std::string &, std::string &lhs, std::string &rhs, std::string &indent)
- void cleanup_dispatch (const Kernel &k, Ex &, Ex::iterator &it)

  Central cleanup dispatch routine, which calls the other cleanup functions defined later.
- void check_index_consistency (const Kernel &k, Ex &tr, Ex::iterator it)

  Generic tool to check for index inconsistencies independent of running any algorithm.
- bool cleanup_productlike (const Kernel &k, Ex &, Ex::iterator &it)

  Individual node cleanup routines.

- bool cleanup_sumlike (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool push_down_multiplier (const Kernel &k, Ex &tr, Ex::iterator it)

  Given a node with a non-unit multiplier, push this multiplier down the tree if the node is not allowed to have a non-unit multiplier.
- bool cleanup_components (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cleanup_partialderivative (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cleanup_derivative (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cleanup_numericalflat (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cleanup_diagonal (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cleanup_kronecker (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cleanup_exterior_derivative (const Kernel &k, Ex &tr, Ex::iterator &it)
- void cleanup_dispatch_deep (const Kernel &k, Ex &, dispatcher_t disp=&cleanup_dispatch)

  More general cleanup of an entire tree.
- void cleanup_dispatch_deep (const Kernel &k, Ex &tr, Ex::iterator &top, dispatcher_t dispatch)
- int subtree_compare (const Properties ∗, Ex::iterator one, Ex::iterator two, int mod_prel=-2, bool checksets=true, int compare_multiplier=-2, bool literal_wildcards=false)

  Basic building block subtree comparison function for tensors without dummy indices, which determines whether two tensor subtrees are equal up to the names of indices.
- bool tree_less (const Properties ∗, const Ex &one, const Ex &two, int mod_prel=-2, bool checksets=true, int compare_multiplier=-2)

  Various comparison functions, some exact, some with pattern logic.
- bool tree_equal (const Properties ∗properties, const Ex &one, const Ex &two, int mod_prel, bool checksets, int compare_multiplier)
- bool tree_exact_less (const Properties ∗properties, const Ex &one, const Ex &two, int mod_prel, bool checksets, int compare_multiplier, bool literal_wildcards)
- bool tree_exact_equal (const Properties ∗properties, const Ex &one, const Ex &two, int mod_prel, bool checksets, int compare_multiplier, bool literal_wildcards)
- bool subtree_less (const Properties ∗properties, Ex::iterator one, Ex::iterator two, int mod_prel, bool checksets, int compare_multiplier)
- bool subtree_equal (const Properties ∗properties, Ex::iterator one, Ex::iterator two, int mod_prel, bool checksets, int compare_multiplier)
- bool subtree_exact_less (const Properties ∗properties, Ex::iterator one, Ex::iterator two, int mod_prel, bool checksets, int compare_multiplier, bool literal_wildcards)
- bool subtree_exact_equal (const Properties ∗properties, Ex::iterator one, Ex::iterator two, int mod_prel, bool checksets, int compare_multiplier, bool literal_wildcards)
- const char ∗ unichar (kunichar c)
- bool operator< (const exchange::tensor_type_t &one, const exchange::tensor_type_t &two)
- void do_list (const Ex &tr, Ex::iterator it, std::function< bool(Ex::iterator)> f)

  Apply a function on every element of a list, or if the iterator 'it' does not point to a list, only on that single element.
- int list_size (const Ex &tr, Ex::iterator it)

  For lists as defined above for 'do_list', return their size (in case you really need to know the size before iterating over the elements).
- Ex::iterator do_subtree (const Ex &tr, Ex::iterator it, std::function< Ex::iterator(Ex::iterator)> f)

  Apply a function on every node in the tree at and below the given node, depth-first.
- Ex::iterator find_in_subtree (const Ex &tr, Ex::iterator it, std::function< bool(Ex::iterator)> f, bool including↩ _head=true)

  Returns an iterator to the first element for which 'f' returns 'true', or 'tr.end()'.
- Ex::iterator find_in_list (const Ex &tr, Ex::iterator it, std::function< Ex::iterator(Ex::iterator)> f)

  Returns an iterator to the first element for which 'f' does not return tr.end().
- Ex make_list (Ex el)

  Ensure that the tree is a list, even if it contains only a single element.
- void pre_clean_dispatch (const Kernel &kernel, Ex &ex, Ex::iterator &it)
- void pre_clean_dispatch_deep (const Kernel &k, Ex &tr)
- void cleanup_updown (const Kernel &k, Ex &, Ex::iterator &it)

Cleanup for individual node types.

- void cleanup_rational (const Kernel &k, Ex &tr, Ex::iterator &st)
- void cleanup_frac (const Kernel &k, Ex &tr, Ex::iterator &st)
- void cleanup_sub (const Kernel &k, Ex &tr, Ex::iterator &it)
- void cleanup_indexbracket (const Kernel &k, Ex &, Ex::iterator &it)

Convert parser output which indicates an indexbracket to an actual indexbracket node.

- long to_long (multiplier_t mul)
- std::string to_string (long num)
- void multiply (rset_t::iterator &, multiplier_t)

Helper functions for manipulation of multipliers.

- void add (rset_t::iterator &num, multiplier_t fac)
- void zero (rset_t::iterator &num)
- void one (rset_t::iterator &num)
- void flip_sign (rset_t::iterator &num)
- void half (rset_t::iterator &num)
- template<typename T >
  bool is_in (const T &val, const std::initializer_list< T > &list)

Bare output operator for Ex objects, mainly to provide a simple way to generate debugging output.

- std::string JSON_serialise (const DTree &)

Serialise a document into .cj format, which is a JSON version of the document tree.

- void JSON_recurse (const DTree &, DTree::iterator, Json::Value &)
- void JSON_deserialise (const std::string &, DTree &)

Load a document from .cj format, i.e. the inverse of the above.

- void JSON_in_recurse (DTree &doc, DTree::iterator loc, const Json::Value &cells)
- std::string export_as_HTML (const DTree &doc, bool for_embedding=false, std::string title="")

Export a document to a single self-contained HTML file containing inline CSS.

- void HTML_recurse (const DTree &doc, DTree::iterator it, std::ostringstream &str, const std::string &preamble_string, bool for_embedding=false, std::string title="")
- std::string latex_to_html (const std::string &)

Convert various LaTeX constructions to HTML-with-Mathjax, e.g.

- std::string export_as_LaTeX (const DTree &doc)

Export a document to a single self-contained LaTeX file.

- void LaTeX_recurse (const DTree &doc, DTree::iterator it, std::ostringstream &str, const std::string &preamble_string)
- std::string export_as_python (const DTree &doc)

Export a document to a python-like file (converting text cells to comments and python cells to python code, dropping output cells).

- void python_recurse (const DTree &doc, DTree::iterator it, std::ostringstream &str)

Variables

- nset_t name_set
- rset_t rat_set

8.1.1 Detailed Description

Class to display expressions in a format that Sympy can parse.

Evaluate a tensorial expression to components, performing all dummy index sums.

Handle the entire preclean stage, which turns a parsed expression into an expression which satisfies the Cadabra conventions.

Parser module, which takes the string output of the preprocessor.hh module and turns it into an Ex expression tree.

Cadabra kernel that keeps all state information that needs to be passed around to algorithms and properties.

Functions to handle the exchange properties of two or more symbols in a product.

Class to handle display of expressions using LaTeX notation.

Class to display expressions to the terminal.

Will throw an exception if a Cadabra Ex object cannot be understood by Sympy. Can also convert expressions back to Cadabra notation. This class contains the printing logic that you see in action when you call the '**sympy**' method on an Ex object.

This is used in the PythonCdb bridge to provide 'str' type python printing for Ex objects. The cadabra2 command line application uses this class for all its output. This class does not necessarily produce output which is readable by sympy; for that, use the DisplaySympy class (as an example, partial derivatives will display using a LaTeX notation using the present class, but be printed as 'sympy.diff' by the DisplaySympy class).

This is a very non-local bit of logic, in the sense that it will try to look around the property assignments in order to figure out the best way to print any given object. See the DisplayTeX::dispatch method to see how this works in more detail.

This module is only concerned with the exchange properties of tensors as a whole, not with index permutation symmetries (which are handled in the canonicalise class of algebra.cc).

At the moment only stores property information, but could also store global settings and the like at some later stage.

The output of preprocessor.hh is assumed to be valid and consistent, so the code here is rather simple.

This does not involve the property system.

- All numerical multipliers in a product on the product node, no multiplier on a sum node.
- Any '\frac' nodes with a purely numerical denominator should be rewritten as a rational multiplier for the numerator node.
- Any \sub nodes get converted to \sum nodes.

  See tests/components.cdb for basic samples.

  Components nodes have the following structure:

  _{m} // index names/types _{n} // last child // list of index values r t [value] // value of tensor for above values of indices ... ...

  ex:= A_{m n} (A_{m n} + B_{m n}); crds:= m -> { t, r, , }; vals:= { A_{t t} -> r, A_{r r} -> r**2, A_{t } -> t, B_{t t} -> 1 }; evaluate(ex, crds, vals); tst:= r * (r + 1) + r**2 * r**2 + t*t - @(ex);

  The algorithm performs the following steps. First, all free and dummy indices are classified using members of Algorithm (maybe later?). For all indices, the 'crds' argument to the algorithm is scanned for a

```
m -> { a,b,c }
```

type pattern.

Do a dept-first scan until the first sum or product node.

In a sum node, all terms must have the same index structure, so we can now make a map from the subtree pattern to all possible index values. For each such index value set, lookup if there is a replacement pattern, if not replace by zero. This map can be reused later for equal sub-expressions (here it is important that a normal tensor expression can be used as a pattern immediately, though I would search both on explicit iterator (for things that we have just seen) and on pattern (for things that occur again later in the tree)).

In a product node, find all dummies and free indices. Create a set of all index value sets, e.g.

{m, n, p} -> { {t, t, t}, {r,t,t}, {t,r,t}, ... }

For each such index value set, lookup replacement rules.

KEY: quick way to lookup, for a given set of index values on a (found) pattern/pattern pointed to by iterator, whether and what is the value of the pattern.

8.1.2 Typedef Documentation

8.1.2.1 typedef void(* cadabra::dispatcher_t) (const Kernel &k, Ex &, Ex::iterator &it)

8.1.2.2 typedef tree<DataCell> cadabra::DTree

8.1.2.3 typedef uintptr_t cadabra::hashval_t

8.1.2.4 typedef mpq_class cadabra::multiplier_t

8.1.2.5 typedef std::set<std::string> cadabra::nset_t

8.1.2.6 typedef std::set<multiplier_t> cadabra::rset_t

8.1.3 Function Documentation

8.1.3.1 void cadabra::add (rset_t::iterator & *num,* multiplier_t *fac*)

8.1.3.2 std::string cadabra::cdb2python (const std::string & *blk*)

8.1.3.3 void cadabra::check_index_consistency (const Kernel & *k,* Ex & *tr,* Ex::iterator *it*)

Generic tool to check for index inconsistencies independent of running any algorithm.

8.1.3.4 bool cadabra::cleanup_components (const Kernel & *k,* Ex & *tr,* Ex::iterator & *it*)

8.1.3.5 bool cadabra::cleanup_derivative (const Kernel & *k,* Ex & *tr,* Ex::iterator & *it*)

8.1.3.6 bool cadabra::cleanup_diagonal (const Kernel & *k,* Ex & *tr,* Ex::iterator & *it*)

8.1.3.7 void cadabra::cleanup_dispatch (const Kernel & *k,* Ex & , Ex::iterator & *it*)

Central cleanup dispatch routine, which calls the other cleanup functions defined later.

These cleanup routines do NOT use normal cadabra algorithms; they are completely independent of them to prevent circular dependence or infinite recursion.

These algorithms clean up the tree at the current node and the first layer of child nodes, but do NOT descend deeper down the tree, UNLESS that would leave the tree in an inconsistent state. An example is acting at the top node of {4}{{a}{b}}, which would push the 4 to the multiplier of the sum, but that is not allowed, so it needs to go further down. Sibling nodes of 'it' remain untouched as well.

8.1.3.8 void cadabra::cleanup_dispatch_deep (const Kernel & *k,* Ex & , dispatcher_t *disp* = &cleanup_dispatch)

More general cleanup of an entire tree.

Walks depth-first along the entire tree and call cleanup_dispatch at every node.

8.1.3.9 void cadabra::cleanup_dispatch_deep (const Kernel & *k,* Ex & *tr,* Ex::iterator & *top,* dispatcher_t *dispatch*)

8.1.3.10 bool cadabra::cleanup_exterior_derivative (const Kernel & *k,* Ex & *tr,* Ex::iterator & *it*)

8.1.3.11 void cadabra::cleanup_frac (const Kernel & *k,* Ex & *tr,* Ex::iterator & *st*)

8.1.3.12 void cadabra::cleanup_indexbracket (const Kernel & *k,* Ex & , Ex::iterator & *it*)

Convert parser output which indicates an indexbracket to an actual indexbracket node.

8.1.3.13 bool cadabra::cleanup_kronecker (const Kernel & *k,* Ex & *tr,* Ex::iterator & *it*)

8.1.3.14 bool cadabra::cleanup_numericalflat (const Kernel & *k,* Ex & *tr,* Ex::iterator & *it*)

8.1.3.15 bool cadabra::cleanup_partialderivative (const Kernel & *k,* Ex & *tr,* Ex::iterator & *it*)

8.1.3.16 bool cadabra::cleanup_productlike (const Kernel & *k,* Ex & , Ex::iterator & *it*)

Individual node cleanup routines.

Do not call these yourself.

Once more, these algorithms clean up the tree at the current node and the first layer of child nodes, but do NOT descend deeper down the tree, except when that is necessary to ensure that the tree remains consistent. As with any algorithms, the iterator pointing to the starting node may be changed, but these functions are not allowed to modify anything except the node and nodes below (in particular, they will leave sibling nodes untouched).

8.1.3.17 void cadabra::cleanup_rational (const Kernel & *k,* Ex & *tr,* Ex::iterator & *st*)

8.1.3.18 void cadabra::cleanup_sub (const Kernel & *k,* Ex & *tr,* Ex::iterator & *it*)

8.1.3.19 bool cadabra::cleanup_sumlike (const Kernel & *k,* Ex & *tr,* Ex::iterator & *it*)

8.1.3.20 void cadabra::cleanup_updown (const Kernel & *k,* Ex & , Ex::iterator & *it*)

Cleanup for individual node types.

These are not needed during any later stages of the manipulation of an expression (and are hence defined here, not in 'Cleanup.hh').

8.1.3.21 std::string cadabra::convert_line (const std::string & *line,* std::string & *lhs,* std::string & *rhs,* std::string & *indent*)

8.1.3.22 std::string cadabra::escape_quotes (const std::string & *line*)

8.1.3.23 std::string cadabra::export_as_HTML (const DTree & *doc,* bool *for_embedding* = `false`, std::string *title* = " ")

Export a document to a single self-contained HTML file containing inline CSS.

8.1.3.24 std::string cadabra::export_as_LaTeX (const DTree & *doc*)

Export a document to a single self-contained LaTeX file.

8.1.3.25 std::string cadabra::export_as_python (const DTree & *doc*)

Export a document to a python-like file (converting text cells to comments and python cells to python code, dropping output cells).

8.1.3.26 void cadabra::flip_sign (rset_t::iterator & *num*)

8.1.3.27 void cadabra::half (rset_t::iterator & *num*)

8.1.3.28 void cadabra::HTML_recurse (const DTree & *doc,* DTree::iterator *it,* std::ostringstream & *str,* const std::string & *preamble_string,* bool *for_embedding* = `false`, std::string *title* = " ")

8.1.3.29 void cadabra::JSON_deserialise (const std::string & *cj,* DTree & *doc*)

Load a document from .cj format, i.e. the inverse of the above.

8.1.3.30 void cadabra::JSON_in_recurse (DTree & *doc,* DTree::iterator *loc,* const Json::Value & *cells*)

8.1.3.31 void cadabra::JSON_recurse (const DTree & *doc,* DTree::iterator *it,* Json::Value & *json*)

8.1.3.32 std::string cadabra::JSON_serialise (const DTree & *doc*)

Serialise a document into .cj format, which is a JSON version of the document tree.

8.1.3.33 void cadabra::LaTeX_recurse (const DTree & *doc,* DTree::iterator *it,* std::ostringstream & *str,* const std::string & *preamble_string*)

8.1.3.34 std::string cadabra::latex_to_html (const std::string & *str*)

Convert various LaTeX constructions to HTML-with-Mathjax, e.g.

8.1.3.35 int cadabra::list_size (const Ex & *tr,* Ex::iterator *it*)

For lists as defined above for 'do_list', return their size (in case you really need to know the size before iterating over the elements).

8.1.3.36 void cadabra::one (rset_t::iterator & *num*)

8.1.3.37 bool cadabra::operator< (const exchange::tensor_type_t & *one,* const exchange::tensor_type_t & *two*)

8.1.3.38 void cadabra::pre_clean_dispatch (const Kernel & *kernel,* Ex & *ex,* Ex::iterator & *it*)

8.1.3.39 void cadabra::pre_clean_dispatch_deep (const Kernel & *k,* Ex & *tr*)

8.1.3.40 bool cadabra::push_down_multiplier (const Kernel & *k,* Ex & *tr,* Ex::iterator *it*)

Given a node with a non-unit multiplier, push this multiplier down the tree if the node is not allowed to have a non-unit multiplier.

This is a recursive procedure as the node onto which the multiplier gets pushed may itself not allow for a non-unit multiplier. Note that some nodes disallow non-unit multipliers on their children, but that should be handled individually (see cleanup of product nodes for an example).

8.1.3.41 void cadabra::python_recurse (const DTree & *doc,* DTree::iterator *it,* std::ostringstream & *str*)

8.1.3.42 bool cadabra::subtree_equal (const Properties * *properties,* Ex::iterator *one,* Ex::iterator *two,* int *mod_prel,* bool *checksets,* int *compare_multiplier*)

8.1.3.43 bool cadabra::subtree_exact_equal (const Properties * *properties,* Ex::iterator *one,* Ex::iterator *two,* int *mod_prel,* bool *checksets,* int *compare_multiplier,* bool *literal_wildcards*)

8.1.3.44 bool cadabra::subtree_exact_less (const Properties * *properties,* Ex::iterator *one,* Ex::iterator *two,* int *mod_prel,* bool *checksets,* int *compare_multiplier,* bool *literal_wildcards*)

8.1.3.45 bool cadabra::subtree_less (const Properties * *properties,* Ex::iterator *one,* Ex::iterator *two,* int *mod_prel,* bool *checksets,* int *compare_multiplier*)

8.1.3.46 long cadabra::to_long (multiplier_t *mul*)

8.1.3.47 std::string cadabra::to_string (long *num*)

8.1.3.48 bool cadabra::tree_equal (const Properties * *properties,* const Ex & *one,* const Ex & *two,* int *mod_prel,* bool *checksets,* int *compare_multiplier*)

8.1.3.49 bool cadabra::tree_exact_equal (const Properties * *properties,* const Ex & *one,* const Ex & *two,* int *mod_prel,* bool *checksets,* int *compare_multiplier,* bool *literal_wildcards*)

8.1.3.50 bool cadabra::tree_exact_less (const Properties * *properties,* const Ex & *one,* const Ex & *two,* int *mod_prel,* bool *checksets,* int *compare_multiplier,* bool *literal_wildcards*)

8.1.3.51 bool cadabra::tree_less (const Properties * *properties,* const Ex & *one,* const Ex & *two,* int *mod_prel,* bool *checksets,* int *compare_multiplier*)

Various comparison functions, some exact, some with pattern logic.

8.1.3.52 const char * cadabra::unichar (kunichar *c*)

8.1.3.53 void cadabra::zero (rset_t::iterator & *num*)

8.1.4 Variable Documentation

8.1.4.1 nset_t cadabra::name_set

8.1.4.2 rset_t cadabra::rat_set

8.2 cadabra2_defaults Namespace Reference

Classes

- class Server
- class Sympy

Functions

- def display (obj, delay_send=False)
- def _displayhook (arg)
- def post_process (__cdbkernel__, ex)

Variables

- __cdbkernel__ = cadabra2.__cdbkernel__
- sympy
- string mopen = "\\begin{dmath*}{}"
- string mclose = "\\end{dmath*}"
- server
- bool have_matplotlib = True
- remember_display_hook = sys.displayhook
- displayhook

8.2.1 Function Documentation

8.2.1.1 def cadabra2_defaults._displayhook (*arg*) [private]

8.2.1.2 def cadabra2_defaults.display (*obj, delay_send* = `False`)

8.2.1.3 def cadabra2_defaults.post_process (*__cdbkernel__, ex*)

8.2.2 Variable Documentation

8.2.2.1 cadabra2_defaults.__cdbkernel__ = cadabra2.__cdbkernel__ [private]

8.2.2.2 cadabra2_defaults.displayhook

8.2.2.3 bool cadabra2_defaults.have_matplotlib = True

8.2.2.4 string cadabra2_defaults.mclose = "\\end{dmath*}"

8.2.2.5 string cadabra2_defaults.mopen = "\\begin{dmath*}{}"

8.2.2.6 cadabra2_defaults.remember_display_hook = sys.displayhook

8.2.2.7 cadabra2_defaults.server

8.2.2.8 cadabra2_defaults.sympy

8.3 cadabra::symbols Namespace Reference

Variables

- const std::set< std::string > greek

8.3.1 Variable Documentation

8.3.1.1 const std::set< std::string > cadabra::symbols::greek

8.4 cadabra_osx Namespace Reference

Classes

- class NotebookWindow

  Objective-C++ class implementing DocumentThread and providing an OS-X notebook interface.

8.5 combin Namespace Reference

Classes

- class combinations
- class combinations_base
- class symm_helper
- class symm_val_helper
- class symmetriser

Typedefs

- typedef std::vector< unsigned int > range_t
- typedef std::vector< range_t > range_vector_t
- typedef std::vector< int > weights_t

Functions

- unsigned long factorial (unsigned int x)
- long vector_sum (const std::vector< int > &)

  sum of elements
- unsigned long vector_prod (const std::vector< unsigned int > &)

  product of elements
- unsigned long vector_prod_fact (const std::vector< unsigned int > &)

  product of factorials of elements
- bool operator== (const std::vector< unsigned int > &, const std::vector< unsigned int > &)
- long hash (const std::vector< unsigned int > &)

  compute a hash value for a vector of unsigned ints
- int determine_intersection_ranges (const range_vector_t &prod, const range_vector_t &indv, range_vector_t &target)
- template<class iterator1 , class iterator2 >
  int ordersign (iterator1 b1, iterator1 e1, iterator2 b2, iterator2 e2, int stepsize=1)
- template<class iterator1 >
  int ordersign (iterator1 b1, iterator1 e1)
- template<class T >
  T fact (T x)
- template<class T >
  std::ostream & operator<< (std::ostream &str, const symmetriser< T > &sym)

8.5.1 Typedef Documentation

8.5.1.1 typedef std::vector<unsigned int> combin::range_t

8.5.1.2 typedef std::vector<range_t> combin::range_vector_t

8.5.1.3 typedef std::vector<int> combin::weights_t

8.5.2 Function Documentation

8.5.2.1 int combin::determine_intersection_ranges (const range_vector_t & *prod,* const range_vector_t & *indv,* combin::range_vector_t & *target*)

8.5.2.2 template<class T > T combin::fact (T *x*)

8.5.2.3 unsigned long combin::factorial (unsigned int *x*)

8.5.2.4 long combin::hash (const std::vector< unsigned int > & *one*)

compute a hash value for a vector of unsigned ints

8.5.2.5 template<class T > std::ostream & combin::operator<< (std::ostream & *str,* const symmetriser< T > & *sym*)

8.5.2.6 bool combin::operator== (const std::vector< unsigned int > & *one,* const std::vector< unsigned int > & *two*)

8.5.2.7 template<class iterator1 , class iterator2 > int combin::ordersign (iterator1 *b1,* iterator1 *e1,* iterator2 *b2,* iterator2 *e2,* int *stepsize* = 1)

8.5.2.8 template<class iterator1 > int combin::ordersign (iterator1 *b1,* iterator1 *e1*)

8.5.2.9 unsigned long combin::vector_prod (const std::vector< unsigned int > & *v*)

product of elements

8.5.2.10 unsigned long combin::vector_prod_fact (const std::vector< unsigned int > & *v*)

product of factorials of elements

8.5.2.11 long combin::vector_sum (const std::vector< int > & *v*)

sum of elements

8.6 echokernel Namespace Reference

Classes

- class EchoKernel

Variables

- kernel_class

8.6.1 Variable Documentation

8.6.1.1 echokernel.kernel_class

8.7 snoop Namespace Reference

Classes

- class Flush
- class Snoop

  Logging class with functionality to send log information to a remote server using a websocket connection.
- class SnoopImpl

Variables

- Flush flush
- Snoop log
- const char info [ ] ="info"
- const char warn [ ] ="warning"
- const char error [ ] ="error"
- const char fatal [ ] ="fatal"
- const char email [ ] ="email"

8.7.1 Variable Documentation

8.7.1.1 const char snoop::email[ ] ="email"

8.7.1.2 const char snoop::error[ ] ="error"

8.7.1.3 const char snoop::fatal[ ] ="fatal"

8.7.1.4 snoop::Flush snoop::flush

8.7.1.5 const char snoop::info[ ] ="info"

8.7.1.6 snoop::Snoop snoop::log

8.7.1.7 const char snoop::warn[ ] ="warning"

8.8 sympy Namespace Reference

Functions

- cadabra::Ex * map_sympy (const cadabra::Kernel &, cadabra::Ex &, const std::vector< std::string > &wrap, const std::string &args, const std::string &method)

  Functionality to act with Sympy on all scalar parts of an expression, and keep the result in-place.
- cadabra::Ex::iterator apply (const cadabra::Kernel &, cadabra::Ex &, cadabra::Ex::iterator &, const std↩ ::vector< std::string > &wrap, const std::string &args, const std::string &method)

  Functionality to act with Sympy functions on (parts of) Cadabra Ex expressions and read the result back into the same Ex.
- cadabra::Ex invert_matrix (const cadabra::Kernel &, cadabra::Ex &ex, cadabra::Ex &rules)

  Use Sympy to invert a matrix, given a set of rules determining its sparse components.

8.9 yngtab Namespace Reference

Generic Young tableaux routines.

Classes

- class filled_tableau
- class tableau
- class tableau_base
- class tableaux

Typedefs

- typedef filled_tableau< std::pair< int, int > > keeptrack_tab_t

Functions

- std::ostream & operator<< (std::ostream &str, const tableau &tab)
- template<>
  void add_box (tableau &tab1, unsigned int row1, const tableau &tab2, unsigned int row2, unsigned int col2)
- bool legal_box (const std::vector< std::pair< int, int > > &prev, const std::vector< std::pair< int, int > > &ths, int colpos, int trypos)
- template<class T , class OutputIterator >
  void LR_tensor (const tableaux< T > &tabs1, const T &tab2, unsigned int maxrows, OutputIterator out, bool alltabs=false)
- template<class T1 , class T2 >
  void add_box (T1 &tab1, unsigned int row1, const T2 &tab2, unsigned int row2, unsigned int col2)
- template<class T1 >
  void add_box (T1 &tab1, unsigned int row1, const tableau &tab2, unsigned int row2, unsigned int col2)

- template<class Tab , class OutputIterator >
  void LR_add_box (const Tab &tab2, Tab &newtab, unsigned int currow2, unsigned int curcol2, unsigned int startrow, unsigned int maxrows, OutputIterator outit, keeptrack_tab_t &Ycurrent, bool alltabs)
- template<class Tab , class OutputIterator >
  void LR_tensor (const Tab &tab1, const Tab &tab2, unsigned int maxrows, OutputIterator outit, bool alltabs=false)
- template<class T , class OutputIterator >
  void LR_tensor (const tableaux< T > &, bool symmetric, unsigned int maxrows, OutputIterator outit)
- template<class T >
  std::ostream & operator<< (std::ostream &, const tableaux< T > &)
- template<class T >
  std::ostream & operator<< (std::ostream &, const filled_tableau< T > &)

8.9.1 Detailed Description

Generic Young tableaux routines.

8.9.2 Typedef Documentation

8.9.2.1 typedef filled_tableau<std::pair<int, int> > yngtab::keeptrack_tab_t

8.9.3 Function Documentation

8.9.3.1 template<> void yngtab::add_box (tableau & *tab1,* unsigned int *row1,* const tableau & *tab2,* unsigned int *row2,* unsigned int *col2*)

8.9.3.2 template<class T1 , class T2 > void yngtab::add_box (T1 & *tab1,* unsigned int *row1,* const T2 & *tab2,* unsigned int *row2,* unsigned int *col2*)

8.9.3.3 template<class T1 > void yngtab::add_box (T1 & *tab1,* unsigned int *row1,* const tableau & *tab2,* unsigned int *row2,* unsigned int *col2*)

8.9.3.4 bool yngtab::legal_box (const std::vector< std::pair< int, int > > & *prev,* const std::vector< std::pair< int, int > > & *ths,* int *colpos,* int *trypos*)

8.9.3.5 template<class Tab , class OutputIterator > void yngtab::LR_add_box (const Tab & *tab2,* Tab & *newtab,* unsigned int *currow2,* unsigned int *curcol2,* unsigned int *startrow,* unsigned int *maxrows,* OutputIterator *outit,* keeptrack_tab_t & *Ycurrent,* bool *alltabs*)

8.9.3.6 template<class T , class OutputIterator > void yngtab::LR_tensor (const tableaux< T > & *tabs1,* const T & *tab2,* unsigned int *maxrows,* OutputIterator *out,* bool *alltabs* = `false`)

8.9.3.7 template<class Tab , class OutputIterator > void yngtab::LR_tensor (const Tab & *tab1,* const Tab & *tab2,* unsigned int *maxrows,* OutputIterator *outit,* bool *alltabs* = `false`)

8.9.3.8 template<class T , class OutputIterator > void yngtab::LR_tensor (const tableaux< T > & , bool *symmetric,* unsigned int *maxrows,* OutputIterator *outit*)

8.9.3.9 std::ostream & yngtab::operator<< (std::ostream & *str,* const tableau & *tab*)

8.9.3.10 template<class T > std::ostream & yngtab::operator<< (std::ostream & *str,* const tableaux< T > & *tabs*)

8.9.3.11 template<class T > std::ostream & yngtab::operator<< (std::ostream & *str,* const filled_tableau< T > & *tab*)

Chapter 9

Class Documentation

9.1 cadabra::Accent Class Reference

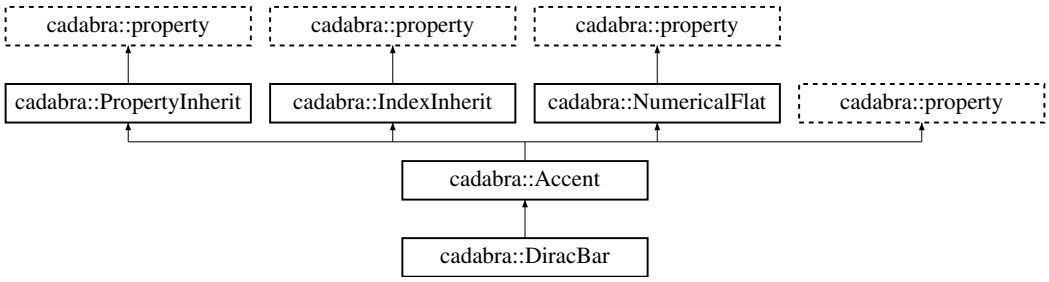
9.1.1 Description

Turns a symbol into an accent.

Accented objects inherit all properties and indices from the objects which they wrap. Here is an example with inherited coordinate dependence: {screen}{1,2,3,4,5,6} {#}::Accent. {#}::PartialDerivative. A::Depends(). (A {A} B): !(%): !(%); (A) * A * B + A * ({A}) * B; {screen} Without the accent property, |{A}| object would be a completely independent object, unrelated to |A|.

`#include <Accent.hh>`

Inheritance diagram for cadabra::Accent:



Public Member Functions

- virtual std::string name () const

Additional Inherited Members

9.1.2 Member Function Documentation

9.1.2.1 std::string Accent::name ( ) const [virtual]

Implements cadabra::property.

Reimplemented in cadabra::DiracBar.

The documentation for this class was generated from the following files:

- core/properties/Accent.hh
- core/properties/Accent.cc

9.2 preprocessor::accu_t Class Reference

Public Member Functions

- accu_t ()
- void erase ()

Public Attributes

- bool head_is_generated
- std::string accu
- unsigned int order
- std::vector< std::string > parts
- unsigned int bracket
- bool is_index

9.2.1 Constructor & Destructor Documentation

9.2.1.1 preprocessor::accu_t::accu_t ( )

9.2.2 Member Function Documentation

9.2.2.1 void preprocessor::accu_t::erase ( )

9.2.3 Member Data Documentation

9.2.3.1 std::string preprocessor::accu_t::accu

9.2.3.2 unsigned int preprocessor::accu_t::bracket

9.2.3.3 bool preprocessor::accu_t::head_is_generated

9.2.3.4 bool preprocessor::accu_t::is_index

9.2.3.5 unsigned int preprocessor::accu_t::order

9.2.3.6 std::vector<std::string> preprocessor::accu_t::parts

The documentation for this class was generated from the following files:

- core/PreProcessor.hh
- core/PreProcessor.cc

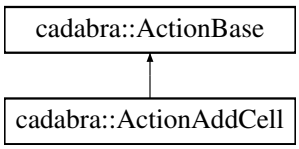
9.3 cadabra::ActionAddCell Class Reference

9.3.1 Description

Add a cell to the notebook.

`#include <Actions.hh>`

Inheritance diagram for cadabra::ActionAddCell:



Public Types

- enum Position { Position::before, Position::after, Position::child }

Public Member Functions

- ActionAddCell (DataCell, DTree::iterator ref_, Position pos_)
- virtual void execute (DocumentThread &, GUIBase &) override

  Perform the action.
- virtual void revert (DocumentThread &, GUIBase &) override

  Revert the change to the DTree document and the GUI.

Private Attributes

- DataCell newcell
- DTree::iterator ref
- DTree::iterator newref
- Position pos
- int child_num

9.3.2 Member Enumeration Documentation

9.3.2.1 enum cadabra::ActionAddCell::Position [strong]

Enumerator

before

after

child

9.3.3 Constructor & Destructor Documentation

9.3.3.1 ActionAddCell::ActionAddCell (DataCell *cell*, DTree::iterator *ref_*, Position *pos_*)

9.3.4 Member Function Documentation

9.3.4.1 void ActionAddCell::execute (DocumentThread & , GUIBase &) [override], [virtual]

Perform the action.

This should update both the document tree data structure and the GUI. The latter is updated by calling relevant methods on the GUIBase object passed in.

Implements cadabra::ActionBase.

9.3.4.2 void ActionAddCell::revert (DocumentThread & , GUIBase &) [override], [virtual]

Revert the change to the DTree document and the GUI.

Implements cadabra::ActionBase.

9.3.5 Member Data Documentation

9.3.5.1 int cadabra::ActionAddCell::child_num [private]

9.3.5.2 DataCell cadabra::ActionAddCell::newcell [private]

9.3.5.3 DTree::iterator cadabra::ActionAddCell::newref [private]

9.3.5.4 Position cadabra::ActionAddCell::pos [private]

9.3.5.5 DTree::iterator cadabra::ActionAddCell::ref [private]

The documentation for this class was generated from the following files:

- client_server/Actions.hh
- client_server/Actions.cc

9.4 cadabra::ActionBase Class Reference

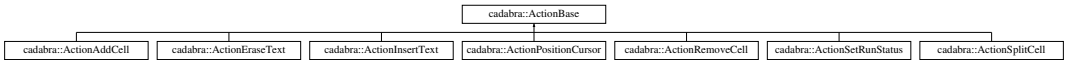
9.4.1 Description

All actions derive from the ActionBase object, which defines the interface they need to implement.

These objects are used to pass (user) action instructions around. They can be stored in undo/redo stacks. All actions run on the GUI thread. The update_gui members typically call members of the GUIBase class. Action objects are allowed to modify the DTree document doc, since they essentially contain code which is part of the DocumentThread object.

```
#include <Actions.hh>
```

Inheritance diagram for cadabra::ActionBase:



Public Member Functions

- virtual void execute (DocumentThread &, GUIBase &)=0

  Perform the action.
- virtual void revert (DocumentThread &, GUIBase &)=0

  Revert the change to the DTree document and the GUI.
- virtual bool undoable () const

  Can this action be undone?

9.4.2 Member Function Documentation

9.4.2.1 virtual void cadabra::ActionBase::execute (DocumentThread & , GUIBase &) [pure virtual]

Perform the action.

This should update both the document tree data structure and the GUI. The latter is updated by calling relevant methods on the GUIBase object passed in.

Implemented in cadabra::ActionEraseText, cadabra::ActionInsertText, cadabra::ActionSplitCell, cadabra::Action↩RemoveCell, cadabra::ActionSetRunStatus, cadabra::ActionPositionCursor, and cadabra::ActionAddCell.

9.4.2.2 virtual void cadabra::ActionBase::revert (DocumentThread & , GUIBase &) [pure virtual]

Revert the change to the DTree document and the GUI.

Implemented in cadabra::ActionEraseText, cadabra::ActionInsertText, cadabra::ActionSplitCell, cadabra::Action↩RemoveCell, cadabra::ActionSetRunStatus, cadabra::ActionPositionCursor, and cadabra::ActionAddCell.

9.4.2.3 bool ActionBase::undoable ( ) const [virtual]

Can this action be undone?

Reimplemented in cadabra::ActionSetRunStatus.

The documentation for this class was generated from the following files:

- client_server/Actions.hh
- client_server/Actions.cc

9.5 cadabra::ActionEraseText Class Reference

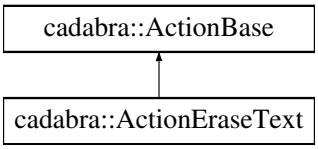
9.5.1 Description

Remove a text string starting at the indicated position, and with the indicated length, from the indicated cell.

This action is assumed to be triggered from a user change to the GUI cells, so will not update the GUI itself, only the underlying DTree. However, the revert method will need to update the GUI representation.

```
#include <Actions.hh>
```

Inheritance diagram for cadabra::ActionEraseText:



Public Member Functions

- ActionEraseText (DTree::iterator, int, int)
- virtual void execute (DocumentThread &, GUIBase &) override

  Perform the action.
- virtual void revert (DocumentThread &, GUIBase &) override

  Revert the change to the DTree document and the GUI.

Private Attributes

- DTree::iterator this_cell
- int from_pos
- int to_pos
- std::string removed_text

9.5.2 Constructor & Destructor Documentation

9.5.2.1 ActionEraseText::ActionEraseText (DTree::iterator *ref_*, int *start*, int *end*)

9.5.3 Member Function Documentation

9.5.3.1 void ActionEraseText::execute (DocumentThread &, GUIBase &) [override], [virtual]

Perform the action.

This should update both the document tree data structure and the GUI. The latter is updated by calling relevant methods on the GUIBase object passed in.

Implements cadabra::ActionBase.

9.5.3.2 void ActionEraseText::revert (DocumentThread &, GUIBase &) [override], [virtual]

Revert the change to the DTree document and the GUI.

Implements cadabra::ActionBase.

9.5.4 Member Data Documentation

9.5.4.1 int cadabra::ActionEraseText::from_pos [private]

9.5.4.2 std::string cadabra::ActionEraseText::removed_text [private]

9.5.4.3 DTree::iterator cadabra::ActionEraseText::this_cell [private]

9.5.4.4 int cadabra::ActionEraseText::to_pos [private]

The documentation for this class was generated from the following files:

- client_server/Actions.hh
- client_server/Actions.cc

9.6 cadabra::ActionInsertText Class Reference

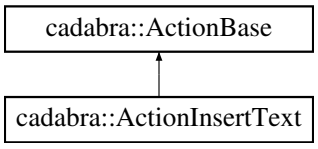
9.6.1 Description

Add a text string (can be just a single character) at the point of the cursor.

This action is assumed to be triggered from a user change to the GUI cells, so will not update the GUI itself, only the underlying DTree. However, the revert method will need to update the GUI representation.

```
#include <Actions.hh>
```

Inheritance diagram for cadabra::ActionInsertText:



Public Member Functions

- ActionInsertText (DTree::iterator, int pos, const std::string &)
- virtual void execute (DocumentThread &, GUIBase &) override

  Perform the action.
- virtual void revert (DocumentThread &, GUIBase &) override

  Revert the change to the DTree document and the GUI.

Private Attributes

- DTree::iterator this_cell
- int insert_pos
- std::string text

9.6.2 Constructor & Destructor Documentation

9.6.2.1 ActionInsertText::ActionInsertText (DTree::iterator *ref_*, int *pos*, const std::string & *content*)

9.6.3 Member Function Documentation

9.6.3.1 void ActionInsertText::execute (DocumentThread & , GUIBase &) [override], [virtual]

Perform the action.

This should update both the document tree data structure and the GUI. The latter is updated by calling relevant methods on the GUIBase object passed in.

Implements cadabra::ActionBase.

9.6.3.2 void ActionInsertText::revert (DocumentThread & , GUIBase &) [override], [virtual]

Revert the change to the DTree document and the GUI.

Implements cadabra::ActionBase.

9.6.4 Member Data Documentation

9.6.4.1 int cadabra::ActionInsertText::insert_pos [private]

9.6.4.2 std::string cadabra::ActionInsertText::text [private]

9.6.4.3 DTree::iterator cadabra::ActionInsertText::this_cell [private]

The documentation for this class was generated from the following files:

- client_server/Actions.hh
- client_server/Actions.cc

9.7 cadabra::ActionPositionCursor Class Reference

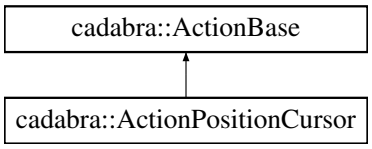
9.7.1 Description

Position the cursor relative to the indicated cell.

If position is 'next' and there is no input cell following the indicated one, create a new one.

`#include <Actions.hh>`

Inheritance diagram for cadabra::ActionPositionCursor:



Public Types

- enum Position { Position::in, Position::next, Position::previous }

Public Member Functions

- ActionPositionCursor (DTree::iterator ref_, Position pos_)
- virtual void execute (DocumentThread &, GUIBase &) override

  Perform the action.
- virtual void revert (DocumentThread &, GUIBase &) override

  Revert the change to the DTree document and the GUI.

Private Attributes

- bool needed_new_cell
- DTree::iterator ref
- DTree::iterator newref
- Position pos

9.7.2 Member Enumeration Documentation

9.7.2.1 enum cadabra::ActionPositionCursor::Position [strong]

Enumerator

in

next

previous

9.7.3 Constructor & Destructor Documentation

9.7.3.1 ActionPositionCursor::ActionPositionCursor (DTree::iterator *ref_*, Position *pos_*)

9.7.4 Member Function Documentation

9.7.4.1 void ActionPositionCursor::execute (DocumentThread & , GUIBase &) [override], [virtual]

Perform the action.

This should update both the document tree data structure and the GUI. The latter is updated by calling relevant methods on the GUIBase object passed in.

Implements cadabra::ActionBase.

9.7.4.2 void ActionPositionCursor::revert (DocumentThread & , GUIBase &) [override], [virtual]

Revert the change to the DTree document and the GUI.

Implements cadabra::ActionBase.

9.7.5 Member Data Documentation

9.7.5.1 bool cadabra::ActionPositionCursor::needed_new_cell [private]

9.7.5.2 DTree::iterator cadabra::ActionPositionCursor::newref [private]

9.7.5.3 Position cadabra::ActionPositionCursor::pos [private]

9.7.5.4 DTree::iterator cadabra::ActionPositionCursor::ref [private]

The documentation for this class was generated from the following files:

- client_server/Actions.hh
- client_server/Actions.cc

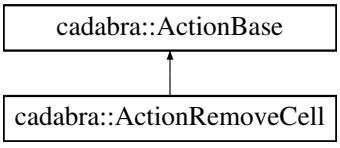
9.8 cadabra::ActionRemoveCell Class Reference

9.8.1 Description

Remove a cell and all its child cells from the document.

`#include <Actions.hh>`

Inheritance diagram for cadabra::ActionRemoveCell:



Public Member Functions

- ActionRemoveCell (DTree::iterator ref_)
- ~ActionRemoveCell ()
- virtual void execute (DocumentThread &, GUIBase &) override

  Perform the action.
- virtual void revert (DocumentThread &, GUIBase &) override

  Revert the change to the DTree document and the GUI.

Private Attributes

- DTree removed_tree
- DTree::iterator reference_parent_cell
- DTree::iterator this_cell
- size_t reference_child_index

9.8.2 Constructor & Destructor Documentation

9.8.2.1 ActionRemoveCell::ActionRemoveCell (DTree::iterator *ref_*)

9.8.2.2 ActionRemoveCell::~ActionRemoveCell ( )

9.8.3 Member Function Documentation

9.8.3.1 void ActionRemoveCell::execute (DocumentThread & , GUIBase &) [override], [virtual]

Perform the action.

This should update both the document tree data structure and the GUI. The latter is updated by calling relevant methods on the GUIBase object passed in.

Implements cadabra::ActionBase.

9.8.3.2 void ActionRemoveCell::revert (DocumentThread & , GUIBase &) [override], [virtual]

Revert the change to the DTree document and the GUI.

Implements cadabra::ActionBase.

9.8.4 Member Data Documentation

9.8.4.1 size_t cadabra::ActionRemoveCell::reference_child_index [private]

9.8.4.2 DTree::iterator cadabra::ActionRemoveCell::reference_parent_cell [private]

9.8.4.3 DTree cadabra::ActionRemoveCell::removed_tree [private]

9.8.4.4 DTree::iterator cadabra::ActionRemoveCell::this_cell [private]

The documentation for this class was generated from the following files:

- client_server/Actions.hh
- client_server/Actions.cc

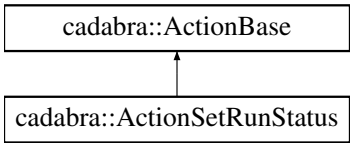
9.9 cadabra::ActionSetRunStatus Class Reference

9.9.1 Description

Update the running status of the indicated cell.

`#include <Actions.hh>`

Inheritance diagram for cadabra::ActionSetRunStatus:



Public Member Functions

- ActionSetRunStatus (DTree::iterator ref_, bool running)
- virtual void execute (DocumentThread &, GUIBase &) override

  Perform the action.
- virtual void revert (DocumentThread &, GUIBase &) override

  Revert the change to the DTree document and the GUI.
- virtual bool undoable () const override

  Can this action be undone?

Private Attributes

- DTree::iterator this_cell
- bool was_running_
- bool new_running_

9.9.2 Constructor & Destructor Documentation

9.9.2.1 ActionSetRunStatus::ActionSetRunStatus (DTree::iterator *ref_*, bool *running*)

9.9.3 Member Function Documentation

9.9.3.1 void ActionSetRunStatus::execute (DocumentThread &, GUIBase &) [override], [virtual]

Perform the action.

This should update both the document tree data structure and the GUI. The latter is updated by calling relevant methods on the GUIBase object passed in.

Implements cadabra::ActionBase.

9.9.3.2 void ActionSetRunStatus::revert (DocumentThread & , GUIBase &) [override], [virtual]

Revert the change to the DTree document and the GUI.

Implements cadabra::ActionBase.

9.9.3.3 bool ActionSetRunStatus::undoable ( ) const [override], [virtual]

Can this action be undone?

Reimplemented from cadabra::ActionBase.

9.9.4 Member Data Documentation

9.9.4.1 bool cadabra::ActionSetRunStatus::new_running_ [private]

9.9.4.2 DTree::iterator cadabra::ActionSetRunStatus::this_cell [private]

9.9.4.3 bool cadabra::ActionSetRunStatus::was_running_ [private]

The documentation for this class was generated from the following files:

- client_server/Actions.hh
- client_server/Actions.cc

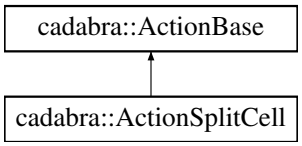
9.10 cadabra::ActionSplitCell Class Reference

9.10.1 Description

Split a cell into two separate cells, at the point of the cursor.

`#include <Actions.hh>`

Inheritance diagram for cadabra::ActionSplitCell:



Public Member Functions

- ActionSplitCell (DTree::iterator ref_)
- ~ActionSplitCell ()
- virtual void execute (DocumentThread &, GUIBase &) override
  Perform the action.
- virtual void revert (DocumentThread &, GUIBase &) override
  Revert the change to the DTree document and the GUI.

Private Attributes

- DTree::iterator this_cell
- DTree::iterator newref

9.10.2 Constructor & Destructor Documentation

9.10.2.1 ActionSplitCell::ActionSplitCell (DTree::iterator *ref_*)

9.10.2.2 ActionSplitCell::~ActionSplitCell ( )

9.10.3 Member Function Documentation

9.10.3.1 void ActionSplitCell::execute (DocumentThread & , GUIBase &) [override], [virtual]

Perform the action.

This should update both the document tree data structure and the GUI. The latter is updated by calling relevant methods on the GUIBase object passed in.

Implements cadabra::ActionBase.

9.10.3.2 void ActionSplitCell::revert (DocumentThread & , GUIBase &) [override], [virtual]

Revert the change to the DTree document and the GUI.

Implements cadabra::ActionBase.

9.10.4 Member Data Documentation

9.10.4.1 DTree::iterator cadabra::ActionSplitCell::newref [private]

9.10.4.2 DTree::iterator cadabra::ActionSplitCell::this_cell [private]

The documentation for this class was generated from the following files:

- client_server/Actions.hh
- client_server/Actions.cc

9.11 cadabra::Algorithm Class Reference

9.11.1 Description

Base class for all algorithms, containing generic routines and in particular the logic for index classification.

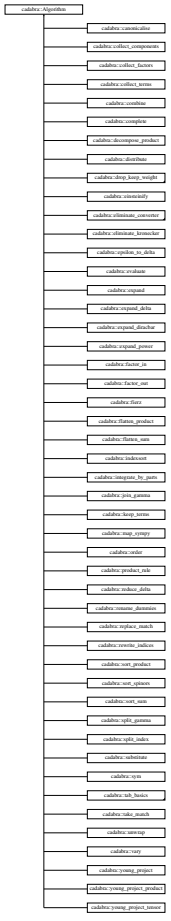
Also contains static algorithms acting on Ex objects which require property information and can therefore not be a member of Ex.

In order to implement a new algorithm, subclass Algorithm and implement the abstract members Algorithm::can_apply and Algorithm::apply (see there for further documentation). The general logic is that the implementation of Algorithm::apply(iterator&) is not allowed to make the node pointed at by the iterator invalid. If the algorithm makes the node vanish, it should indicate so by setting its multiplier to zero; the calling logic will then take care of cleaning up the subtree at the node.

The algorithm is, however, allowed to change the node itself or replace it with another one, as long as it updates the iterator.

```
#include <Algorithm.hh>
```

Inheritance diagram for cadabra::Algorithm:



Public Types

- typedef Ex::iterator iterator
- typedef Ex::post_order_iterator post_order_iterator
- typedef Ex::sibling_iterator sibling_iterator
- typedef Ex::result_t result_t
- typedef std::multimap< Ex, Ex::iterator, tree_exact_less_for_indexmap_obj > index_map_t

  A map from a pattern to the position where it occurs in the tree.
- typedef std::map< Ex::iterator, int, Ex::iterator_base_less > index_position_map_t

  A map from the position of each index to the sequential index.

Public Member Functions

- Algorithm (const Kernel &, Ex &)

  Initialise the algorithm with a reference to the expression tree, but do not yet do anything with this tree.
- virtual ~Algorithm ()
- void set_progress_monitor (ProgressMonitor *)

  Provide the algorithm with a ProgressMonitor object on which to register (nested) progress information, to be reported out-of-band to a client.
- result_t apply_generic (bool deep=true, bool repeat=false, unsigned int depth=0)

  The main entry points for running algorithms, which traverse the tree post-order ('child before parent').
- result_t apply_generic (iterator &, bool deep, bool repeat, unsigned int depth)
- result_t apply_pre_order (bool repeat=false)

  Apply algorithm with alternative traversal: starting from the top node, traverse the tree pre-order ('parent before child') and once the algorithm acts at a given node, do not traverse the subtree below anymore.
- bool check_consistency (iterator) const

  Given an expression top node, check index consistency.
- bool check_index_consistency (iterator) const
- bool check_degree_consistency (iterator) const

  Given an expression top node, check differential form degree consistency.
- void report_progress (const std::string &, int todo, int done, int count=2)
- index_iterator begin_index (iterator it) const
- index_iterator end_index (iterator it) const
- unsigned int number_of_indices (iterator it)
- bool rename_replacement_dummies (iterator, bool still_inside_algo=false)

Static Public Member Functions

- static unsigned int number_of_indices (const Properties &, iterator it)
- static unsigned int number_of_direct_indices (iterator it)

Public Attributes

- bool interrupted
- unsigned int number_of_calls
- unsigned int number_of_modifications
- bool suppress_normal_output
- bool discard_command_node
- Stopwatch index_sw
- Stopwatch get_dummy_sw
- Stopwatch report_progress_stopwatch

Protected Types

- typedef std::pair< sibling_iterator, sibling_iterator > range_t

  Finding objects in sets.
- typedef std::vector< range_t > range_vector_t

Protected Member Functions

- virtual bool can_apply (iterator)=0
- virtual result_t apply (iterator &)=0
- int index_parity (iterator) const
- bool contains (sibling_iterator from, sibling_iterator to, sibling_iterator arg)
- void find_argument_lists (range_vector_t &, bool only_comma_lists=true) const
- template<class Iter >
  range_vector_t::iterator find_arg_superset (range_vector_t &, Iter st, Iter nd)
- range_vector_t::iterator find_arg_superset (range_vector_t &, sibling_iterator it)
- unsigned int locate_single_object (Ex::iterator obj_to_find, Ex::iterator st, Ex::iterator nd, std::vector< unsigned int > &store)
- bool locate_object_set (const Ex &objs, Ex::iterator st, Ex::iterator nd, std::vector< unsigned int > &store)
- bool is_termlike (iterator)

  Determine structure (version-2)
- bool is_factorlike (iterator)
- bool is_single_term (iterator)

  Take a single non-product node in a sum and wrap it in a product node, so it can be handled on the same footing as a proper product.
- bool is_nonprod_factor_in_prod (iterator)
- bool prod_wrap_single_term (iterator &)
- bool prod_unwrap_single_term (iterator &)
- void force_prod_wrap (iterator &)

  Wrap a term in a product, irrespective of its parent (it usually makes more sense to call the safer prod_wrap_single_term above).
- bool separated_by_derivative (iterator, iterator, iterator check_dependence) const

  Figure out whether two objects (commonly indices) are separated by a derivative operator, as in

  $$\partial_a A_b C^b$$

  .
- void pushup_multiplier (iterator)
- template<class BinaryPredicate >
  unsigned int intersection_number (sibling_iterator, sibling_iterator, sibling_iterator, sibling_iterator, BinaryPredicate) const

  Determine the number of elements in the first range which also occur in the second range.
- void node_zero (iterator)
- void node_one (iterator)
- void node_integer (iterator, int)
- void fill_index_position_map (iterator, const index_map_t &, index_position_map_t &) const

  Index manipulation and classification.
- void fill_map (index_map_t &, sibling_iterator, sibling_iterator) const
- void print_classify_indices (std::ostream &, iterator) const
- void determine_intersection (index_map_t &one, index_map_t &two, index_map_t &target, bool move_out=false) const
- void classify_add_index (iterator it, index_map_t &ind_free, index_map_t &ind_dummy) const
- void classify_indices_up (iterator, index_map_t &ind_free, index_map_t &ind_dummy) const
- void classify_indices (iterator, index_map_t &ind_free, index_map_t &ind_dummy) const

- int max_numbered_name_one (const std::string &nm, const index_map_t *one) const
- int max_numbered_name (const std::string &, const index_map_t *m1, const index_map_t *m2=0, const index_map_t *m3=0, const index_map_t *m4=0, const index_map_t *m5=0) const
- Ex get_dummy (const list_property *, const index_map_t *m1, const index_map_t *m2=0, const index_map_t *m3=0, const index_map_t *m4=0, const index_map_t *m5=0) const
- Ex get_dummy (const list_property *, iterator) const
- Ex get_dummy (const list_property *, iterator, iterator) const
- bool index_in_set (Ex, const index_map_t *) const
- index_map_t::iterator find_modulo_parent_rel (iterator it, index_map_t &imap) const

  Find an index in the set, not taking into account index position.

Static Protected Member Functions

- static bool less_without_numbers (nset_t::iterator, nset_t::iterator)
- static bool equal_without_numbers (nset_t::iterator, nset_t::iterator)
- static bool compare_ (const str_node &, const str_node &)

Protected Attributes

- const Kernel & kernel
- Ex & tr
- ProgressMonitor * pm

Private Member Functions

- result_t apply_once (Ex::iterator &it)
- result_t apply_deep (Ex::iterator &it)
- void propagate_zeroes (post_order_iterator &, const iterator &)

  Given a node with zero multiplier, propagate this zero upwards in the tree.
- void dumpmap (std::ostream &, const index_map_t &) const

9.11.2 Member Typedef Documentation

9.11.2.1 typedef std::multimap<Ex, Ex::iterator, tree_exact_less_for_indexmap_obj> cadabra::Algorithm::index_map_t

A map from a pattern to the position where it occurs in the tree.

The comparator is such that we store indices exactly, apart from their multiplicative factor. This means that the index in A_{n} and in A_{-n} are stored in the same way, and one needs to lookup the expression in the tree to find this multiplier. See basic.cdb test 26 for an example that uses this.

9.11.2.2 typedef std::map<Ex::iterator, int, Ex::iterator_base_less> cadabra::Algorithm::index_position_map_t

A map from the position of each index to the sequential index.

9.11.2.3 typedef Ex::iterator cadabra::Algorithm::iterator

9.11.2.4 typedef Ex::post_order_iterator cadabra::Algorithm::post_order_iterator

9.11.2.5 typedef std::pair<sibling_iterator, sibling_iterator> cadabra::Algorithm::range_t [protected]

Finding objects in sets.

9.11.2.6 typedef std::vector<range_t> cadabra::Algorithm::range_vector_t [protected]

9.11.2.7 typedef Ex::result_t cadabra::Algorithm::result_t

9.11.2.8 typedef Ex::sibling_iterator cadabra::Algorithm::sibling_iterator

9.11.3 Constructor & Destructor Documentation

9.11.3.1 Algorithm::Algorithm (const Kernel & *k*, Ex & *tr_*)

Initialise the algorithm with a reference to the expression tree, but do not yet do anything with this tree.

Algorithms are not typically allowed to mess with the settings in the Kernel, so it is passed const.

9.11.3.2 Algorithm::~Algorithm ( ) [virtual]

9.11.4 Member Function Documentation

9.11.4.1 virtual result_t cadabra::Algorithm::apply (iterator &) [protected], [pure virtual]

Implemented in cadabra::evaluate, cadabra::keep_weight, cadabra::substitute, cadabra::drop_weight, cadabra::complete, cadabra::decompose_product, cadabra::distribute, cadabra::integrate_by_parts, cadabra::map_sympy, cadabra::vary, cadabra::canonicalise, cadabra::collect_components, cadabra::collect_factors, cadabra::collect_terms, cadabra::einsteinify, cadabra::factor_in, cadabra::factor_out, cadabra::fierz, cadabra::split_index, cadabra::young_project, cadabra::epsilon_to_delta, cadabra::split_gamma, cadabra::young_project_tensor, cadabra::combine, cadabra::eliminate_kronecker, cadabra::eliminate_converter, cadabra::expand, cadabra::expand_delta, cadabra::expand_diracbar, cadabra::expand_power, cadabra::flatten_product, cadabra::join_gamma, cadabra::keep_terms, cadabra::order, cadabra::reduce_delta, cadabra::rename_dummies, cadabra::replace_match, cadabra::rewrite_indices, cadabra::sort_product, cadabra::sort_spinors, cadabra::sort_sum, cadabra::sym, cadabra::take_match, cadabra::young_project_product, cadabra::indexsort, cadabra::lr_tensor, cadabra::flatten_sum, cadabra::product_rule, and cadabra::unwrap.

9.11.4.2 Algorithm::result_t Algorithm::apply_deep (Ex::iterator & *it*) [private]

9.11.4.3 Algorithm::result_t Algorithm::apply_generic (bool *deep* = true, bool *repeat* = false, unsigned int *depth* = 0)

The main entry points for running algorithms, which traverse the tree post-order ('child before parent').

The 'deep' flag indicates whether sub-expressions should be acted on too. The 'repeat' flag indicates whether the algorithm should be applied until the expression no longer changes. The 'depth' flag, if not equal to -1, indicates the depth in the tree where the algorithm should start applying.

9.11.4.4 Algorithm::result_t Algorithm::apply_generic (Ex::iterator & *it,* bool *deep,* bool *repeat,* unsigned int *depth*)

9.11.4.5 Algorithm::result_t Algorithm::apply_once (Ex::iterator & *it*) [private]

9.11.4.6 Algorithm::result_t Algorithm::apply_pre_order (bool *repeat* = false)

Apply algorithm with alternative traversal: starting from the top node, traverse the tree pre-order ('parent before child') and once the algorithm acts at a given node, do not traverse the subtree below anymore.

9.11.4.7 index_iterator Algorithm::begin_index (iterator *it*) const

9.11.4.8 virtual bool cadabra::Algorithm::can_apply (iterator) [protected], [pure virtual]

Implemented in cadabra::evaluate, cadabra::substitute, cadabra::complete, cadabra::decompose_product, cadabra::distribute, cadabra::integrate_by_parts, cadabra::map_sympy, cadabra::vary, cadabra::canonicalise, cadabra::collect_components, cadabra::collect_factors, cadabra::collect_terms, cadabra::drop_keep_weight, cadabra::einsteinify, cadabra::factor_in, cadabra::factor_out, cadabra::fierz, cadabra::split_index, cadabra::young_project, cadabra::epsilon_to_delta, cadabra::split_gamma, cadabra::young_project_tensor, cadabra::combine, cadabra::eliminate_kronecker, cadabra::eliminate_converter, cadabra::expand, cadabra::expand_delta, cadabra::expand_diracbar, cadabra::expand_power, cadabra::flatten_product, cadabra::join_gamma, cadabra::keep_terms, cadabra::order, cadabra::reduce_delta, cadabra::rename_dummies, cadabra::replace_match, cadabra::rewrite_indices, cadabra::sort_product, cadabra::sort_spinors, cadabra::sort_sum, cadabra::sym, cadabra::take_match, cadabra::young_project_product, cadabra::indexsort, cadabra::lr_tensor, cadabra::flatten_sum, cadabra::product_rule, and cadabra::unwrap.

9.11.4.9 bool Algorithm::check_consistency (iterator *it*) const

Given an expression top node, check index consistency.

9.11.4.10 bool Algorithm::check_degree_consistency (iterator *it*) const

Given an expression top node, check differential form degree consistency.

9.11.4.11 bool Algorithm::check_index_consistency (iterator *it*) const

9.11.4.12 void Algorithm::classify_add_index (iterator *it,* index_map_t & *ind_free,* index_map_t & *ind_dummy*) const [protected]

9.11.4.13 void Algorithm::classify_indices (iterator *it,* index_map_t & *ind_free,* index_map_t & *ind_dummy*) const [protected]

9.11.4.14 void Algorithm::classify_indices_up (iterator *it,* index_map_t & *ind_free,* index_map_t & *ind_dummy*) const [protected]

9.11.4.15 bool Algorithm::compare_ (const str_node & *one,* const str_node & *two*) [static], [protected]

9.11.4.16 bool Algorithm::contains (sibling_iterator *from,* sibling_iterator *to,* sibling_iterator *arg*) [protected]

9.11.4.17 void Algorithm::determine_intersection (index_map_t & *one,* index_map_t & *two,* index_map_t & *target,* bool *move_out* = false) const [protected]

9.11.4.18 void Algorithm::dumpmap (std::ostream & *str,* const index_map_t & *mp*) const [private]

9.11.4.19 index_iterator Algorithm::end_index (iterator *it*) const

9.11.4.20 bool Algorithm::equal_without_numbers (nset_t::iterator *it1,* nset_t::iterator *it2*) [static], [protected]

9.11.4.21 void Algorithm::fill_index_position_map (iterator *prodnode,* const index_map_t & *im,* index_position_map_t & *ipm*) const [protected]

Index manipulation and classification.

Routines to find and classify all indices in an expression, taking into account sums and products. Note that dummy indices do not always come in pairs, for instance in expressions like a_{m n} (b^{n p} + q^{n p}) . Similarly, free indices can appear multiple times, as in a_{m} + b_{m} .

9.11.4.22 void Algorithm::fill_map (index_map_t & *mp,* sibling_iterator *st,* sibling_iterator *nd*) const [protected]

9.11.4.23 template<class Iter > Algorithm::range_vector_t::iterator Algorithm::find_arg_superset (range_vector_t & *ran,* Iter *st,* Iter *nd*) [protected]

9.11.4.24 Algorithm::range_vector_t::iterator Algorithm::find_arg_superset (range_vector_t & *ran,* sibling_iterator *it*) [protected]

9.11.4.25 void cadabra::Algorithm::find_argument_lists (range_vector_t & , bool *only_comma_lists* = true) const [protected]

9.11.4.26 Algorithm::index_map_t::iterator Algorithm::find_modulo_parent_rel (iterator *it,* index_map_t & *imap*) const [protected]

Find an index in the set, not taking into account index position.

9.11.4.27 void Algorithm::force_prod_wrap (iterator & *it*) [protected]

Wrap a term in a product, irrespective of its parent (it usually makes more sense to call the safer prod_wrap_↩ single_term above).

9.11.4.28 **Ex Algorithm::get_dummy (const list_property * *dums,* const index_map_t * *m1,* const index_map_t * *m2* = 0, const index_map_t * *m3* = 0, const index_map_t * *m4* = 0, const index_map_t * *m5* = 0) const** [protected]

9.11.4.29 **Ex Algorithm::get_dummy (const list_property * *dums,* iterator *it*) const** [protected]

9.11.4.30 **Ex Algorithm::get_dummy (const list_property * *dums,* iterator *it1,* iterator *it2*) const** [protected]

9.11.4.31 **bool Algorithm::index_in_set (Ex *ex,* const index_map_t * *im*) const** [protected]

9.11.4.32 **int Algorithm::index_parity (iterator *it*) const** [protected]

9.11.4.33 **template<class BinaryPredicate > unsigned int Algorithm::intersection_number (sibling_iterator *from1,* sibling_iterator *to1,* sibling_iterator *from2,* sibling_iterator *to2,* BinaryPredicate *fun*) const** [protected]

Determine the number of elements in the first range which also occur in the second range.

9.11.4.34 **bool Algorithm::is_factorlike (iterator *it*)** [protected]

9.11.4.35 **bool Algorithm::is_nonprod_factor_in_prod (iterator *it*)** [protected]

9.11.4.36 **bool Algorithm::is_single_term (iterator *it*)** [protected]

Take a single non-product node in a sum and wrap it in a product node, so it can be handled on the same footing as a proper product.

9.11.4.37 **bool Algorithm::is_termlike (iterator *it*)** [protected]

Determine structure (version-2)

9.11.4.38 **bool Algorithm::less_without_numbers (nset_t::iterator *it1,* nset_t::iterator *it2*)** [static], [protected]

9.11.4.39 **bool Algorithm::locate_object_set (const Ex & *objs,* Ex::iterator *st,* Ex::iterator *nd,* std::vector< unsigned int > & *store*)** [protected]

9.11.4.40 **unsigned int Algorithm::locate_single_object (Ex::iterator *obj_to_find,* Ex::iterator *st,* Ex::iterator *nd,* std::vector< unsigned int > & *store*)** [protected]

9.11.4.41 **int Algorithm::max_numbered_name (const std::string & *nm,* const index_map_t * *m1,* const index_map_t * *m2* = 0, const index_map_t * *m3* = 0, const index_map_t * *m4* = 0, const index_map_t * *m5* = 0) const** [protected]

9.11.4.42 **int Algorithm::max_numbered_name_one (const std::string & *nm,* const index_map_t * *one*) const** [protected]

9.11.4.43 void Algorithm::node_integer (iterator *it,* int *num*) [protected]

9.11.4.44 void Algorithm::node_one (iterator *it*) [protected]

9.11.4.45 void Algorithm::node_zero (iterator *it*) [protected]

9.11.4.46 unsigned int Algorithm::number_of_direct_indices (iterator *it*) [static]

9.11.4.47 unsigned int Algorithm::number_of_indices (iterator *it*)

9.11.4.48 unsigned int Algorithm::number_of_indices (const Properties & *pr,* iterator *it*) [static]

9.11.4.49 void Algorithm::print_classify_indices (std::ostream & *str,* iterator *st*) const [protected]

9.11.4.50 bool Algorithm::prod_unwrap_single_term (iterator & *it*) [protected]

9.11.4.51 bool Algorithm::prod_wrap_single_term (iterator & *it*) [protected]

9.11.4.52 void Algorithm::propagate_zeroes (post_order_iterator & *it,* const iterator & *topnode*) [private]

Given a node with zero multiplier, propagate this zero upwards in the tree.

Changes the iterator so that it points to the next node in a post_order traversal (post_order: children first, then node). The second node is the topmost node, beyond which this routine is not allowed to touch the tree (i.e. the 2nd iterator will always remain valid).

9.11.4.53 void Algorithm::pushup_multiplier (iterator *it*) [protected]

9.11.4.54 bool Algorithm::rename_replacement_dummies (iterator *two,* bool *still_inside_algo* = false)

9.11.4.55 void Algorithm::report_progress (const std::string & *str,* int *todo,* int *done,* int *count* = 2)

9.11.4.56 bool Algorithm::separated_by_derivative (iterator *i1,* iterator *i2,* iterator *check_dependence*) const [protected]

Figure out whether two objects (commonly indices) are separated by a derivative operator, as in

$$\partial_a A_b C^b$$

.

If the last iterator is pointing to a valid node, check whether it is independent of the derivative (using the Depends property).

9.11.4.57 void Algorithm::set_progress_monitor (ProgressMonitor * *pm_*)

Provide the algorithm with a ProgressMonitor object on which to register (nested) progress information, to be reported out-of-band to a client.

9.11.5 Member Data Documentation

9.11.5.1 bool cadabra::Algorithm::discard_command_node

9.11.5.2 Stopwatch cadabra::Algorithm::get_dummy_sw [mutable]

9.11.5.3 Stopwatch cadabra::Algorithm::index_sw [mutable]

9.11.5.4 bool cadabra::Algorithm::interrupted

9.11.5.5 const Kernel& cadabra::Algorithm::kernel [protected]

9.11.5.6 unsigned int cadabra::Algorithm::number_of_calls

9.11.5.7 unsigned int cadabra::Algorithm::number_of_modifications

9.11.5.8 ProgressMonitor* cadabra::Algorithm::pm [protected]

9.11.5.9 Stopwatch cadabra::Algorithm::report_progress_stopwatch [mutable]

9.11.5.10 bool cadabra::Algorithm::suppress_normal_output

9.11.5.11 Ex& cadabra::Algorithm::tr [protected]

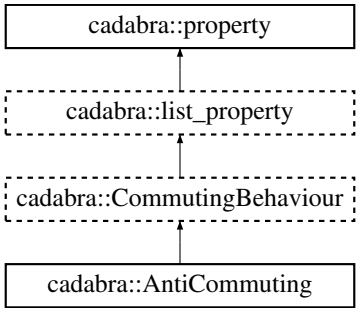
The documentation for this class was generated from the following files:

- core/Algorithm.hh
- core/Algorithm.cc

9.12 cadabra::AntiCommuting Class Reference

`#include <AntiCommuting.hh>`

Inheritance diagram for cadabra::AntiCommuting:



Public Member Functions

- virtual std::string name () const
- virtual int sign () const

Additional Inherited Members

9.12.1 Member Function Documentation

9.12.1.1 std::string AntiCommuting::name ( ) const [virtual]

Implements cadabra::property.

9.12.1.2 virtual int cadabra::AntiCommuting::sign ( ) const [inline], [virtual]

Implements cadabra::CommutingBehaviour.

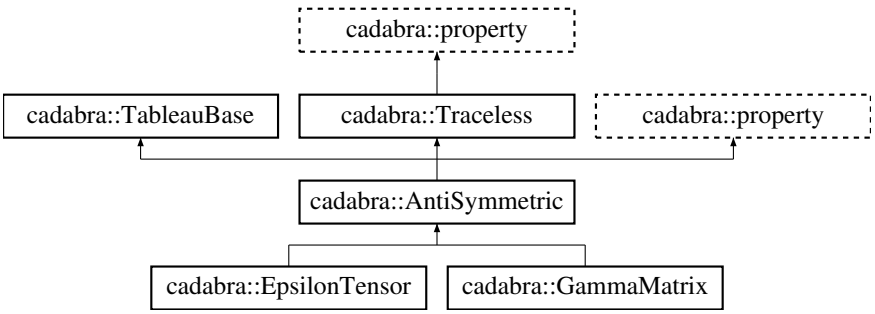
The documentation for this class was generated from the following files:

- core/properties/AntiCommuting.hh
- core/properties/AntiCommuting.cc

9.13 cadabra::AntiSymmetric Class Reference

```
#include <AntiSymmetric.hh>
```

Inheritance diagram for cadabra::AntiSymmetric:



Public Member Functions

- virtual ~AntiSymmetric ()
- virtual std::string name () const override
- virtual unsigned int size (const Properties &, Ex &, Ex::iterator) const override
- virtual tab_t get_tab (const Properties &, Ex &, Ex::iterator, unsigned int) const override

Additional Inherited Members

9.13.1 Constructor & Destructor Documentation

9.13.1.1 virtual cadabra::AntiSymmetric::~AntiSymmetric ( ) [inline], [virtual]

9.13.2 Member Function Documentation

9.13.2.1 TableauBase::tab_t AntiSymmetric::get_tab (const Properties & *pr,* Ex & *tr,* Ex::iterator *it,* unsigned int *num*) const [override], [virtual]

Implements cadabra::TableauBase.

9.13.2.2 std::string AntiSymmetric::name ( ) const [override], [virtual]

Implements cadabra::property.

Reimplemented in cadabra::EpsilonTensor, and cadabra::GammaMatrix.

9.13.2.3 unsigned int AntiSymmetric::size (const Properties & , Ex & , Ex::iterator) const [override], [virtual]

Implements cadabra::TableauBase.

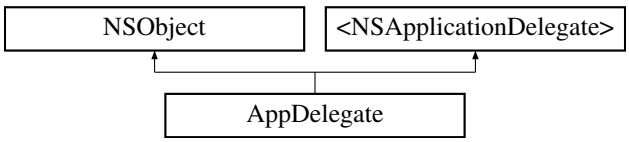
The documentation for this class was generated from the following files:

- core/properties/AntiSymmetric.hh
- core/properties/AntiSymmetric.cc

9.14 AppDelegate Class Reference

```
#import <AppDelegate.h>
```

Inheritance diagram for AppDelegate:



The documentation for this class was generated from the following file:

- frontend/osx/Cadabra/Cadabra/AppDelegate.h

9.15 AppDelegate() Category Reference

Properties

- IBOutlet NSWindow * window
- IBOutlet NotebookController * notebookController

9.15.1 Property Documentation

9.15.1.1 - (IBOutlet NotebookController*) notebookController [read], [write], [nonatomic], [strong]

9.15.1.2 - (IBOutlet NSWindow*) window [read], [write], [atomic], [weak]

The documentation for this category was generated from the following file:

- frontend/osx/Cadabra/Cadabra/AppDelegate.mm

9.16 snoop::Snoop::AppEntry Class Reference

9.16.1 Description

C++ representation of an run entry.

`#include <Snoop.hh>`

Public Member Functions

- AppEntry ()
- AppEntry (const std::string &uuid_, uint64_t create_millis_, uint64_t receive_millis_, pid_t pid_, const std::string &ip_address_, const std::string &machine_id_, const std::string &app_name_, const std::string &app_version_, const std::string &user_id_, int server_status_)
- std::string to_json (bool human_readable) const
- void from_json (const Json::Value &)

Public Attributes

- int id
- std::string uuid
- uint64_t create_millis
- uint64_t receive_millis
- pid_t pid
- std::string ip_address
- std::string machine_id
- std::string app_name
- std::string app_version
- std::string user_id
- int server_status
- bool connected

9.16.2 Constructor & Destructor Documentation

9.16.2.1 Snoop::AppEntry::AppEntry ( )

9.16.2.2 Snoop::AppEntry::AppEntry (const std::string & *uuid_*, uint64_t *create_millis_*, uint64_t *receive_millis_*, pid_t *pid_*, const std::string & *ip_address_*, const std::string & *machine_id_*, const std::string & *app_name_*, const std::string & *app_version_*, const std::string & *user_id_*, int *server_status_*)

9.16.3 Member Function Documentation

9.16.3.1 void Snoop::AppEntry::from_json (const Json::Value & *entry*)

9.16.3.2 std::string Snoop::AppEntry::to_json (bool *human_readable*) const

9.16.4 Member Data Documentation

9.16.4.1 std::string snoop::Snoop::AppEntry::app_name

9.16.4.2 std::string snoop::Snoop::AppEntry::app_version

9.16.4.3 bool snoop::Snoop::AppEntry::connected

9.16.4.4 uint64_t snoop::Snoop::AppEntry::create_millis

9.16.4.5 int snoop::Snoop::AppEntry::id

9.16.4.6 std::string snoop::Snoop::AppEntry::ip_address

9.16.4.7 std::string snoop::Snoop::AppEntry::machine_id

9.16.4.8 pid_t snoop::Snoop::AppEntry::pid

9.16.4.9 uint64_t snoop::Snoop::AppEntry::receive_millis

9.16.4.10 int snoop::Snoop::AppEntry::server_status

9.16.4.11 std::string snoop::Snoop::AppEntry::user_id

9.16.4.12 std::string snoop::Snoop::AppEntry::uuid

The documentation for this class was generated from the following files:

- client_server/Snoop.hh
- client_server/Snoop.cc

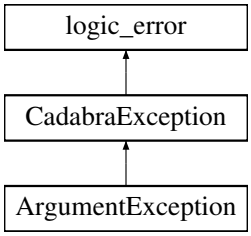
9.17 ArgumentException Class Reference

9.17.1 Description

Exception thrown when arguments to an algorithm or property are not correct.

`#include <Exceptions.hh>`

Inheritance diagram for ArgumentException:



Public Member Functions

- ArgumentException (std::string="")
- std::string py_what () const

9.17.2 Constructor & Destructor Documentation

9.17.2.1 ArgumentException::ArgumentException (std::string *s* = " ")

9.17.3 Member Function Documentation

9.17.3.1 std::string ArgumentException::py_what ( ) const

The documentation for this class was generated from the following files:

- core/Exceptions.hh
- core/Exceptions.cc

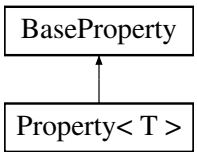
9.18 BaseProperty Class Reference

9.18.1 Description

Helper class to ensure that all Python property objects derive from the same base class.

`#include <PythonCdb.hh>`

Inheritance diagram for BaseProperty:



The documentation for this class was generated from the following file:

- core/PythonCdb.hh

9.19 ProgressMonitor::Block Class Reference

Public Member Functions

- Block ()

Public Attributes

- std::string name
- std::chrono::milliseconds started
- int step
- int total_steps

9.19.1 Constructor & Destructor Documentation

9.19.1.1 ProgressMonitor::Block::Block ( )

9.19.2 Member Data Documentation

9.19.2.1 std::string ProgressMonitor::Block::name

9.19.2.2 std::chrono::milliseconds ProgressMonitor::Block::started

9.19.2.3 int ProgressMonitor::Block::step

9.19.2.4 int ProgressMonitor::Block::total_steps

The documentation for this class was generated from the following files:

- core/ProgressMonitor.hh
- core/ProgressMonitor.cc

9.20 Server::Block Class Reference

Public Member Functions

- Block (websocketpp::connection_hdl, const std::string &, uint64_t id)

Public Attributes

- websocketpp::connection_hdl hdl
- std::string input
- std::string output
- std::string error
- uint64_t cell_id

9.20.1 Constructor & Destructor Documentation

9.20.1.1 Server::Block::Block (websocketpp::connection_hdl *h*, const std::string & *str*, uint64_t *id*)

9.20.2 Member Data Documentation

9.20.2.1 uint64_t Server::Block::cell_id

9.20.2.2 std::string Server::Block::error

9.20.2.3 websocketpp::connection_hdl Server::Block::hdl

9.20.2.4 std::string Server::Block::input

9.20.2.5 std::string Server::Block::output

The documentation for this class was generated from the following files:

- client_server/Server.hh
- client_server/Server.cc

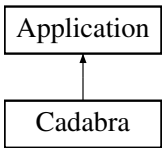
9.21 Cadabra Class Reference

9.21.1 Description

The Cadabra notebook application.

`#include <Cadabra.hh>`

Inheritance diagram for Cadabra:



Public Member Functions

- bool open_help (const std::string &filename, const std::string &title)

Static Public Member Functions

- static Glib::RefPtr< Cadabra > create (int, char **)

Protected Member Functions

- Cadabra (int, char **)
- virtual ~Cadabra ()
- void on_activate () override
- void on_open (const Gio::Application::type_vec_files &files, const Glib::ustring &hint) override

Private Attributes

- cadabra::ComputeThread compute
- std::thread compute_thread

9.21.2 Constructor & Destructor Documentation

9.21.2.1 Cadabra::Cadabra (int *argc,* char ** *argv*) [protected]

9.21.2.2 Cadabra::~Cadabra ( ) [protected], [virtual]

9.21.3 Member Function Documentation

9.21.3.1 Glib::RefPtr< Cadabra > Cadabra::create (int *argc,* char ** *argv*) [static]

9.21.3.2 void Cadabra::on_activate ( ) [override], [protected]

9.21.3.3 void Cadabra::on_open (const Gio::Application::type_vec_files & *files,* const Glib::ustring & *hint*) [override], [protected]

9.21.3.4 bool Cadabra::open_help (const std::string & *filename,* const std::string & *title*)

9.21.4 Member Data Documentation

9.21.4.1 cadabra::ComputeThread Cadabra::compute [private]

9.21.4.2 std::thread Cadabra::compute_thread [private]

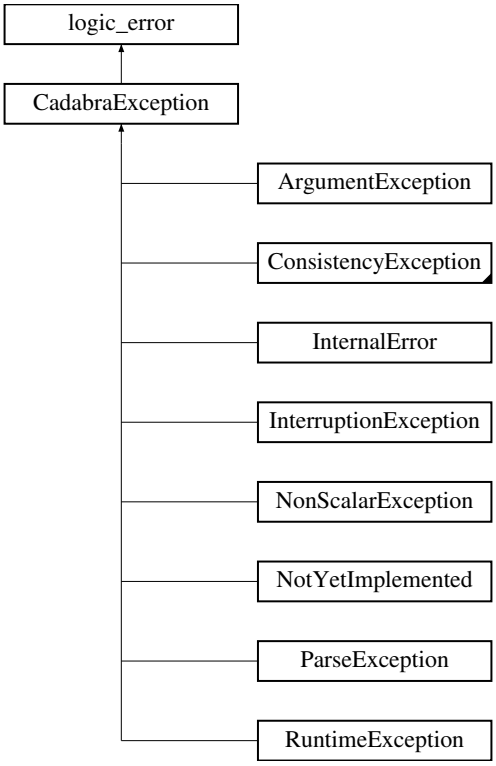
The documentation for this class was generated from the following files:

- frontend/gtkmm/Cadabra.hh
- frontend/gtkmm/Cadabra.cc

9.22 CadabraException Class Reference

`#include <Exceptions.hh>`

Inheritance diagram for CadabraException:



Public Member Functions

- CadabraException (std::string)

9.22.1 Constructor & Destructor Documentation

9.22.1.1 CadabraException::CadabraException (std::string *s*)

The documentation for this class was generated from the following files:

- core/Exceptions.hh
- core/Exceptions.cc

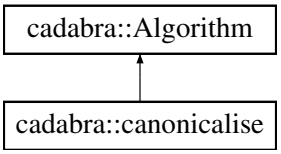
9.23 cadabra::canonicalise Class Reference

9.23.1 Description

Canonicalise the index structure of a tensorial expression.

`#include <canonicalise.hh>`

Inheritance diagram for cadabra::canonicalise:



Public Member Functions

- canonicalise (const Kernel &, Ex &)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Public Attributes

- std::vector< std::vector< int > > generating_set
- bool reuse_generating_set

Private Member Functions

- bool remove_traceless_traces (iterator &)
- bool remove_vanishing_numericals (iterator &)
- bool only_one_on_derivative (iterator index1, iterator index2) const
- std::string get_index_set_name (iterator) const
- Indices::position_t position_type (iterator) const

Additional Inherited Members

9.23.2 Constructor & Destructor Documentation

9.23.2.1 canonicalise::canonicalise (const Kernel & *k,* Ex & *tr*)

9.23.3 Member Function Documentation

9.23.3.1 Algorithm::result_t canonicalise::apply (iterator & *it*) [virtual]

Implements cadabra::Algorithm.

9.23.3.2 bool canonicalise::can_apply (iterator *it*) [virtual]

Implements cadabra::Algorithm.

9.23.3.3 std::string canonicalise::get_index_set_name (iterator *it*) const [private]

9.23.3.4 bool canonicalise::only_one_on_derivative (iterator *index1*, iterator *index2*) const [private]

9.23.3.5 Indices::position_t canonicalise::position_type (iterator *it*) const [private]

9.23.3.6 bool canonicalise::remove_traceless_traces (iterator & *it*) [private]

9.23.3.7 bool canonicalise::remove_vanishing_numericals (iterator & *it*) [private]

9.23.4 Member Data Documentation

9.23.4.1 std::vector<std::vector<int> > cadabra::canonicalise::generating_set

9.23.4.2 bool cadabra::canonicalise::reuse_generating_set

The documentation for this class was generated from the following files:

- core/algorithms/canonicalise.hh
- core/algorithms/canonicalise.cc

9.24 Server::CatchOutput Class Reference

9.24.1 Description

Python output catching.

We implement this in a C++ class because we want to be able to catch each line of output separately, and perhaps add additional functionality to send out-of-band messages to the client later.

```
#include <Server.hh>
```

Public Member Functions

- CatchOutput ()
- CatchOutput (const CatchOutput &)
- void write (const std::string &txt)
- void clear ()
- std::string str () const

Private Attributes

- std::string collect

9.24.2 Constructor & Destructor Documentation

9.24.2.1 Server::CatchOutput::CatchOutput ( )

9.24.2.2 Server::CatchOutput::CatchOutput (const CatchOutput &)

9.24.3 Member Function Documentation

9.24.3.1 void Server::CatchOutput::clear ( )

9.24.3.2 std::string Server::CatchOutput::str ( ) const

9.24.3.3 void Server::CatchOutput::write (const std::string & *txt*)

9.24.4 Member Data Documentation

9.24.4.1 std::string Server::CatchOutput::collect [private]

The documentation for this class was generated from the following files:

- client_server/Server.hh
- client_server/Server.cc

9.25 cadabra::CodeInput Class Reference

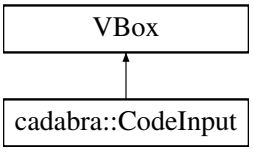
9.25.1 Description

A text cell editor widget with support for editing Python and LaTeX.

CodeInput is essentially a TextView with some additional i/o logic.

```
#include <CodeInput.hh>
```

Inheritance diagram for cadabra::CodeInput:



Classes

- class exp_input_tv

  The actual text widget used by CodeInput.

Public Member Functions

- CodeInput (DTree::iterator, Glib::RefPtr< Gtk::TextBuffer >, double scale, int font_step)

  Initialise with existing TextBuffer and a pointer to the Datacell corresponding to this CodeInput widget.
- CodeInput (DTree::iterator, const std::string &, double scale, int font_step)

  Initialise with a new TextBuffer (to be created by CodeInput), filling it with the content of the given string.
- void set_font_size (int num)

  Set the font size, 0 being default, negative smaller, positive larger.
- bool handle_button_press (GdkEventButton *)

  Handle mouse buttons.
- void handle_insert (const Gtk::TextIter &pos, const Glib::ustring &text, int bytes)

  Handle an insert event, which can consist of one or more inserted characters.
- void handle_erase (const Gtk::TextIter &start, const Gtk::TextIter &end)

  Handle an erase event.
- void update_buffer ()

  Ensure that the visual representation matches the DTree cell.
- void slice_cell (std::string &before, std::string &after)

  Return two strings corresponding to the text before and after the current cursor position.

Public Attributes

- Glib::RefPtr< Gtk::TextBuffer > buffer

  We cannot edit the content of the DataCell directly, because Gtk needs a Gtk::TextBuffer.
- exp_input_tv edit

Private Member Functions

- void init (int font_step)

9.25.2 Constructor & Destructor Documentation

9.25.2.1 CodeInput::CodeInput (DTree::iterator *it,* Glib::RefPtr< Gtk::TextBuffer > *tb,* double *scale,* int *font_step*)

Initialise with existing TextBuffer and a pointer to the Datacell corresponding to this CodeInput widget.

CodeInput is not allowed to modify this DataCell directly, but can read properties from it (e.g. in order to know when to display a 'busy' indicator). The scale parameter refers to hdpi scaling.

9.25.2.2 CodeInput::CodeInput (DTree::iterator *it,* const std::string & *txt,* double *scale,* int *font_step*)

Initialise with a new TextBuffer (to be created by CodeInput), filling it with the content of the given string.

9.25.3 Member Function Documentation

9.25.3.1 bool CodeInput::handle_button_press (GdkEventButton * *button*)

Handle mouse buttons.

9.25.3.2 void CodeInput::handle_erase (const Gtk::TextIter & *start,* const Gtk::TextIter & *end*)

Handle an erase event.

This function will just massage that data and then feed it through to the notebook window class by emitting a signal on content_erase (done like this to separate DTree modification from the widget).

9.25.3.3 void CodeInput::handle_insert (const Gtk::TextIter & *pos,* const Glib::ustring & *text,* int *bytes*)

Handle an insert event, which can consist of one or more inserted characters.

This function will just massage that data and then feed it through to the notebook window class by emitting a signal on content_insert (done like this to separate DTree modification from the widget).

9.25.3.4 void CodeInput::init (int *font_step*) [private]

9.25.3.5 void CodeInput::set_font_size (int *num*)

Set the font size, 0 being default, negative smaller, positive larger.

9.25.3.6 void CodeInput::slice_cell (std::string & *before,* std::string & *after*)

Return two strings corresponding to the text before and after the current cursor position.

9.25.3.7 void CodeInput::update_buffer ( )

Ensure that the visual representation matches the DTree cell.

9.25.4 Member Data Documentation

9.25.4.1 Glib::RefPtr<Gtk::TextBuffer> cadabra::CodeInput::buffer

We cannot edit the content of the DataCell directly, because Gtk needs a Gtk::TextBuffer.

However, the CodeInput widgets corresponding to a single DataCell all share their TextBuffer.

9.25.4.2 exp_input_tv cadabra::CodeInput::edit

The documentation for this class was generated from the following files:

- frontend/gtkmm/CodeInput.hh
- frontend/gtkmm/CodeInput.cc

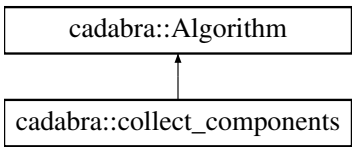
9.26 cadabra::collect_components Class Reference

9.26.1 Description

Collect terms inside a sum, merging their substitution rules.

`#include <collect_components.hh>`

Inheritance diagram for cadabra::collect_components:



Public Member Functions

- collect_components (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Additional Inherited Members

9.26.2 Constructor & Destructor Documentation

9.26.2.1 collect_components::collect_components (const Kernel & *k*, Ex & *tr*)

9.26.3 Member Function Documentation

9.26.3.1 Algorithm::result_t collect_components::apply (iterator & *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.26.3.2 bool collect_components::can_apply (iterator *st*) [override], [virtual]

Implements cadabra::Algorithm.

The documentation for this class was generated from the following files:

- core/algorithms/collect_components.hh
- core/algorithms/collect_components.cc

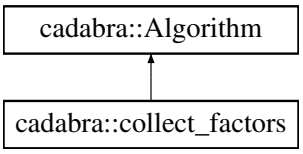
9.27 cadabra::collect_factors Class Reference

9.27.1 Description

Collect symbolically equal factors in a product.

`#include <collect_factors.hh>`

Inheritance diagram for cadabra::collect_factors:



Public Member Functions

- collect_factors (const Kernel &, Ex &)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Private Types

- typedef std::multimap< hashval_t, sibling_iterator > factor_hash_t
- typedef factor_hash_t::iterator factor_hash_iterator_t

Private Member Functions

- void fill_hash_map (iterator)

Private Attributes

- factor_hash_t factor_hash

Additional Inherited Members

9.27.2 Member Typedef Documentation

9.27.2.1 typedef factor_hash_t::iterator cadabra::collect_factors::factor_hash_iterator_t [private]

9.27.2.2 typedef std::multimap<hashval_t, sibling_iterator> cadabra::collect_factors::factor_hash_t [private]

9.27.3 Constructor & Destructor Documentation

9.27.3.1 collect_factors::collect_factors (const Kernel & *k*, Ex & *e*)

9.27.4 Member Function Documentation

9.27.4.1 Algorithm::result_t collect_factors::apply (iterator & *st*) [virtual]

Implements cadabra::Algorithm.

9.27.4.2 bool collect_factors::can_apply (iterator *it*) [virtual]

Implements cadabra::Algorithm.

9.27.4.3 void collect_factors::fill_hash_map (iterator *it*) [private]

9.27.5 Member Data Documentation

9.27.5.1 factor_hash_t cadabra::collect_factors::factor_hash [private]

The documentation for this class was generated from the following files:

- core/algorithms/collect_factors.hh
- core/algorithms/collect_factors.cc

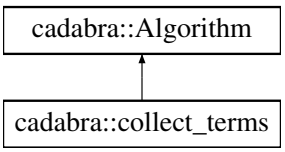
9.28 cadabra::collect_terms Class Reference

9.28.1 Description

Collect symbolically equal terms in a sum.

`#include <collect_terms.hh>`

Inheritance diagram for cadabra::collect_terms:



Public Member Functions

- collect_terms (const Kernel &, Ex &)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)
- void fill_hash_map (iterator)
- void fill_hash_map (sibling_iterator, sibling_iterator)

Private Types

- typedef std::multimap< hashval_t, sibling_iterator > term_hash_t
- typedef term_hash_t::iterator term_hash_iterator_t

Private Member Functions

- result_t collect_from_hash_map ()
- void remove_zeroed_terms (sibling_iterator, sibling_iterator)

Private Attributes

- term_hash_t term_hash

Additional Inherited Members

9.28.2 Member Typedef Documentation

9.28.2.1 typedef term_hash_t::iterator cadabra::collect_terms::term_hash_iterator_t [private]

9.28.2.2 typedef std::multimap<hashval_t, sibling_iterator> cadabra::collect_terms::term_hash_t [private]

9.28.3 Constructor & Destructor Documentation

9.28.3.1 collect_terms::collect_terms (const Kernel & *k*, Ex & *tr*)

9.28.4 Member Function Documentation

9.28.4.1 Algorithm::result_t collect_terms::apply (iterator & *st*) [virtual]

Implements cadabra::Algorithm.

9.28.4.2 bool collect_terms::can_apply (iterator *st*) [virtual]

Implements cadabra::Algorithm.

9.28.4.3 Algorithm::result_t collect_terms::collect_from_hash_map ( ) [private]

9.28.4.4 void collect_terms::fill_hash_map (iterator *it*)

9.28.4.5 void collect_terms::fill_hash_map (sibling_iterator *sib*, sibling_iterator *end*)

9.28.4.6 void collect_terms::remove_zeroed_terms (sibling_iterator *from*, sibling_iterator *to*) [private]

9.28.5 Member Data Documentation

9.28.5.1 term_hash_t cadabra::collect_terms::term_hash [private]

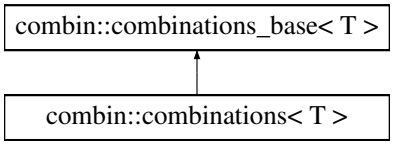
The documentation for this class was generated from the following files:

- core/algorithms/collect_terms.hh
- core/algorithms/collect_terms.cc

9.29 combin::combinations< T > Class Template Reference

`#include <Combinatorics.hh>`

Inheritance diagram for combin::combinations< T >:



Public Types

- typedef std::vector< std::vector< T > > permuted_sets_t
- typedef permuted_sets_t::const_iterator const_iterator

Public Member Functions

- combinations ()
- combinations (const std::vector< T > &)
- virtual ~combinations ()
- virtual void clear ()
- virtual void clear_results ()
- const std::vector< T > & operator[ ] (unsigned int) const
- int ordersign (unsigned int) const
- unsigned int size () const
- unsigned int multiplier (unsigned int) const

Protected Member Functions

- virtual void vector_generated (const std::vector< unsigned int > &)

Private Attributes

- permuted_sets_t storage

Additional Inherited Members

9.29.1 Member Typedef Documentation

9.29.1.1 template<class T> typedef permuted_sets_t::const_iterator combin::combinations< T >::const_iterator

9.29.1.2 template<class T> typedef std::vector<std::vector<T> > combin::combinations< T >::permuted_sets_t

9.29.2 Constructor & Destructor Documentation

9.29.2.1 template<class T > combin::combinations< T >::combinations ( )

9.29.2.2 template<class T> combin::combinations< T >::combinations (const std::vector< T > & *oa*)

9.29.2.3 template<class T > combin::combinations< T >::~combinations ( ) [virtual]

9.29.3 Member Function Documentation

9.29.3.1 template<class T > void combin::combinations< T >::clear ( ) [virtual]

Reimplemented from combin::combinations_base< T >.

9.29.3.2 template<class T > void combin::combinations< T >::clear_results ( ) [virtual]

Reimplemented from combin::combinations_base< T >.

9.29.3.3 template<class T > unsigned int combin::combinations< T >::multiplier (unsigned int *num*) const

9.29.3.4 template<class T > const std::vector< T > & combin::combinations< T >::operator[ ] (unsigned int *i*) const

9.29.3.5 template<class T > int combin::combinations< T >::ordersign (unsigned int *num*) const

9.29.3.6 template<class T > unsigned int combin::combinations< T >::size ( ) const

9.29.3.7 template<class T > void combin::combinations< T >::vector_generated (const std::vector< unsigned int > & *toadd*) [protected], [virtual]

Implements combin::combinations_base< T >.

9.29.4 Member Data Documentation

9.29.4.1 template<class T> permuted_sets_t combin::combinations< T >::storage [private]

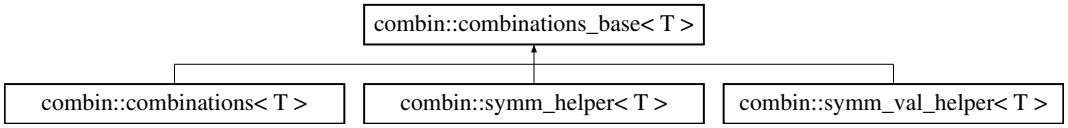
The documentation for this class was generated from the following file:

- core/Combinatorics.hh

9.30 combin::combinations_base< T > Class Template Reference

`#include <Combinatorics.hh>`

Inheritance diagram for combin::combinations_base< T >:



Public Types

- enum weight_cond { weight_equals, weight_less, weight_greater }

Public Member Functions

- combinations_base ()
- combinations_base (const std::vector< T > &)
- virtual ~combinations_base ()
- void permute (long start=-1, long end=-1)
- virtual void clear ()
- virtual void clear_results ()
- unsigned int sum_of_sublengths () const
- void set_unit_sublengths ()
- unsigned int multiplier (const std::vector< T > &) const
- unsigned int total_permutations () const

Public Attributes

- unsigned int block_length
- std::vector< unsigned int > sublengths
- range_vector_t input_asym
- std::vector< T > original
- bool multiple_pick
- std::vector< weights_t > weights
- std::vector< int > max_weights
- std::vector< weight_cond > weight_conditions
- unsigned int sub_problem_blocksize

Protected Member Functions

- virtual void vector_generated (const std::vector< unsigned int > &)=0
- virtual bool entry_accepted (unsigned int current) const

Protected Attributes

- std::vector< unsigned int > temparr
- long start_
- long end_
- long vector_generated_called_
- std::vector< int > current_weight

Private Member Functions

- bool is_allowed_by_weight_constraints (unsigned int i)
- bool final_weight_constraints_check () const
- void update_weights (unsigned int i)
- void restore_weights (unsigned int i)
- void nextstep (unsigned int current, unsigned int fromalgehad, unsigned int groupindex, std::vector< bool > algehad)

9.30.1 Member Enumeration Documentation

9.30.1.1 template<class T> enum combin::combinations_base::weight_cond

Enumerator

weight_equals

weight_less

weight_greater

9.30.2 Constructor & Destructor Documentation

9.30.2.1 template<class T > combin::combinations_base< T >::combinations_base ( )

9.30.2.2 template<class T> combin::combinations_base< T >::combinations_base (const std::vector< T > & *oa*)

9.30.2.3 template<class T > combin::combinations_base< T >::~combinations_base ( ) [virtual]

9.30.3 Member Function Documentation

9.30.3.1 template<class T > void combin::combinations_base< T >::clear ( ) [virtual]

Reimplemented in combin::symm_val_helper< T >, combin::symm_val_helper< unsigned int >, combin::symm_helper< T >, combin::symm_helper< unsigned int >, combin::combinations< T >, and combin::combinations< unsigned int >.

9.30.3.2 template<class T > void combin::combinations_base< T >::clear_results ( ) [virtual]

Reimplemented in combin::combinations< T >, and combin::combinations< unsigned int >.

9.30.3.3 template<class T > bool combin::combinations_base< T >::entry_accepted (unsigned int *current*) const [protected], [virtual]

9.30.3.4 template<class T > bool combin::combinations_base< T >::final_weight_constraints_check ( ) const [private]

9.30.3.5 template<class T > bool combin::combinations_base< T >::is_allowed_by_weight_constraints (unsigned int *i*) [private]

9.30.3.6 template<class T> unsigned int combin::combinations_base< T >::multiplier (const std::vector< T > & *stor*) const

9.30.3.7 template<class T > void combin::combinations_base< T >::nextstep (unsigned int *current,* unsigned int *fromalgehad,* unsigned int *groupindex,* std::vector< bool > *algehad*) [private]

9.30.3.8 template<class T > void combin::combinations_base< T >::permute (long *start* = -1, long *end* = -1)

9.30.3.9 template<class T > void combin::combinations_base< T >::restore_weights (unsigned int *i*) [private]

9.30.3.10 template<class T > void combin::combinations_base< T >::set_unit_sublengths ( )

9.30.3.11 template<class T > unsigned int combin::combinations_base< T >::sum_of_sublengths ( ) const

9.30.3.12 template<class T > unsigned int combin::combinations_base< T >::total_permutations ( ) const

9.30.3.13 template<class T > void combin::combinations_base< T >::update_weights (unsigned int *i*) [private]

9.30.3.14 template<class T> virtual void combin::combinations_base< T >::vector_generated (const std::vector< unsigned int > &) [protected], [pure virtual]

Implemented in combin::symm_val_helper< T >, combin::symm_val_helper< unsigned int >, combin::symm_helper< T >, combin::symm_helper< unsigned int >, combin::combinations< T >, and combin::combinations< unsigned int >.

9.30.4 Member Data Documentation

9.30.4.1 template<class T> unsigned int combin::combinations_base< T >::block_length

9.30.4.2 template<class T> std::vector<int> combin::combinations_base< T >::current_weight [protected]

9.30.4.3 template<class T> long combin::combinations_base< T >::end_ [protected]

9.30.4.4 template<class T> range_vector_t combin::combinations_base< T >::input_asym

9.30.4.5 template<class T> std::vector<int> combin::combinations_base< T >::max_weights

9.30.4.6 template<class T> bool combin::combinations_base< T >::multiple_pick

9.30.4.7 template<class T> std::vector<T> combin::combinations_base< T >::original

9.30.4.8 template<class T> long combin::combinations_base< T >::start_ [protected]

9.30.4.9 template<class T> unsigned int combin::combinations_base< T >::sub_problem_blocksize

9.30.4.10 template<class T> std::vector<unsigned int> combin::combinations_base< T >::sublengths

9.30.4.11 template<class T> std::vector<unsigned int> combin::combinations_base< T >::temparr [protected]

9.30.4.12 template<class T> long combin::combinations_base< T >::vector_generated_called_ [protected]

9.30.4.13 template<class T> std::vector<weight_cond> combin::combinations_base< T >::weight_conditions

9.30.4.14 template<class T> std::vector<weights_t> combin::combinations_base< T >::weights

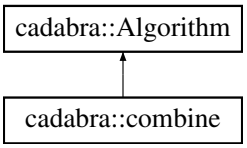
The documentation for this class was generated from the following file:

- core/Combinatorics.hh

9.31 cadabra::combine Class Reference

`#include <combine.hh>`

Inheritance diagram for cadabra::combine:



Public Member Functions

- combine (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Private Types

- typedef std::map< nset_t::iterator, iterator > indexlocmap_t

Private Attributes

- indexlocmap_t iloc

Additional Inherited Members

9.31.1 Member Typedef Documentation

9.31.1.1 typedef std::map<nset_t::iterator, iterator> cadabra::combine::indexlocmap_t [private]

9.31.2 Constructor & Destructor Documentation

9.31.2.1 combine::combine (const Kernel & *k*, Ex & *e*)

9.31.3 Member Function Documentation

9.31.3.1 Algorithm::result_t combine::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.31.3.2 bool combine::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.31.4 Member Data Documentation

9.31.4.1 indexlocmap_t cadabra::combine::iloc [private]

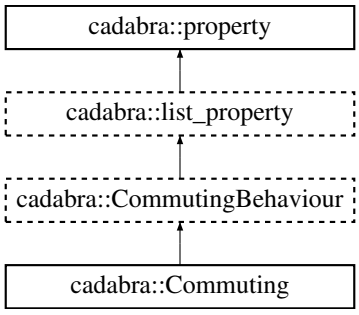
The documentation for this class was generated from the following files:

- core/algorithms/combine.hh
- core/algorithms/combine.cc

9.32 cadabra::Commuting Class Reference

`#include <Commuting.hh>`

Inheritance diagram for cadabra::Commuting:



Public Member Functions

- virtual std::string name () const
- virtual int sign () const

Additional Inherited Members

9.32.1 Member Function Documentation

9.32.1.1 std::string Commuting::name ( ) const [virtual]

Implements cadabra::property.

9.32.1.2 virtual int cadabra::Commuting::sign ( ) const [inline], [virtual]

Implements cadabra::CommutingBehaviour.

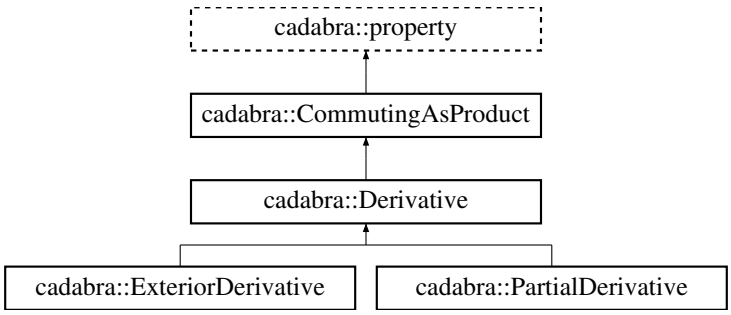
The documentation for this class was generated from the following files:

- core/properties/Commuting.hh
- core/properties/Commuting.cc

9.33 cadabra::CommutingAsProduct Class Reference

`#include <CommutingAsProduct.hh>`

Inheritance diagram for cadabra::CommutingAsProduct:



Public Member Functions

- virtual std::string name () const

Additional Inherited Members

9.33.1 Member Function Documentation

9.33.1.1 std::string CommutingAsProduct::name ( ) const [virtual]

Implements cadabra::property.

Reimplemented in cadabra::Derivative, cadabra::ExteriorDerivative, and cadabra::PartialDerivative.

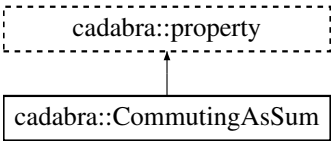
The documentation for this class was generated from the following files:

- core/properties/CommutingAsProduct.hh
- core/properties/CommutingAsProduct.cc

9.34 cadabra::CommutingAsSum Class Reference

`#include <CommutingAsSum.hh>`

Inheritance diagram for cadabra::CommutingAsSum:



Public Member Functions

- virtual std::string name () const

Additional Inherited Members

9.34.1 Member Function Documentation

9.34.1.1 std::string CommutingAsSum::name ( ) const [virtual]

Implements cadabra::property.

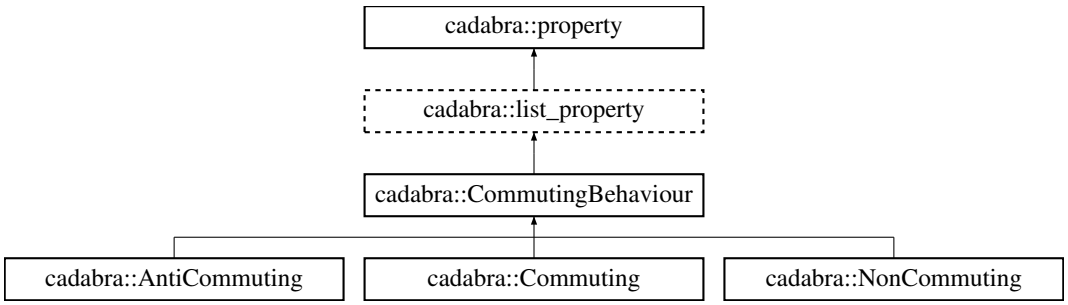
The documentation for this class was generated from the following files:

- core/properties/CommutingAsSum.hh
- core/properties/CommutingAsSum.cc

9.35 cadabra::CommutingBehaviour Class Reference

`#include <CommutingBehaviour.hh>`

Inheritance diagram for cadabra::CommutingBehaviour:



Public Member Functions

- virtual int sign () const =0
- virtual match_t equals (const property ∗) const

Additional Inherited Members

9.35.1 Member Function Documentation

9.35.1.1 property::match_t CommutingBehaviour::equals (const property ∗) const [virtual]

Reimplemented from cadabra::property.

9.35.1.2 virtual int cadabra::CommutingBehaviour::sign ( ) const [pure virtual]

Implemented in cadabra::AntiCommuting, cadabra::Commuting, and cadabra::NonCommuting.

The documentation for this class was generated from the following files:

- core/properties/CommutingBehaviour.hh
- core/properties/CommutingBehaviour.cc

9.36 cadabra::complete Class Reference

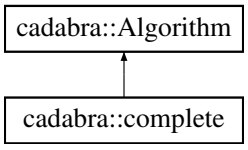
9.36.1 Description

Complete a set of coordinate rules so that they also cover related tensors.

At present this only inverts metric rules, but could do more related rules, or expanded to cover symmetry.

`#include <complete.hh>`

Inheritance diagram for cadabra::complete:



Public Member Functions

- complete (const Kernel &, Ex &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Private Attributes

- Ex goal

Additional Inherited Members

9.36.2 Constructor & Destructor Documentation

9.36.2.1 complete::complete (const Kernel & *k*, Ex & *e*, Ex & *g*)

9.36.3 Member Function Documentation

9.36.3.1 Algorithm::result_t complete::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.36.3.2 bool complete::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.36.4 Member Data Documentation

9.36.4.1 Ex cadabra::complete::goal [private]

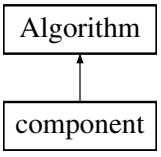
The documentation for this class was generated from the following files:

- core/algorithms/complete.hh
- core/algorithms/complete.cc

9.37 component Class Reference

`#include <component.hh>`

Inheritance diagram for component:



Public Member Functions

- component (const Kernel &, Ex &ex, Ex &rules)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

9.37.1 Constructor & Destructor Documentation

9.37.1.1 component::component (const Kernel & , Ex & *ex*, Ex & *rules*)

9.37.2 Member Function Documentation

9.37.2.1 virtual result_t component::apply (iterator &) [virtual]

9.37.2.2 virtual bool component::can_apply (iterator) [virtual]

The documentation for this class was generated from the following file:

- core/algorithms/component.hh

9.38 cadabra::ComputeThread Class Reference

9.38.1 Description

Base class which talks to the server and sends Action objects back to the DocumentThread.

ComputeThread is the base class which takes care of doing actual computations with the cells in a document. It handles talking to the server backend. It knows how to pass cells to the server and ask them to be executed. Results are reported back to the GUI by putting ActionBase objects onto its todo stack. ComputeThread never directly modifies the document tree.

```
#include <ComputeThread.hh>
```

Public Member Functions

- ComputeThread ()

  If the ComputeThread is constructed with a null pointer to the gui, there will be no gui updates, just DTree updates.
- ComputeThread (const ComputeThread &)=delete
- ~ComputeThread ()
- void set_master (GUIBase *, DocumentThread *)

  Determine the objects that this compute thread should be talking to.
- void run ()

  Main entry point, which will connect to the server and then start an event loop to handle communication with the server.
- void execute_cell (DTree::iterator)

  In order to execute code on the server, call the following from the GUI thread.
- void stop ()

  Stop the current cell execution on the server and remove all other cells from the run queue as well.
- void restart_kernel ()

  Restart the kernel.
- int number_of_cells_executing (void) const
- void terminate ()

  Terminate the compute thread, in preparation for shutting down the client altogether.

Private Member Functions

- void init ()
- void try_connect ()
- void try_spawn_server ()
- void on_open (websocketpp::connection_hdl hdl)
- void on_fail (websocketpp::connection_hdl hdl)
- void on_close (websocketpp::connection_hdl hdl)
- void on_message (websocketpp::connection_hdl hdl, message_ptr msg)
- DTree::iterator find_cell_by_id (DataCell::id_t, bool remove)
- void all_cells_nonrunning ()

  Set all cells to be non-running (e.g.

Private Attributes

- GUIBase * gui
- DocumentThread * docthread
- std::thread::id gui_thread_id
- std::map< DataCell::id_t, DTree::iterator > running_cells
- WSClient wsclient
- bool connection_is_open
- bool restarting_kernel
- WSClient::connection_ptr connection
- websocketpp::connection_hdl our_connection_hdl
- Glib::Pid server_pid
- int server_stdout
- int server_stderr
- unsigned short port

9.38.2 Constructor & Destructor Documentation

9.38.2.1 ComputeThread::ComputeThread ( )

If the ComputeThread is constructed with a null pointer to the gui, there will be no gui updates, just DTree updates.

9.38.2.2 cadabra::ComputeThread::ComputeThread (const ComputeThread &) [delete]

9.38.2.3 ComputeThread::~ComputeThread ( )

9.38.3 Member Function Documentation

9.38.3.1 void ComputeThread::all_cells_nonrunning ( ) [private]

Set all cells to be non-running (e.g.

after a kernel failure) and report the status of each cell to the GUI.

9.38.3.2 void ComputeThread::execute_cell (DTree::iterator *it*)

In order to execute code on the server, call the following from the GUI thread.

This method returns as soon as the request has been put on the network queue. If no communication with the server is necessary, this returns immediately. The ComputeThread will report the result of the computation/processing by adding actions to the DocumentThread owned pending_actions stack, by calling queue_action. It will never modify the cell directly, and will also never modify any other cells in the document tree.

9.38.3.3 DTree::iterator ComputeThread::find_cell_by_id (DataCell::id_t *id,* bool *remove*) [private]

9.38.3.4 void ComputeThread::init ( ) [private]

9.38.3.5 int ComputeThread::number_of_cells_executing (void) const

9.38.3.6 void ComputeThread::on_close (websocketpp::connection_hdl *hdl*) [private]

9.38.3.7 void ComputeThread::on_fail (websocketpp::connection_hdl *hdl*) [private]

9.38.3.8 void ComputeThread::on_message (websocketpp::connection_hdl *hdl,* message_ptr *msg*) [private]

9.38.3.9 void ComputeThread::on_open (websocketpp::connection_hdl *hdl*) [private]

9.38.3.10 void ComputeThread::restart_kernel ( )

Restart the kernel.

9.38.3.11 void ComputeThread::run ( )

Main entry point, which will connect to the server and then start an event loop to handle communication with the server.

Only terminates when the connection drops, so run your GUI on a different thread.

9.38.3.12 void ComputeThread::set_master (GUIBase * *b,* DocumentThread * *d*)

Determine the objects that this compute thread should be talking to.

9.38.3.13 void ComputeThread::stop ( )

Stop the current cell execution on the server and remove all other cells from the run queue as well.

9.38.3.14 void ComputeThread::terminate ( )

Terminate the compute thread, in preparation for shutting down the client altogether.

9.38.3.15 void ComputeThread::try_connect ( ) [private]

9.38.3.16 void ComputeThread::try_spawn_server ( ) [private]

9.38.4 Member Data Documentation

9.38.4.1 WSClient::connection_ptr cadabra::ComputeThread::connection [private]

9.38.4.2 bool cadabra::ComputeThread::connection_is_open [private]

9.38.4.3 DocumentThread* cadabra::ComputeThread::docthread [private]

9.38.4.4 GUIBase* cadabra::ComputeThread::gui [private]

9.38.4.5 std::thread::id cadabra::ComputeThread::gui_thread_id [private]

9.38.4.6 websocketpp::connection_hdl cadabra::ComputeThread::our_connection_hdl [private]

9.38.4.7 unsigned short cadabra::ComputeThread::port [private]

9.38.4.8 bool cadabra::ComputeThread::restarting_kernel [private]

9.38.4.9 std::map<DataCell::id_t, DTree::iterator> cadabra::ComputeThread::running_cells [private]

9.38.4.10 Glib::Pid cadabra::ComputeThread::server_pid [private]

9.38.4.11 int cadabra::ComputeThread::server_stderr [private]

9.38.4.12 int cadabra::ComputeThread::server_stdout [private]

9.38.4.13 WSClient cadabra::ComputeThread::wsclient [private]

The documentation for this class was generated from the following files:

- client_server/ComputeThread.hh
- client_server/ComputeThread.cc

9.39 Server::Connection Class Reference

Public Member Functions

- Connection ()

Public Attributes

- websocketpp::connection_hdl hdl
- boost::uuids::uuid uuid

9.39.1 Constructor & Destructor Documentation

9.39.1.1 Server::Connection::Connection ( )

9.39.2 Member Data Documentation

9.39.2.1 websocketpp::connection_hdl Server::Connection::hdl

9.39.2.2 boost::uuids::uuid Server::Connection::uuid

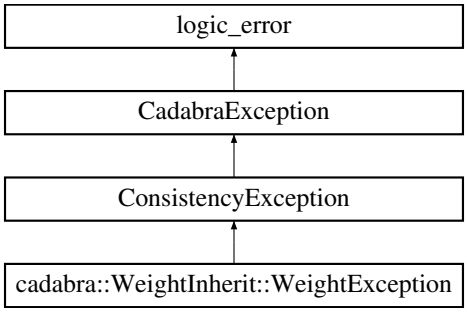
The documentation for this class was generated from the following files:

- client_server/Server.hh
- client_server/Server.cc

9.40 ConsistencyException Class Reference

`#include <Exceptions.hh>`

Inheritance diagram for ConsistencyException:



Public Member Functions

- ConsistencyException (std::string)

9.40.1 Constructor & Destructor Documentation

9.40.1.1 ConsistencyException::ConsistencyException (std::string *s*)

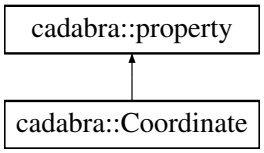
The documentation for this class was generated from the following files:

- core/Exceptions.hh
- core/Exceptions.cc

9.41 cadabra::Coordinate Class Reference

`#include <Coordinate.hh>`

Inheritance diagram for cadabra::Coordinate:



Public Member Functions

- virtual std::string name () const

Additional Inherited Members

9.41.1 Member Function Documentation

9.41.1.1 std::string Coordinate::name ( ) const [virtual]

Implements cadabra::property.

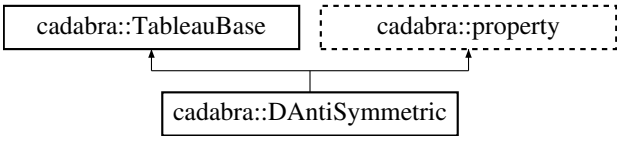
The documentation for this class was generated from the following files:

- core/properties/Coordinate.hh
- core/properties/Coordinate.cc

9.42 cadabra::DAntiSymmetric Class Reference

`#include <DAntiSymmetric.hh>`

Inheritance diagram for cadabra::DAntiSymmetric:



Public Member Functions

- virtual ~DAntiSymmetric ()
- virtual std::string name () const override
- virtual unsigned int size (const Properties &, Ex &, Ex::iterator) const override
- virtual tab_t get_tab (const Properties &, Ex &, Ex::iterator, unsigned int) const override

Additional Inherited Members

9.42.1 Constructor & Destructor Documentation

9.42.1.1 virtual cadabra::DAntiSymmetric::~DAntiSymmetric ( ) [inline], [virtual]

9.42.2 Member Function Documentation

9.42.2.1 TableauBase::tab_t DAntiSymmetric::get_tab (const Properties & *properties,* Ex & *tr,* Ex::iterator *it,* unsigned int *num*) const [override], [virtual]

Implements cadabra::TableauBase.

9.42.2.2 std::string DAntiSymmetric::name ( ) const [override], [virtual]

Implements cadabra::property.

9.42.2.3 unsigned int DAntiSymmetric::size (const Properties & , Ex & , Ex::iterator) const [override], [virtual]

Implements cadabra::TableauBase.

The documentation for this class was generated from the following files:

- core/properties/DAntiSymmetric.hh
- core/properties/DAntiSymmetric.cc

9.43 cadabra::DataCell Class Reference

9.43.1 Description

DataCells are the basic building blocks for a document.

They represent visual units in the notebook interface. They are stored in a tree inside the client, and can be transmitted over the wire between server and client in JSON format (see the documentation of the cadabra::JSON_serialise and cadabra::JSON_deserialise methods below for details on this representation). The notebook user interface reads these cells and construct corresponding graphical output for them.

The cadabra.display method of the cadabra python library knows how to turn various Python objects into the corresponding JSON representation of a DataCell.

```
#include <DataCell.hh>
```

Classes

- class id_t

  Each cell is identified by a serial number 'id' which is used to keep track of it across network calls, and a bool indicating whether the client or the server has created this cell.

Public Types

- enum CellType {
  CellType::document, CellType::python, CellType::latex, CellType::output,
  CellType::verbatim, CellType::latex_view, CellType::image_png, CellType::error }

  Cells are labelled with the data type of its contents, which is stored in a textural representation but may need processing for proper display.

Public Member Functions

- DataCell (CellType t=CellType::python, const std::string &str="", bool hidden=false)

  Standard constructor, generates a new unique id for this DataCell.
- DataCell (id_t, CellType t=CellType::python, const std::string &str="", bool hidden=false)

  Initialise a cell with an already determined id (it is the caller's responsibility to ensure that this id does not clash with any other DataCell's id).
- DataCell (const DataCell &)

  Copy constructor; preserves all information including id.
- id_t id () const

Public Attributes

- CellType cell_type
- std::string textbuf

  Textual representation of the cell content.
- bool hidden

  Flag indicating whether this cell should be hidden from view.
- bool sensitive
- bool running

  Indicator whether this cell is currently being evaluated by the server.

Private Attributes

- id_t serial_number

Static Private Attributes

- static std::mutex serial_mutex
- static uint64_t max_serial_number =0

9.43.2 Member Enumeration Documentation

9.43.2.1 enum cadabra::DataCell::CellType [strong]

Cells are labelled with the data type of its contents, which is stored in a textural representation but may need processing for proper display.

Enumerator

document head node, only one per document

python input : editor cell for code in python

latex input : editor cell for code in latex

output output: cell showing python stdout, verbatim

verbatim output: cell showing other verbatim output

latex_view output: cell showing LaTeX text formatted using a LaTeX

image_png output: cell showing a base64 encoded PNG image

error output: cell showing LaTeX text for errors

9.43.3 Constructor & Destructor Documentation

9.43.3.1 DataCell::DataCell (CellType *t* = CellType::python, const std::string & *str* = " ", bool *hidden* = `false`)

Standard constructor, generates a new unique id for this DataCell.

9.43.3.2 DataCell::DataCell (id_t *id_*, CellType *t* = CellType::python, const std::string & *str* = " ", bool *hidden* = `false`)

Initialise a cell with an already determined id (it is the caller's responsibility to ensure that this id does not clash with any other DataCell's id).

9.43.3.3 DataCell::DataCell (const DataCell & *other*)

Copy constructor; preserves all information including id.

9.43.4 Member Function Documentation

9.43.4.1 DataCell::id_t DataCell::id ( ) const

9.43.5 Member Data Documentation

9.43.5.1 CellType cadabra::DataCell::cell_type

9.43.5.2 bool cadabra::DataCell::hidden

Flag indicating whether this cell should be hidden from view.

The GUI should have a way to bring the cells back into view, typically by clicking on the output cell corresponding to the input cell.

9.43.5.3 uint64_t DataCell::max_serial_number =0 `[static]`, `[private]`

9.43.5.4 bool cadabra::DataCell::running

Indicator whether this cell is currently being evaluated by the server.

Currently only has a meaning for cells of type 'python'. This flag is set/reset using the ActionSetRunStatus action.

9.43.5.5 bool cadabra::DataCell::sensitive

9.43.5.6 std::mutex DataCell::serial_mutex [static], [private]

9.43.5.7 id_t cadabra::DataCell::serial_number [private]

9.43.5.8 std::string cadabra::DataCell::textbuf

Textual representation of the cell content.

For e.g. latex cells it is a bit of a waste to store this representation both in the input and in the output cell. However, this gives us the flexibility to do manipulations on the input (e.g. resolving equation references) before feeding it to LaTeX.

The documentation for this class was generated from the following files:

- client_server/DataCell.hh
- client_server/DataCell.cc

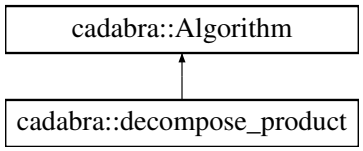
9.44 cadabra::decompose_product Class Reference

9.44.1 Description

Decompose a product of tensors by applying Young projectors.

`#include <decompose_product.hh>`

Inheritance diagram for cadabra::decompose_product:



Public Member Functions

- decompose_product (const Kernel &, Ex &tr)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Private Types

- typedef young_project::name_tab_t sibtab_t
- typedef yngtab::tableaux< sibtab_t > sibtabs_t
- typedef young_project::pos_tab_t numtab_t
- typedef yngtab::tableaux< numtab_t > numtabs_t

Private Member Functions

- const Indices * indices_equivalent (iterator it) const

  Test that all indices on the product are equivalent, that is, have the same Indices property attached to them.
- void fill_asym_ranges (TableauBase::tab_t &tab, int offset, combin::range_vector_t &)
- void project_onto_initial_symmetries (Ex &rep, iterator rr, young_project &yp, const TableauBase *tt, iterator ff, int offset, const TableauBase::tab_t &thetab, bool remove_traces)

Private Attributes

- iterator f1
- iterator f2
- const TableauBase * t1
- const TableauBase * t2
- TableauBase::tab_t t1tab
- TableauBase::tab_t t2tab
- const Indices * ind1
- const Indices * ind2
- unsigned int dim
- yngtab::filled_tableau< iterator > nt1
- yngtab::filled_tableau< iterator > nt2
- combin::range_vector_t asym_ranges

Additional Inherited Members

9.44.2 Member Typedef Documentation

9.44.2.1 typedef young_project::pos_tab_t cadabra::decompose_product::numtab_t [private]

9.44.2.2 typedef yngtab::tableaux<numtab_t> cadabra::decompose_product::numtabs_t [private]

9.44.2.3 typedef young_project::name_tab_t cadabra::decompose_product::sibtab_t [private]

9.44.2.4 typedef yngtab::tableaux<sibtab_t> cadabra::decompose_product::sibtabs_t [private]

9.44.3 Constructor & Destructor Documentation

9.44.3.1 decompose_product::decompose_product (const Kernel & *k*, Ex & *tr*)

9.44.4 Member Function Documentation

9.44.4.1 Algorithm::result_t decompose_product::apply (iterator & *it*) [override], [virtual]

++ntt; ++ntt; ++ntt;

break;

Implements cadabra::Algorithm.

9.44.4.2 bool decompose_product::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.44.4.3 void decompose_product::fill_asym_ranges (TableauBase::tab_t & *tab,* int *offset,* combin::range_vector_t & *ranges*) [private]

9.44.4.4 const Indices * decompose_product::indices_equivalent (iterator *it*) const [private]

Test that all indices on the product are equivalent, that is, have the same Indices property attached to them.

Return this property.

9.44.4.5 void decompose_product::project_onto_initial_symmetries (Ex & *rep,* iterator *rr,* young_project & *yp,* const TableauBase * *tt,* iterator *ff,* int *offset,* const TableauBase::tab_t & *thetab,* bool *remove_traces*) [private]

9.44.5 Member Data Documentation

9.44.5.1 combin::range_vector_t cadabra::decompose_product::asym_ranges [private]

9.44.5.2 unsigned int cadabra::decompose_product::dim [private]

9.44.5.3 iterator cadabra::decompose_product::f1 [private]

9.44.5.4 iterator cadabra::decompose_product::f2 [private]

9.44.5.5 const Indices* cadabra::decompose_product::ind1 [private]

9.44.5.6 const Indices * cadabra::decompose_product::ind2 [private]

9.44.5.7 yngtab::filled_tableau<iterator> cadabra::decompose_product::nt1 [private]

9.44.5.8 yngtab::filled_tableau<iterator> cadabra::decompose_product::nt2 [private]

9.44.5.9 const TableauBase* cadabra::decompose_product::t1 [private]

9.44.5.10 TableauBase::tab_t cadabra::decompose_product::t1tab [private]

9.44.5.11 const TableauBase * cadabra::decompose_product::t2 [private]

9.44.5.12 TableauBase::tab_t cadabra::decompose_product::t2tab [private]

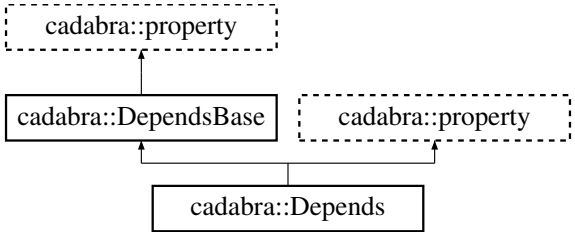
The documentation for this class was generated from the following files:

- core/algorithms/decompose_product.hh
- core/algorithms/decompose_product.cc

9.45 cadabra::Depends Class Reference

`#include <Depends.hh>`

Inheritance diagram for cadabra::Depends:



Public Member Functions

- virtual std::string name () const override
- virtual bool parse (const Kernel &, keyval_t &) override
- virtual Ex dependencies (const Kernel &, Ex::iterator) const override

  Returns a tree of objects on which the given object depends.
- virtual std::string unnamed_argument () const override

Private Attributes

- Ex dependencies_

Additional Inherited Members

9.45.1 Member Function Documentation

9.45.1.1 Ex Depends::dependencies (const Kernel & , Ex::iterator) const [override], [virtual]

Returns a tree of objects on which the given object depends.

Implements cadabra::DependsBase.

9.45.1.2 std::string Depends::name ( ) const [override], [virtual]

Implements cadabra::property.

9.45.1.3 bool Depends::parse (const Kernel & *kernel,* keyval_t & *kv*) [override], [virtual]

Reimplemented from cadabra::property.

9.45.1.4 virtual std::string cadabra::Depends::unnamed_argument ( ) const [inline],[override],[virtual]

Reimplemented from cadabra::property.

9.45.2 Member Data Documentation

9.45.2.1 Ex cadabra::Depends::dependencies_ [private]

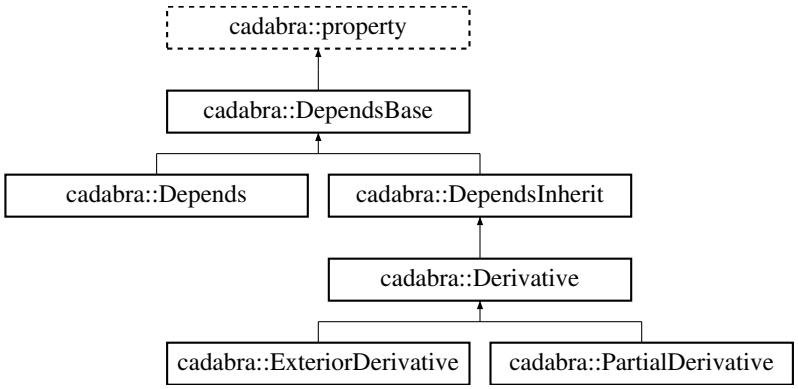
The documentation for this class was generated from the following files:

- core/properties/Depends.hh
- core/properties/Depends.cc

9.46 cadabra::DependsBase Class Reference

`#include <DependsBase.hh>`

Inheritance diagram for cadabra::DependsBase:



Public Member Functions

- virtual Ex dependencies (const Kernel &, Ex::iterator) const =0

  Returns a tree of objects on which the given object depends.

Additional Inherited Members

9.46.1 Member Function Documentation

9.46.1.1 virtual Ex cadabra::DependsBase::dependencies (const Kernel & , Ex::iterator) const [pure virtual]

Returns a tree of objects on which the given object depends.

Implemented in cadabra::DependsInherit, and cadabra::Depends.

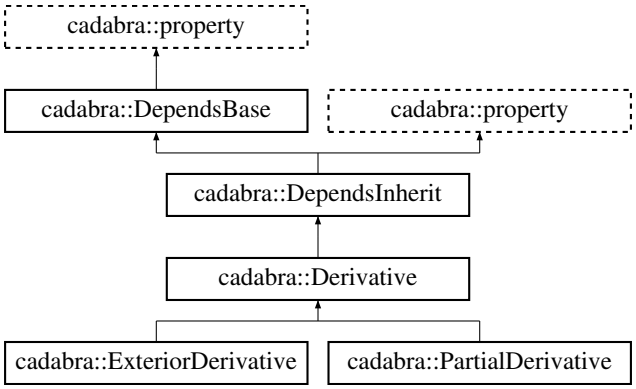
The documentation for this class was generated from the following file:

- core/properties/DependsBase.hh

9.47 cadabra::DependsInherit Class Reference

`#include <DependsInherit.hh>`

Inheritance diagram for cadabra::DependsInherit:



Public Member Functions

- virtual std::string name () const override
- virtual Ex dependencies (const Kernel &, Ex::iterator) const override

  Returns a tree of objects on which the given object depends.

Additional Inherited Members

9.47.1 Member Function Documentation

9.47.1.1 Ex DependsInherit::dependencies (const Kernel & , Ex::iterator) const [override], [virtual]

Returns a tree of objects on which the given object depends.

Implements cadabra::DependsBase.

9.47.1.2 std::string DependsInherit::name ( ) const [override], [virtual]

Implements cadabra::property.

Reimplemented in cadabra::Derivative, cadabra::ExteriorDerivative, and cadabra::PartialDerivative.

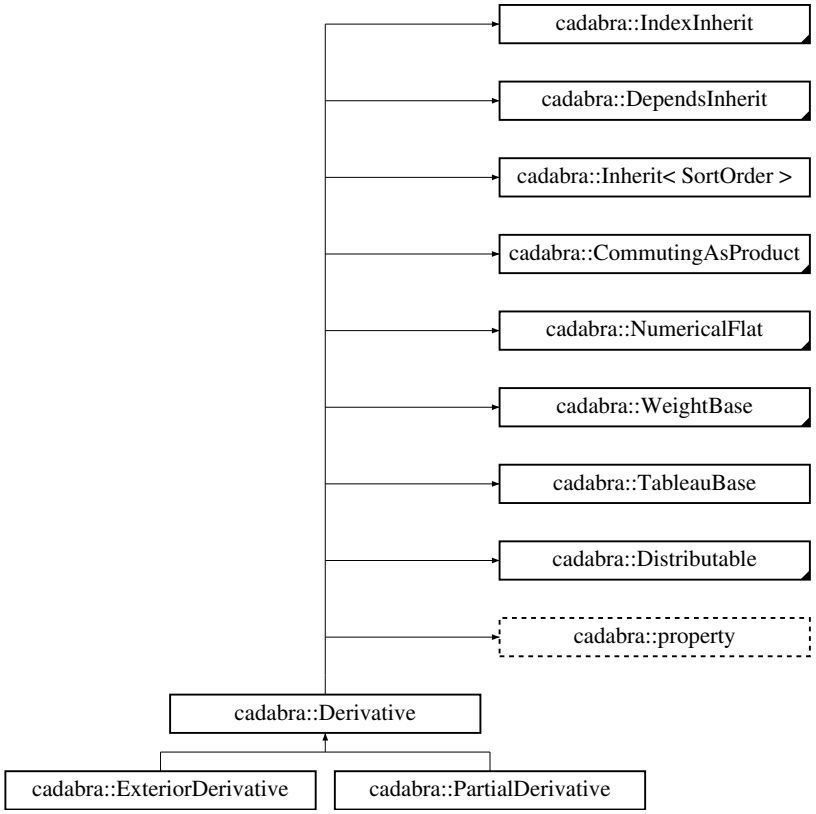
The documentation for this class was generated from the following files:

- core/properties/DependsInherit.hh
- core/properties/DependsInherit.cc

9.48 cadabra::Derivative Class Reference

`#include <Derivative.hh>`

Inheritance diagram for cadabra::Derivative:



Public Member Functions

- virtual ~Derivative ()
- virtual std::string name () const override
- virtual unsigned int size (const Properties &, Ex &, Ex::iterator) const override
- virtual tab_t get_tab (const Properties &, Ex &, Ex::iterator, unsigned int) const override
- virtual multiplier_t value (const Kernel &, Ex::iterator, const std::string &forcedlabel) const override

Additional Inherited Members

9.48.1 Constructor & Destructor Documentation

9.48.1.1 virtual cadabra::Derivative::~Derivative ( ) [inline], [virtual]

9.48.2 Member Function Documentation

9.48.2.1 TableauBase::tab_t Derivative::get_tab (const Properties & *properties*, Ex & *tr*, Ex::iterator *it*, unsigned int *num*) const [override], [virtual]

Implements cadabra::TableauBase.

Reimplemented in cadabra::PartialDerivative.

9.48.2.2 std::string Derivative::name ( ) const [override], [virtual]

Implements cadabra::property.

Reimplemented in cadabra::ExteriorDerivative, and cadabra::PartialDerivative.

9.48.2.3 unsigned int Derivative::size (const Properties & *properties,* Ex & *tr,* Ex::iterator *it*) const [override], [virtual]

Implements cadabra::TableauBase.

Reimplemented in cadabra::PartialDerivative.

9.48.2.4 multiplier_t Derivative::value (const Kernel & *kernel,* Ex::iterator *it,* const std::string & *forcedlabel*) const [override], [virtual]

Implements cadabra::WeightBase.

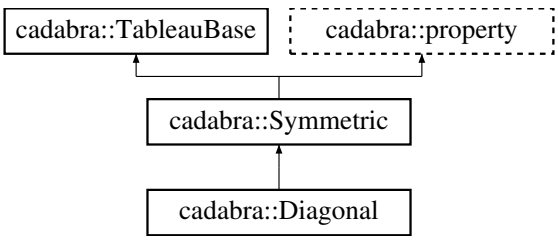
The documentation for this class was generated from the following files:

- core/properties/Derivative.hh
- core/properties/Derivative.cc

9.49 cadabra::Diagonal Class Reference

`#include <Diagonal.hh>`

Inheritance diagram for cadabra::Diagonal:



Public Member Functions

- virtual std::string name () const

Additional Inherited Members

9.49.1 Member Function Documentation

9.49.1.1 std::string Diagonal::name ( ) const [virtual]

Reimplemented from cadabra::Symmetric.

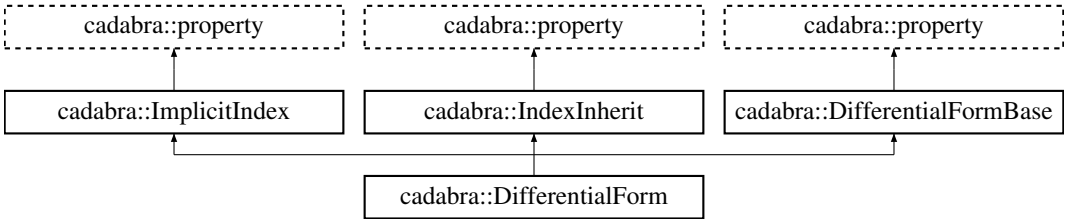
The documentation for this class was generated from the following files:

- core/properties/Diagonal.hh
- core/properties/Diagonal.cc

9.50 cadabra::DifferentialForm Class Reference

`#include <DifferentialForm.hh>`

Inheritance diagram for cadabra::DifferentialForm:



Public Member Functions

- virtual std::string name () const override
- virtual bool parse (const Kernel &, keyval_t &) override
- virtual Ex degree (const Properties &, Ex::iterator) const override

Private Attributes

- Ex degree_

Additional Inherited Members

9.50.1 Member Function Documentation

9.50.1.1 Ex DifferentialForm::degree (const Properties & , Ex::iterator) const [override], [virtual]

Implements cadabra::DifferentialFormBase.

9.50.1.2 std::string DifferentialForm::name ( ) const [override], [virtual]

Reimplemented from cadabra::ImplicitIndex.

9.50.1.3 bool DifferentialForm::parse (const Kernel & , keyval_t & *keyvals*) [override], [virtual]

Reimplemented from cadabra::ImplicitIndex.

9.50.2 Member Data Documentation

9.50.2.1 Ex cadabra::DifferentialForm::degree_ [private]

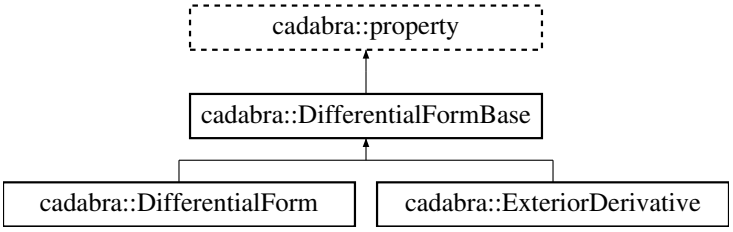
The documentation for this class was generated from the following files:

- core/properties/DifferentialForm.hh
- core/properties/DifferentialForm.cc

9.51 cadabra::DifferentialFormBase Class Reference

```
#include <DifferentialFormBase.hh>
```

Inheritance diagram for cadabra::DifferentialFormBase:



Public Member Functions

- virtual Ex degree (const Properties &, Ex::iterator) const =0

Additional Inherited Members

9.51.1 Member Function Documentation

9.51.1.1 virtual Ex cadabra::DifferentialFormBase::degree (const Properties & , Ex::iterator) const [pure virtual]

Implemented in cadabra::DifferentialForm, and cadabra::ExteriorDerivative.

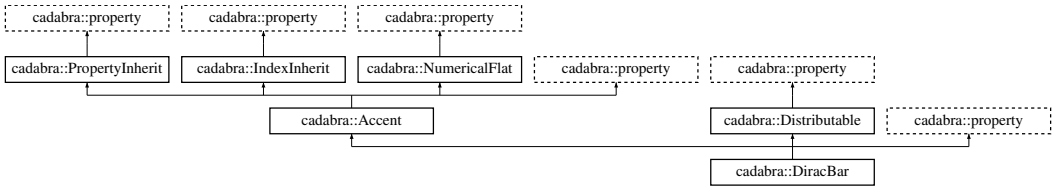
The documentation for this class was generated from the following file:

- core/properties/DifferentialFormBase.hh

9.52 cadabra::DiracBar Class Reference

`#include <DiracBar.hh>`

Inheritance diagram for cadabra::DiracBar:



Public Member Functions

- virtual std::string name () const

Additional Inherited Members

9.52.1 Member Function Documentation

9.52.1.1 std::string DiracBar::name ( ) const [virtual]

Implements cadabra::property.

The documentation for this class was generated from the following files:

- core/properties/DiracBar.hh
- core/properties/DiracBar.cc

9.53 cadabra::DisplayBase Class Reference

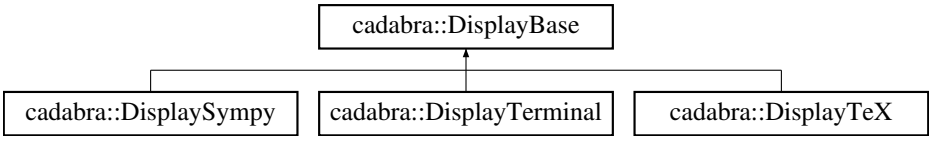
9.53.1 Description

Base class for all display classes.

A key difficulty with printing is to figure out when to print additional brackets for objects which would otherwise not render correctly. For example, a sum inside a product need brackets, but it does not need brackets when it is given as an argument to a function, because then the brackets are already there from the function call.

`#include <DisplayBase.hh>`

Inheritance diagram for cadabra::DisplayBase:



Public Member Functions

- DisplayBase (const Kernel &, const Ex &)
- void output (std::ostream &)
- void output (std::ostream &, Ex::iterator)
- virtual void dispatch (std::ostream &, Ex::iterator)=0

Protected Member Functions

- virtual bool needs_brackets (Ex::iterator it)=0

  Determine if a node needs extra brackets around it.

Protected Attributes

- const Ex & tree
- const Kernel & kernel

9.53.2 Constructor & Destructor Documentation

9.53.2.1 DisplayBase::DisplayBase (const Kernel & *k,* const Ex & *e*)

9.53.3 Member Function Documentation

9.53.3.1 virtual void cadabra::DisplayBase::dispatch (std::ostream & , Ex::iterator) [pure virtual]

Implemented in cadabra::DisplaySympy, cadabra::DisplayTeX, and cadabra::DisplayTerminal.

9.53.3.2 virtual bool cadabra::DisplayBase::needs_brackets (Ex::iterator *it*) [protected], [pure virtual]

Determine if a node needs extra brackets around it.

Uses context from the parent node if necessary. Has to be implemented in a derived class, because the answer depends on the printing method (e.g. (a+b)/c needs brackets when printed like this, but does not need brackets when printed as {a+b}{c}).

Implemented in cadabra::DisplaySympy, cadabra::DisplayTerminal, and cadabra::DisplayTeX.

9.53.3.3 void DisplayBase::output (std::ostream & *str*)

9.53.3.4 void DisplayBase::output (std::ostream & *str,* Ex::iterator *it*)

9.53.4 Member Data Documentation

9.53.4.1 const Kernel& cadabra::DisplayBase::kernel [protected]

9.53.4.2 const Ex& cadabra::DisplayBase::tree [protected]

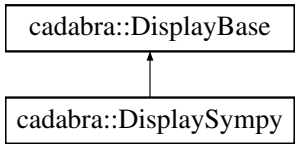
The documentation for this class was generated from the following files:

- core/DisplayBase.hh
- core/DisplayBase.cc

9.54 cadabra::DisplaySympy Class Reference

`#include <DisplaySympy.hh>`

Inheritance diagram for cadabra::DisplaySympy:



Public Member Functions

- DisplaySympy (const Kernel &, const Ex &)
- void import (Ex &)

  Rewrite the output of sympy back into a notation used by Cadabra.

Protected Member Functions

- virtual bool needs_brackets (Ex::iterator it) override

  Determine if a node needs extra brackets around it.

Private Member Functions

- void print_multiplier (std::ostream &, Ex::iterator)

  Output the expression to a sympy-readable form.
- void print_opening_bracket (std::ostream &, str_node::bracket_t)
- void print_closing_bracket (std::ostream &, str_node::bracket_t)
- void print_parent_rel (std::ostream &, str_node::parent_rel_t, bool first)
- void print_children (std::ostream &, Ex::iterator, int skip=0)
- virtual void dispatch (std::ostream &, Ex::iterator) override

  For every object encountered, dispatch will figure out the most appropriate way to convert it into a LaTeX expression.
- void print_productlike (std::ostream &, Ex::iterator, const std::string &inbetween)

  Printing members for various standard constructions, e.g.
- void print_sumlike (std::ostream &, Ex::iterator)
- void print_fraclike (std::ostream &, Ex::iterator)
- void print_commalike (std::ostream &, Ex::iterator)
- void print_arrowlike (std::ostream &, Ex::iterator)
- void print_powlike (std::ostream &, Ex::iterator)
- void print_intlike (std::ostream &, Ex::iterator)
- void print_equalitylike (std::ostream &, Ex::iterator)
- void print_components (std::ostream &, Ex::iterator)
- void print_partial (std::ostream &str, Ex::iterator it)
- void print_matrix (std::ostream &str, Ex::iterator it)
- void print_other (std::ostream &str, Ex::iterator it)
- bool children_have_brackets (Ex::iterator ch) const

Private Attributes

- std::map< std::string, std::string > symmap

  Map from Cadabra symbols to Sympy symbols.
- std::map< nset_t::iterator, Ex, nset_it_less > depsyms

  Map from symbols which have had dependencies added to an expression containing these dependencies.

Additional Inherited Members

9.54.1 Constructor & Destructor Documentation

9.54.1.1 DisplaySympy::DisplaySympy (const Kernel & *kernel,* const Ex & *e*)

9.54.2 Member Function Documentation

9.54.2.1 bool DisplaySympy::children_have_brackets (Ex::iterator *ch*) const [private]

9.54.2.2 void DisplaySympy::dispatch (std::ostream & *str,* Ex::iterator *it*) [override], [private], [virtual]

For every object encountered, dispatch will figure out the most appropriate way to convert it into a LaTeX expression.

This may be done by simply looking at the object's name (e.g. will print as a product) but may also involve looking up properties and deciding on the best course of action based on the attached properties.

Implements cadabra::DisplayBase.

9.54.2.3 void DisplaySympy::import (Ex & *ex*)

Rewrite the output of sympy back into a notation used by Cadabra.

This in particular involves converting 'sin' and friends to '' and so on, as well as converting all the greek symbols. Currently only acts node-by-node, does not do anything complicated with trees.

9.54.2.4 bool DisplaySympy::needs_brackets (Ex::iterator *it*) [override], [protected], [virtual]

Determine if a node needs extra brackets around it.

Uses context from the parent node if necessary. Has to be implemented in a derived class, because the answer depends on the printing method (e.g. (a+b)/c needs brackets when printed like this, but does not need brackets when printed as {a+b}{c}).

Implements cadabra::DisplayBase.

9.54.2.5 void DisplaySympy::print_arrowlike (std::ostream & *str,* Ex::iterator *it*) [private]

9.54.2.6 void DisplaySympy::print_children (std::ostream & *str,* Ex::iterator *it,* int *skip* = 0) [private]

9.54.2.7 void DisplaySympy::print_closing_bracket (std::ostream & *str,* str_node::bracket_t *br*) [private]

9.54.2.8 void DisplaySympy::print_commalike (std::ostream & *str,* Ex::iterator *it*) [private]

9.54.2.9 void DisplaySympy::print_components (std::ostream & *str,* Ex::iterator *it*) [private]

9.54.2.10 void DisplaySympy::print_equalitylike (std::ostream & *str,* Ex::iterator *it*) [private]

9.54.2.11 void DisplaySympy::print_fraclike (std::ostream & *str,* Ex::iterator *it*) [private]

9.54.2.12 void DisplaySympy::print_intlike (std::ostream & *str,* Ex::iterator *it*) [private]

9.54.2.13 void DisplaySympy::print_matrix (std::ostream & *str,* Ex::iterator *it*) [private]

9.54.2.14 void DisplaySympy::print_multiplier (std::ostream & *str,* Ex::iterator *it*) [private]

Output the expression to a sympy-readable form.

For symbols which cannot be parsed by sympy, this can convert to an alternative, Such rewrites can then be undone by the 'import' member above.

9.54.2.15 void DisplaySympy::print_opening_bracket (std::ostream & *str,* str_node::bracket_t *br*) [private]

9.54.2.16 void DisplaySympy::print_other (std::ostream & *str,* Ex::iterator *it*) [private]

9.54.2.17 void DisplaySympy::print_parent_rel (std::ostream & *str,* str_node::parent_rel_t *pr,* bool *first*) [private]

9.54.2.18 void DisplaySympy::print_partial (std::ostream & *str,* Ex::iterator *it*) [private]

9.54.2.19 void DisplaySympy::print_powlike (std::ostream & *str,* Ex::iterator *it*) [private]

9.54.2.20 void DisplaySympy::print_productlike (std::ostream & *str,* Ex::iterator *it,* const std::string & *inbetween*) [private]

Printing members for various standard constructions, e.g.

print as a list, or as a decorated symbol with super/subscripts etc. The names reflect the structure of the output, not necessarily the meaning or name of the object that is being printed.

9.54.2.21 void DisplaySympy::print_sumlike (std::ostream & *str,* Ex::iterator *it*) [private]

9.54.3 Member Data Documentation

9.54.3.1 std::map<nset_t::iterator, Ex, nset_it_less> cadabra::DisplaySympy::depsyms [private]

Map from symbols which have had dependencies added to an expression containing these dependencies.

9.54.3.2 std::map<std::string, std::string> cadabra::DisplaySympy::symmap [private]

Map from Cadabra symbols to Sympy symbols.

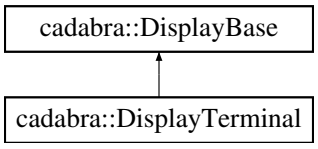
The documentation for this class was generated from the following files:

- core/DisplaySympy.hh
- core/DisplaySympy.cc

9.55 cadabra::DisplayTerminal Class Reference

`#include <DisplayTerminal.hh>`

Inheritance diagram for cadabra::DisplayTerminal:



Public Member Functions

- DisplayTerminal (const Kernel &, const Ex &)

Protected Member Functions

- virtual void dispatch (std::ostream &, Ex::iterator) override
- virtual bool needs_brackets (Ex::iterator it) override

  Determine if a node needs extra brackets around it.

Private Member Functions

- void print_multiplier (std::ostream &, Ex::iterator, int mult=1)
- void print_opening_bracket (std::ostream &, str_node::bracket_t, str_node::parent_rel_t)
- void print_closing_bracket (std::ostream &, str_node::bracket_t, str_node::parent_rel_t)
- void print_parent_rel (std::ostream &, str_node::parent_rel_t, bool first)
- void print_children (std::ostream &, Ex::iterator, int skip=0)
- void print_productlike (std::ostream &, Ex::iterator, const std::string &inbetween)

  Printing members for various standard constructions, e.g.
- void print_sumlike (std::ostream &, Ex::iterator)
- void print_fraclike (std::ostream &, Ex::iterator)
- void print_commalike (std::ostream &, Ex::iterator)
- void print_arrowlike (std::ostream &, Ex::iterator)
- void print_powlike (std::ostream &, Ex::iterator)
- void print_intlike (std::ostream &, Ex::iterator)
- void print_equalitylike (std::ostream &, Ex::iterator)
- void print_commutator (std::ostream &str, Ex::iterator it, bool comm)
- void print_components (std::ostream &, Ex::iterator)
- void print_other (std::ostream &, Ex::iterator)
- bool children_have_brackets (Ex::iterator ch) const

Private Attributes

- int bracket_level =0
- std::map< std::string, std::string > symmap

Additional Inherited Members

9.55.1 Constructor & Destructor Documentation

9.55.1.1 DisplayTerminal::DisplayTerminal (const Kernel & *k*, const Ex & *e*)

9.55.2 Member Function Documentation

9.55.2.1 bool DisplayTerminal::children_have_brackets (Ex::iterator *ch*) const [private]

9.55.2.2 void DisplayTerminal::dispatch (std::ostream & *str*, Ex::iterator *it*) [override], [protected], [virtual]

Implements cadabra::DisplayBase.

9.55.2.3 bool DisplayTerminal::needs_brackets (Ex::iterator *it*) [override], [protected], [virtual]

Determine if a node needs extra brackets around it.

Uses context from the parent node if necessary. Has to be implemented in a derived class, because the answer depends on the printing method (e.g. (a+b)/c needs brackets when printed like this, but does not need brackets when printed as {a+b}{c}).

Implements cadabra::DisplayBase.

9.55.2.4 void DisplayTerminal::print_arrowlike (std::ostream & *str,* Ex::iterator *it*) [private]

9.55.2.5 void DisplayTerminal::print_children (std::ostream & *str,* Ex::iterator *it,* int *skip* = 0) [private]

9.55.2.6 void DisplayTerminal::print_closing_bracket (std::ostream & *str,* str_node::bracket_t *br,* str_node::parent_rel_t *pr*) [private]

9.55.2.7 void DisplayTerminal::print_commalike (std::ostream & *str,* Ex::iterator *it*) [private]

9.55.2.8 void DisplayTerminal::print_commutator (std::ostream & *str,* Ex::iterator *it,* bool *comm*) [private]

9.55.2.9 void DisplayTerminal::print_components (std::ostream & *str,* Ex::iterator *it*) [private]

9.55.2.10 void DisplayTerminal::print_equalitylike (std::ostream & *str,* Ex::iterator *it*) [private]

9.55.2.11 void DisplayTerminal::print_fraclike (std::ostream & *str,* Ex::iterator *it*) [private]

9.55.2.12 void DisplayTerminal::print_intlike (std::ostream & *str,* Ex::iterator *it*) [private]

9.55.2.13 void DisplayTerminal::print_multiplier (std::ostream & *str,* Ex::iterator *it,* int *mult* = 1) [private]

9.55.2.14 void DisplayTerminal::print_opening_bracket (std::ostream & *str,* str_node::bracket_t *br,* str_node::parent_rel_t *pr*) [private]

9.55.2.15 void DisplayTerminal::print_other (std::ostream & *str,* Ex::iterator *it*) [private]

9.55.2.16 void DisplayTerminal::print_parent_rel (std::ostream & *str,* str_node::parent_rel_t *pr,* bool *first*) [private]

9.55.2.17 void DisplayTerminal::print_powlike (std::ostream & *str,* Ex::iterator *it*) [private]

9.55.2.18 void DisplayTerminal::print_productlike (std::ostream & *str,* Ex::iterator *it,* const std::string & *inbetween*) [private]

Printing members for various standard constructions, e.g.

print as a list, or as a decorated symbol with super/subscripts etc. The names reflect the structure of the output, not necessarily the meaning or name of the object that is being printed.

9.55.2.19 void DisplayTerminal::print_sumlike (std::ostream & *str,* Ex::iterator *it*) [private]

9.55.3 Member Data Documentation

9.55.3.1 int cadabra::DisplayTerminal::bracket_level =0 [private]

9.55.3.2 std::map<std::string, std::string> cadabra::DisplayTerminal::symmap [private]

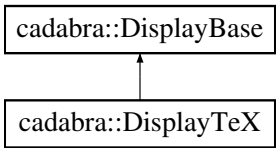
The documentation for this class was generated from the following files:

- core/DisplayTerminal.hh
- core/DisplayTerminal.cc

9.56 cadabra::DisplayTeX Class Reference

`#include <DisplayTeX.hh>`

Inheritance diagram for cadabra::DisplayTeX:



Public Member Functions

- DisplayTeX (const Kernel &, const Ex &)

Protected Member Functions

- virtual bool needs_brackets (Ex::iterator it) override

  Determine if a node needs extra brackets around it.

Private Member Functions

- void print_multiplier (std::ostream &, Ex::iterator, int mult=1)
- void print_opening_bracket (std::ostream &, str_node::bracket_t, str_node::parent_rel_t)
- void print_closing_bracket (std::ostream &, str_node::bracket_t, str_node::parent_rel_t)
- void print_parent_rel (std::ostream &, str_node::parent_rel_t, bool first)
- void print_children (std::ostream &, Ex::iterator, int skip=0)
- std::string texify (std::string) const
- virtual void dispatch (std::ostream &, Ex::iterator) override

  For every object encountered, dispatch will figure out the most appropriate way to convert it into a LaTeX expression.
- void print_productlike (std::ostream &, Ex::iterator, const std::string &inbetween)

  Printing members for various standard constructions, e.g.
- void print_sumlike (std::ostream &, Ex::iterator)
- void print_fraclike (std::ostream &, Ex::iterator)
- void print_commalike (std::ostream &, Ex::iterator)
- void print_arrowlike (std::ostream &, Ex::iterator)
- void print_powlike (std::ostream &, Ex::iterator)
- void print_intlike (std::ostream &, Ex::iterator)
- void print_equalitylike (std::ostream &, Ex::iterator)
- void print_commutator (std::ostream &str, Ex::iterator it, bool comm)
- void print_components (std::ostream &, Ex::iterator)
- void print_conditional (std::ostream &, Ex::iterator)
- void print_relation (std::ostream &, Ex::iterator)
- void print_indexbracket (std::ostream &, Ex::iterator)
- void print_wedgeproduct (std::ostream &, Ex::iterator)
- void print_tableau (std::ostream &, Ex::iterator)
- void print_ftableau (std::ostream &, Ex::iterator)
- void print_other (std::ostream &str, Ex::iterator it)
- bool children_have_brackets (Ex::iterator ch) const
- bool reads_as_operator (Ex::iterator obj, Ex::iterator arg) const

  Determine whether the indicated object 'obj', when acting on the single argument 'arg', reads as an operator, and therefore 'arg' does not need to be wrapped in brackets.

Private Attributes

- bool print_star =false
- bool tight_star =false
- bool tight_plus =false
- bool utf8_output =false
- bool latex_spacing =true
- bool latex_linefeeds =true
- bool extra_brackets_for_symbols =false
- int bracket_level =0
- std::map< std::string, std::string > symmap

  Map from Cadabra symbols to LaTeX symbols (for some typographic cleanup).
- std::set< std::string > curly_bracket_operators

  List of operators which need all arguments fed with curly brackets, not round ones (e.g.

Additional Inherited Members

9.56.1 Constructor & Destructor Documentation

9.56.1.1 DisplayTeX::DisplayTeX (const Kernel & *k,* const Ex & *e*)

9.56.2 Member Function Documentation

9.56.2.1 bool DisplayTeX::children_have_brackets (Ex::iterator *ch*) const [private]

9.56.2.2 void DisplayTeX::dispatch (std::ostream & *str,* Ex::iterator *it*) [override], [private], [virtual]

For every object encountered, dispatch will figure out the most appropriate way to convert it into a LaTeX expression.

This may be done by simply looking at the object's name (e.g. will print as a product) but may also involve looking up properties and deciding on the best course of action based on the attached properties.

Implements cadabra::DisplayBase.

9.56.2.3 bool DisplayTeX::needs_brackets (Ex::iterator *it*) [override], [protected], [virtual]

Determine if a node needs extra brackets around it.

Uses context from the parent node if necessary. Has to be implemented in a derived class, because the answer depends on the printing method (e.g. (a+b)/c needs brackets when printed like this, but does not need brackets when printed as {a+b}{c}).

Implements cadabra::DisplayBase.

9.56.2.4 void DisplayTeX::print_arrowlike (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.5 void DisplayTeX::print_children (std::ostream & *str,* Ex::iterator *it,* int *skip* = 0) [private]

9.56.2.6 void DisplayTeX::print_closing_bracket (std::ostream & *str,* str_node::bracket_t *br,* str_node::parent_rel_t *pr*) [private]

9.56.2.7 void DisplayTeX::print_commalike (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.8 void DisplayTeX::print_commutator (std::ostream & *str,* Ex::iterator *it,* bool *comm*) [private]

9.56.2.9 void DisplayTeX::print_components (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.10 void DisplayTeX::print_conditional (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.11 void DisplayTeX::print_equalitylike (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.12 void DisplayTeX::print_fraclike (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.13 void DisplayTeX::print_ftableau (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.14 void DisplayTeX::print_indexbracket (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.15 void DisplayTeX::print_intlike (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.16 void DisplayTeX::print_multiplier (std::ostream & *str,* Ex::iterator *it,* int *mult* = 1) [private]

9.56.2.17 void DisplayTeX::print_opening_bracket (std::ostream & *str,* str_node::bracket_t *br,* str_node::parent_rel_t *pr*) [private]

9.56.2.18 void DisplayTeX::print_other (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.19 void DisplayTeX::print_parent_rel (std::ostream & *str,* str_node::parent_rel_t *pr,* bool *first*) [private]

9.56.2.20 void DisplayTeX::print_powlike (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.21 void DisplayTeX::print_productlike (std::ostream & *str,* Ex::iterator *it,* const std::string & *inbetween*) [private]

Printing members for various standard constructions, e.g.

print as a list, or as a decorated symbol with super/subscripts etc. The names reflect the structure of the output, not necessarily the meaning or name of the object that is being printed.

9.56.2.22 void DisplayTeX::print_relation (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.23 void DisplayTeX::print_sumlike (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.24 void DisplayTeX::print_tableau (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.25 void DisplayTeX::print_wedgeproduct (std::ostream & *str,* Ex::iterator *it*) [private]

9.56.2.26 bool DisplayTeX::reads_as_operator (Ex::iterator *obj,* Ex::iterator *arg*) const [private]

Determine whether the indicated object 'obj', when acting on the single argument 'arg', reads as an operator, and therefore 'arg' does not need to be wrapped in brackets.

Example: the tree {A} can be displayed as ' A' (or rather, '{A}', instead of '(A)'.

9.56.2.27 std::string DisplayTeX::texify (std::string *str*) const [private]

9.56.3 Member Data Documentation

9.56.3.1 int cadabra::DisplayTeX::bracket_level =0 [private]

9.56.3.2 std::set<std::string> cadabra::DisplayTeX::curly_bracket_operators [private]

List of operators which need all arguments fed with curly brackets, not round ones (e.g.

).

9.56.3.3 bool cadabra::DisplayTeX::extra_brackets_for_symbols =false [private]

9.56.3.4 bool cadabra::DisplayTeX::latex_linefeeds =true [private]

9.56.3.5 bool cadabra::DisplayTeX::latex_spacing =true [private]

9.56.3.6 bool cadabra::DisplayTeX::print_star =false [private]

9.56.3.7 std::map<std::string, std::string> cadabra::DisplayTeX::symmap [private]

Map from Cadabra symbols to LaTeX symbols (for some typographic cleanup).

9.56.3.8 bool cadabra::DisplayTeX::tight_plus =false [private]

9.56.3.9 bool cadabra::DisplayTeX::tight_star =false [private]

9.56.3.10 bool cadabra::DisplayTeX::utf8_output =false [private]

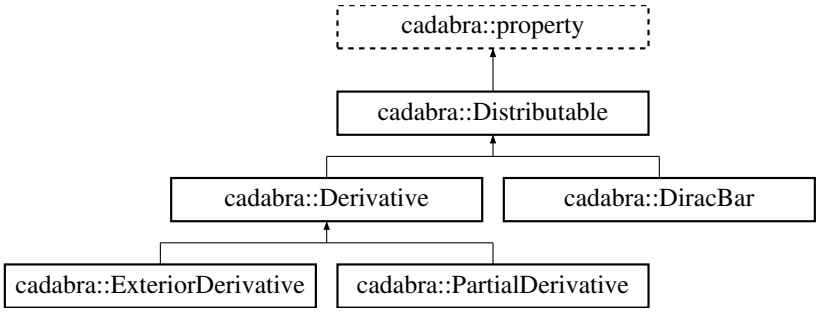
The documentation for this class was generated from the following files:

- core/DisplayTeX.hh
- core/DisplayTeX.cc

9.57 cadabra::Distributable Class Reference

`#include <Distributable.hh>`

Inheritance diagram for cadabra::Distributable:



Public Member Functions

- virtual ~Distributable ()
- virtual std::string name () const

Additional Inherited Members

9.57.1 Constructor & Destructor Documentation

9.57.1.1 virtual cadabra::Distributable::~Distributable ( ) [inline], [virtual]

9.57.2 Member Function Documentation

9.57.2.1 std::string Distributable::name ( ) const [virtual]

Implements cadabra::property.

Reimplemented in cadabra::Derivative, cadabra::ExteriorDerivative, cadabra::DiracBar, and cadabra::PartialDerivative.

The documentation for this class was generated from the following files:

- core/properties/Distributable.hh
- core/properties/Distributable.cc

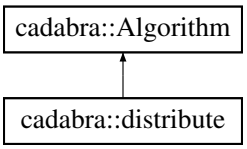
9.58 cadabra::distribute Class Reference

9.58.1 Description

Distribute factors over a sum, that is, $(A+B)C \rightarrow AC + BC$.

`#include <distribute.hh>`

Inheritance diagram for cadabra::distribute:



Public Member Functions

- distribute (const Kernel &, Ex &)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Additional Inherited Members

9.58.2 Constructor & Destructor Documentation

9.58.2.1 distribute::distribute (const Kernel & *k*, Ex & *tr*)

9.58.3 Member Function Documentation

9.58.3.1 Algorithm::result_t distribute::apply (iterator & *prod*) [virtual]

Implements cadabra::Algorithm.

9.58.3.2 bool distribute::can_apply (iterator *st*) [virtual]

Implements cadabra::Algorithm.

The documentation for this class was generated from the following files:

- core/algorithms/distribute.hh
- core/algorithms/distribute.cc

9.59 cadabra::DocumentThread Class Reference

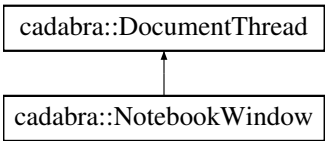
9.59.1 Description

A base class with all the logic to manipulate a Cadabra notebook document.

Relies on the various objects derived from ActionBase in order to get actual work done. All methods here will always run on the GUI thread.In order to implement a GUI, derive from both DocumentThread and GUIBase and then implement the virtual functions of the latter (those implement basic insertion/removal of notebook cells; the logic to figure out which ones and to implement the undo/redo stack is all in the GUI-agnostic DocumentThread).

`#include <DocumentThread.hh>`

Inheritance diagram for cadabra::DocumentThread:



Public Member Functions

- DocumentThread (GUIBase *)
- DocumentThread (const DocumentThread &)=delete

  It is not possible to copy-construct a DocumentThread as it holds on to resources which are not easily copied (such as GUI elements).
- void set_compute_thread (ComputeThread *)

  Let the notebook know about the ComputeThread so that it can send cells for evaluation.
- void build_visual_representation ()

  Ensure that the gui has an up-to-date representation of the dtree.
- void queue_action (std::shared_ptr< ActionBase >)

  All changes to the document should be made by submitting ActionBase derived objects to the 'queue_action' function, so that an undo stack can be kept.
- void new_document ()

  Setup an empty new document with a single Python input cell.
- void load_from_string (const std::string &)

  Load a new notebook from a JSON string.
- void undo ()

  One undo step.
- bool is_registered () const

  Determine if a user has been registered with the Cadabra log server.
- void set_user_details (const std::string &name, const std::string &email, const std::string &affiliation)

  Set user details which will be sent to the Cadabra log server.

Public Attributes

- friend ActionAddCell
- friend ActionPositionCursor
- friend ActionRemoveCell
- friend ActionSplitCell
- friend ActionSetRunStatus
- friend ActionInsertText
- friend ActionEraseText

Protected Types

- enum help_t { help_t::algorithm, help_t::property, help_t::latex, help_t::none }

  Help system.
- typedef std::stack< std::shared_ptr< ActionBase > > ActionStack

Protected Member Functions

- void process_action_queue ()

  Process the action queue.
- bool help_type_and_topic (const std::string &before, const std::string &after, help_t &help_type, std::string &help_topic) const

Protected Attributes

- GUIBase * gui
- ComputeThread * compute
- DTree doc

  The actual document tree.
- std::mutex stack_mutex

  The action undo/redo/todo stacks and logic to execute.
- ActionStack undo_stack
- ActionStack redo_stack
- std::queue< std::shared_ptr< ActionBase > > pending_actions
- bool disable_stacks
- bool registered

  Configuration options read from ~/.config/cadabra.conf.

9.59.2 Member Typedef Documentation

9.59.2.1 typedef std::stack<std::shared_ptr<ActionBase> > cadabra::DocumentThread::ActionStack [protected]

9.59.3 Member Enumeration Documentation

9.59.3.1 enum cadabra::DocumentThread::help_t [strong], [protected]

Help system.

Enumerator

algorithm

property

latex

none

9.59.4 Constructor & Destructor Documentation

9.59.4.1 DocumentThread::DocumentThread (GUIBase * *g*)

9.59.4.2 cadabra::DocumentThread::DocumentThread (const DocumentThread &) [delete]

It is not possible to copy-construct a DocumentThread as it holds on to resources which are not easily copied (such as GUI elements).

9.59.5 Member Function Documentation

9.59.5.1 void DocumentThread::build_visual_representation ( )

Ensure that the gui has an up-to-date representation of the dtree.

Traverses the entire tree so is expensive to run and should only be used when loading new documents or creating a new canvas view.

9.59.5.2 bool DocumentThread::help_type_and_topic (const std::string & *before*, const std::string & *after*, help_t & *help_type*, std::string & *help_topic*) const [protected]

9.59.5.3 bool DocumentThread::is_registered ( ) const

Determine if a user has been registered with the Cadabra log server.

9.59.5.4 void DocumentThread::load_from_string (const std::string & *json*)

Load a new notebook from a JSON string.

Should only be called from the GUI thread. Will cancel any pending operations on the existing notebook (if present) first.

9.59.5.5 void DocumentThread::new_document ( )

Setup an empty new document with a single Python input cell.

9.59.5.6 void DocumentThread::process_action_queue ( ) [protected]

Process the action queue.

It is allowed to call queue_action() above while this is running. So a running action can add more actions.

9.59.5.7 void DocumentThread::queue_action (std::shared_ptr< ActionBase > *ab*)

All changes to the document should be made by submitting ActionBase derived objects to the 'queue_action' function, so that an undo stack can be kept.

They are then processed by calling the 'process_action_queue' method (only available from this thread).

9.59.5.8 void DocumentThread::set_compute_thread (ComputeThread * *cl*)

Let the notebook know about the ComputeThread so that it can send cells for evaluation.

Notebook does NOT own this pointer.

9.59.5.9 void DocumentThread::set_user_details (const std::string & *name,* const std::string & *email,* const std::string & *affiliation*)

Set user details which will be sent to the Cadabra log server.

9.59.5.10 void DocumentThread::undo ( )

One undo step.

9.59.6 Member Data Documentation

9.59.6.1 friend cadabra::DocumentThread::ActionAddCell

9.59.6.2 friend cadabra::DocumentThread::ActionEraseText

9.59.6.3 friend cadabra::DocumentThread::ActionInsertText

9.59.6.4 friend cadabra::DocumentThread::ActionPositionCursor

9.59.6.5 friend cadabra::DocumentThread::ActionRemoveCell

9.59.6.6 friend cadabra::DocumentThread::ActionSetRunStatus

9.59.6.7 friend cadabra::DocumentThread::ActionSplitCell

9.59.6.8 ComputeThread* cadabra::DocumentThread::compute [protected]

9.59.6.9 bool cadabra::DocumentThread::disable_stacks [protected]

9.59.6.10 DTree cadabra::DocumentThread::doc [protected]

The actual document tree.

This object is only modified on the GUI thread, either directly by code in DocumentThread, or by code in the various objects derived from ActionBase. In particular, ComputeThread cannot access this tree directly.

9.59.6.11 GUIBase* cadabra::DocumentThread::gui [protected]

9.59.6.12 std::queue<std::shared_ptr<ActionBase> > cadabra::DocumentThread::pending_actions [protected]

9.59.6.13 ActionStack cadabra::DocumentThread::redo_stack [protected]

9.59.6.14 bool cadabra::DocumentThread::registered [protected]

Configuration options read from ~/.config/cadabra.conf.

9.59.6.15 std::mutex cadabra::DocumentThread::stack_mutex [protected]

The action undo/redo/todo stacks and logic to execute.

them. These stacks can be accessed from both the DocumentThread as well as the ComputeThread (the latter does it through the DocumentThread::queue_action method), so they need a mutex to access them.

9.59.6.16 ActionStack cadabra::DocumentThread::undo_stack [protected]

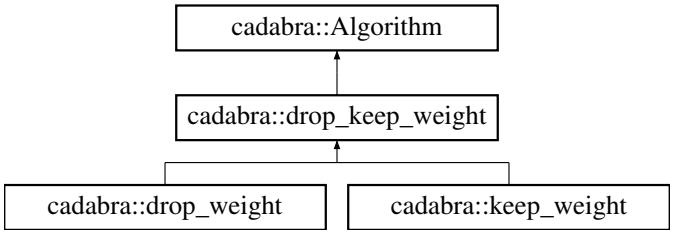
The documentation for this class was generated from the following files:

- client_server/DocumentThread.hh
- client_server/DocumentThread.cc

9.60 cadabra::drop_keep_weight Class Reference

`#include <drop_weight.hh>`

Inheritance diagram for cadabra::drop_keep_weight:



Public Member Functions

- drop_keep_weight (const Kernel &, Ex &, Ex &)
- virtual bool can_apply (iterator) override
- result_t do_apply (iterator &, bool keepthem)

Protected Attributes

- Ex arg
- const WeightInherit ∗ gmn
- const Weight ∗ wgh
- std::string label
- multiplier_t weight

Additional Inherited Members

9.60.1 Constructor & Destructor Documentation

9.60.1.1 drop_keep_weight::drop_keep_weight (const Kernel & *k,* Ex & *tr,* Ex & *a*)

9.60.2 Member Function Documentation

9.60.2.1 bool drop_keep_weight::can_apply (iterator *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.60.2.2 Algorithm::result_t drop_keep_weight::do_apply (iterator & *it,* bool *keepthem*)

9.60.3 Member Data Documentation

9.60.3.1 Ex cadabra::drop_keep_weight::arg [protected]

9.60.3.2 const WeightInherit∗ cadabra::drop_keep_weight::gmn [protected]

9.60.3.3 std::string cadabra::drop_keep_weight::label [protected]

9.60.3.4 multiplier_t cadabra::drop_keep_weight::weight [protected]

9.60.3.5 const Weight∗ cadabra::drop_keep_weight::wgh [protected]

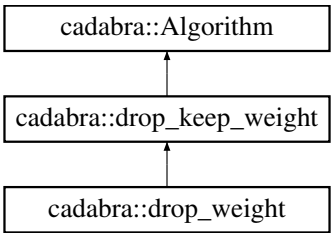
The documentation for this class was generated from the following files:

- core/algorithms/drop_weight.hh
- core/algorithms/drop_weight.cc

9.61 cadabra::drop_weight Class Reference

`#include <drop_weight.hh>`

Inheritance diagram for cadabra::drop_weight:



Public Member Functions

- drop_weight (const Kernel &, Ex &, Ex &)
- virtual result_t apply (iterator &) override

Additional Inherited Members

9.61.1 Constructor & Destructor Documentation

9.61.1.1 drop_weight::drop_weight (const Kernel & *k,* Ex & *e,* Ex & *a*)

9.61.2 Member Function Documentation

9.61.2.1 Algorithm::result_t drop_weight::apply (iterator & *it*) [override], [virtual]

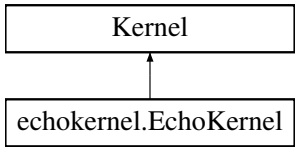
Implements cadabra::Algorithm.

The documentation for this class was generated from the following files:

- core/algorithms/drop_weight.hh
- core/algorithms/drop_weight.cc

9.62 echokernel.EchoKernel Class Reference

Inheritance diagram for echokernel.EchoKernel:



Public Member Functions

- def do_execute (self, code, silent, store_history=True, user_expressions=None, allow_stdin=False)

Static Public Attributes

- string implementation_version = '1.0'
- string language = 'no-op'
- string language_version = '0.1'
- dictionary language_info = {'mimetype': 'text/plain'}
- string banner = "Echo kernel - as useful as a parrot"
- string implementation = 'Echo'

9.62.1 Member Function Documentation

9.62.1.1 def echokernel.EchoKernel.do_execute (*self, code, silent, store_history* = `True`, *user_expressions* = `None`, *allow_stdin* = `False`)

9.62.2 Member Data Documentation

9.62.2.1 string echokernel.EchoKernel.banner = "Echo kernel - as useful as a parrot" [static]

9.62.2.2 string echokernel.EchoKernel.implementation = 'Echo' [static]

9.62.2.3 string echokernel.EchoKernel.implementation_version = '1.0' [static]

9.62.2.4 string echokernel.EchoKernel.language = 'no-op' [static]

9.62.2.5 dictionary echokernel.EchoKernel.language_info = {'mimetype': 'text/plain'} [static]

9.62.2.6 string echokernel.EchoKernel.language_version = '0.1' [static]

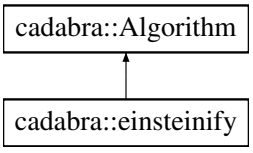
The documentation for this class was generated from the following file:

- core/echokernel.py

9.63 cadabra::einsteinify Class Reference

`#include <einsteinify.hh>`

Inheritance diagram for cadabra::einsteinify:



Public Member Functions

- einsteinify (const Kernel &, Ex &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Private Attributes

- Ex metric

Additional Inherited Members

9.63.1 Constructor & Destructor Documentation

9.63.1.1 einsteinify::einsteinify (const Kernel & *k*, Ex & *e*, Ex & *m*)

9.63.2 Member Function Documentation

9.63.2.1 Algorithm::result_t einsteinify::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.63.2.2 bool einsteinify::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.63.3 Member Data Documentation

9.63.3.1 Ex cadabra::einsteinify::metric [private]

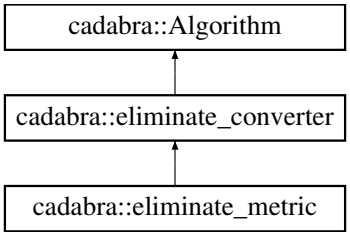
The documentation for this class was generated from the following files:

- core/algorithms/einsteinify.hh
- core/algorithms/einsteinify.cc

9.64 cadabra::eliminate_converter Class Reference

`#include <eliminate_metric.hh>`

Inheritance diagram for cadabra::eliminate_converter:



Public Member Functions

- eliminate_converter (const Kernel &, Ex &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Protected Member Functions

- virtual bool is_conversion_object (iterator) const =0

Private Member Functions

- bool handle_one_index (iterator, iterator, iterator, sibling_iterator)

Private Attributes

- Ex preferred
- index_map_t ind_dummy
- index_map_t ind_free

Additional Inherited Members

9.64.1 Constructor & Destructor Documentation

9.64.1.1 eliminate_converter::eliminate_converter (const Kernel & *k,* Ex & *e,* Ex & *pref*)

9.64.2 Member Function Documentation

9.64.2.1 Algorithm::result_t eliminate_converter::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.64.2.2 bool eliminate_converter::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.64.2.3 bool eliminate_converter::handle_one_index (iterator *ind1,* iterator *ind2,* iterator *fit,* sibling_iterator *objs*) [private]

9.64.2.4 virtual bool cadabra::eliminate_converter::is_conversion_object (iterator) const [protected], [pure virtual]

Implemented in cadabra::eliminate_metric.

9.64.3 Member Data Documentation

9.64.3.1 index_map_t cadabra::eliminate_converter::ind_dummy [private]

9.64.3.2 index_map_t cadabra::eliminate_converter::ind_free [private]

9.64.3.3 Ex cadabra::eliminate_converter::preferred [private]

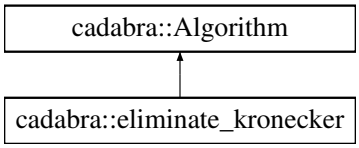
The documentation for this class was generated from the following files:

- core/algorithms/eliminate_metric.hh
- core/algorithms/eliminate_metric.cc

9.65 cadabra::eliminate_kronecker Class Reference

`#include <eliminate_kronecker.hh>`

Inheritance diagram for cadabra::eliminate_kronecker:



Public Member Functions

- eliminate_kronecker (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Additional Inherited Members

9.65.1 Constructor & Destructor Documentation

9.65.1.1 eliminate_kronecker::eliminate_kronecker (const Kernel & *k*, Ex & *tr*)

9.65.2 Member Function Documentation

9.65.2.1 Algorithm::result_t eliminate_kronecker::apply (iterator & *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.65.2.2 bool eliminate_kronecker::can_apply (iterator *st*) [override], [virtual]

Implements cadabra::Algorithm.

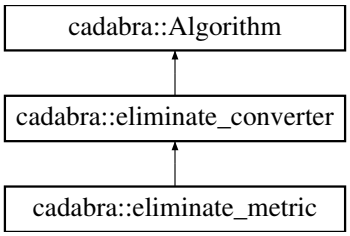
The documentation for this class was generated from the following files:

- core/algorithms/eliminate_kronecker.hh
- core/algorithms/eliminate_kronecker.cc

9.66 cadabra::eliminate_metric Class Reference

`#include <eliminate_metric.hh>`

Inheritance diagram for cadabra::eliminate_metric:



Public Member Functions

- eliminate_metric (const Kernel &, Ex &, Ex &)

Protected Member Functions

- virtual bool is_conversion_object (iterator) const override

Additional Inherited Members

9.66.1 Constructor & Destructor Documentation

9.66.1.1 eliminate_metric::eliminate_metric (const Kernel & *k*, Ex & *e*, Ex & *pref*)

9.66.2 Member Function Documentation

9.66.2.1 bool eliminate_metric::is_conversion_object (iterator *fit*) const [override], [protected], [virtual]

Implements cadabra::eliminate_converter.

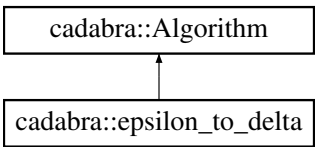
The documentation for this class was generated from the following files:

- core/algorithms/eliminate_metric.hh
- core/algorithms/eliminate_metric.cc

9.67 cadabra::epsilon_to_delta Class Reference

`#include <epsilon_to_delta.hh>`

Inheritance diagram for cadabra::epsilon_to_delta:



Public Member Functions

- epsilon_to_delta (const Kernel &, Ex &, bool reduce_)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Private Attributes

- bool reduce
- std::vector< Ex::iterator > epsilons
- int signature
- Ex repdelta

Additional Inherited Members

9.67.1 Constructor & Destructor Documentation

9.67.1.1 epsilon_to_delta::epsilon_to_delta (const Kernel & *k*, Ex & *tr*, bool *reduce_*)

9.67.2 Member Function Documentation

9.67.2.1 Algorithm::result_t epsilon_to_delta::apply (iterator & *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.67.2.2 bool epsilon_to_delta::can_apply (iterator *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.67.3 Member Data Documentation

9.67.3.1 std::vector<Ex::iterator> cadabra::epsilon_to_delta::epsilons [private]

9.67.3.2 bool cadabra::epsilon_to_delta::reduce [private]

9.67.3.3 Ex cadabra::epsilon_to_delta::repdelta [private]

9.67.3.4 int cadabra::epsilon_to_delta::signature [private]

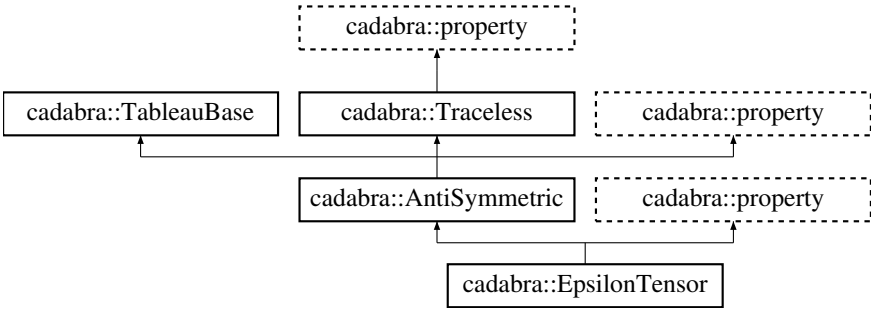
The documentation for this class was generated from the following files:

- core/algorithms/epsilon_to_delta.hh
- core/algorithms/epsilon_to_delta.cc

9.68 cadabra::EpsilonTensor Class Reference

`#include <EpsilonTensor.hh>`

Inheritance diagram for cadabra::EpsilonTensor:



Public Member Functions

- virtual ~EpsilonTensor ()
- virtual bool parse (const Kernel &, keyval_t &) override
- virtual std::string name () const override

Public Attributes

- Ex metric
- Ex krdelta

Additional Inherited Members

9.68.1 Constructor & Destructor Documentation

9.68.1.1 virtual cadabra::EpsilonTensor::~EpsilonTensor ( ) [inline], [virtual]

9.68.2 Member Function Documentation

9.68.2.1 std::string EpsilonTensor::name ( ) const [override], [virtual]

Implements cadabra::property.

9.68.2.2 bool EpsilonTensor::parse (const Kernel & *k*, keyval_t & *keyvals*) [override], [virtual]

Reimplemented from cadabra::property.

9.68.3 Member Data Documentation

9.68.3.1 Ex cadabra::EpsilonTensor::krdelta

9.68.3.2 Ex cadabra::EpsilonTensor::metric

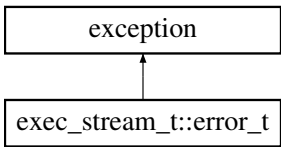
The documentation for this class was generated from the following files:

- core/properties/EpsilonTensor.hh
- core/properties/EpsilonTensor.cc

9.69 exec_stream_t::error_t Class Reference

`#include <exec-stream.h>`

Inheritance diagram for exec_stream_t::error_t:



Public Member Functions

- error_t (std::string const &msg)
- error_t (std::string const &msg, error_code_t code)
- ~error_t () throw ()
- virtual char const * what () const throw ()

Protected Member Functions

- error_t ()
- void compose (std::string const &msg, error_code_t code)

Protected Attributes

- std::string m_msg

9.69.1 Constructor & Destructor Documentation

9.69.1.1 exec_stream_t::error_t::error_t (std::string const & *msg*)

9.69.1.2 exec_stream_t::error_t::error_t (std::string const & *msg*, error_code_t *code*)

9.69.1.3 exec_stream_t::error_t::∼error_t ( ) throw)

9.69.1.4 exec_stream_t::error_t::error_t ( ) [protected]

9.69.2 Member Function Documentation

9.69.2.1 void exec_stream_t::error_t::compose (std::string const & *msg*, error_code_t *code*) [protected]

9.69.2.2 char const ∗ exec_stream_t::error_t::what ( ) const throw) [virtual]

9.69.3 Member Data Documentation

9.69.3.1 std::string exec_stream_t::error_t::m_msg [protected]

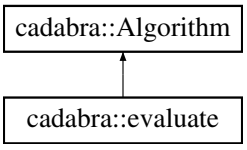
The documentation for this class was generated from the following files:

- frontend/common/exec-stream.h
- frontend/common/exec-stream.cc

9.70 cadabra::evaluate Class Reference

```
#include <evaluate.hh>
```

Inheritance diagram for cadabra::evaluate:



Public Member Functions

- evaluate (const Kernel &, Ex &, const Ex &component_values, bool rhs=false)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override
- void merge_components (iterator it1, iterator it2)

  Merge the information in two 'components' nodes at the given iterators, moving all out of the second one into the first one.

Private Member Functions

- bool is_component (iterator it) const
- iterator handle_components (iterator it)
- iterator handle_sum (iterator it)
- iterator handle_prod (iterator it)
- iterator handle_derivative (iterator it)
- iterator handle_epsilon (iterator it)
- iterator handle_factor (sibling_iterator sib, const index_map_t &full_ind_free)

  Replace a single factor with a 'components' ...
- iterator dense_factor (iterator sib, const index_map_t &ind_free, const index_map_t &ind_dummy)

  Expand a tensor factor into a components node with all components written out explicitly.
- void merge_component_children (iterator it)

  Merge entries in a single 'components' node when they are for the.
- void cleanup_components (iterator it1)

  Cleanup all components in a 'components' node; that is, call the cleanup_dispatch function on them.
- void simplify_components (iterator)

  Simplify all components of a 'components' node by running sympy's simplify on them.
- iterator wrap_scalar_in_components_node (iterator sib)

  Wrap a non-component scalar node in a 'components' node.
- std::set< Ex, tree_exact_less_obj > dependencies (iterator it)

  Determine all the Coordinate dependencies of the object at 'it'.

Private Attributes

- const Ex & components
- bool only_rhs

Additional Inherited Members

9.70.1 Constructor & Destructor Documentation

9.70.1.1 evaluate::evaluate (const Kernel & *k*, Ex & *tr*, const Ex & *component_values*, bool *rhs* = `false`)

9.70.2 Member Function Documentation

9.70.2.1 Algorithm::result_t evaluate::apply (iterator & *it*) `[override], [virtual]`

Implements cadabra::Algorithm.

9.70.2.2 bool evaluate::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.70.2.3 void evaluate::cleanup_components (iterator *it1*) [private]

Cleanup all components in a 'components' node; that is, call the cleanup_dispatch function on them.

9.70.2.4 Ex::iterator evaluate::dense_factor (iterator *sib*, const index_map_t & *ind_free*, const index_map_t & *ind_dummy*) [private]

Expand a tensor factor into a components node with all components written out explicitly.

Used when there is no sparse rule matching this factor.

9.70.2.5 std::set< Ex, tree_exact_less_obj > evaluate::dependencies (iterator *it*) [private]

Determine all the Coordinate dependencies of the object at 'it'.

For the time being this can only be a 'components' node.

9.70.2.6 Ex::iterator evaluate::handle_components (iterator *it*) [private]

9.70.2.7 Ex::iterator evaluate::handle_derivative (iterator *it*) [private]

9.70.2.8 Ex::iterator evaluate::handle_epsilon (iterator *it*) [private]

9.70.2.9 Ex::iterator evaluate::handle_factor (sibling_iterator *sib*, const index_map_t & *full_ind_free*) [private]

Replace a single factor with a 'components' ...

The full_ind_free argument can contain a list of indices in the order in which values should be stored in index value sets.

9.70.2.10 Ex::iterator evaluate::handle_prod (iterator *it*) [private]

9.70.2.11 Ex::iterator evaluate::handle_sum (iterator *it*) [private]

9.70.2.12 bool evaluate::is_component (iterator *it*) const [private]

9.70.2.13 void evaluate::merge_component_children (iterator *it*) [private]

Merge entries in a single 'components' node when they are for the.

same index value(s).

9.70.2.14 void evaluate::merge_components (iterator *it1*, iterator *it2*)

Merge the information in two 'components' nodes at the given iterators, moving all out of the second one into the first one.

9.70.2.15 void evaluate::simplify_components (iterator *it*) [private]

Simplify all components of a 'components' node by running sympy's simplify on them.

Returns a replacement iterator to the top.

9.70.2.16 Algorithm::iterator evaluate::wrap_scalar_in_components_node (iterator *sib*) [private]

Wrap a non-component scalar node in a 'components' node.

9.70.3 Member Data Documentation

9.70.3.1 const Ex& cadabra::evaluate::components [private]

9.70.3.2 bool cadabra::evaluate::only_rhs [private]

The documentation for this class was generated from the following files:

- core/algorithms/evaluate.hh
- core/algorithms/evaluate.cc

9.71 cadabra::Ex Class Reference

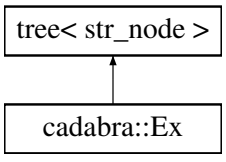
9.71.1 Description

Basic storage class for symbolic mathemematical expressions.

The full meaning of an expression typically requires knowledge about properties of patterns in it, which this class does *not* contain. All property dependent algorithms acting on Ex objects are in Algorithm.hh.

```
#include <Storage.hh>
```

Inheritance diagram for cadabra::Ex:



Public Types

- enum result_t { l_checkpointed, l_no_action, l_applied, l_error }

  Keeping track of what algorithms have done to this expression.

Public Member Functions

- Ex ()
- Ex (tree< str_node >::iterator)
- Ex (const str_node &)
- Ex (const Ex &)
- Ex (const std::string &)

  Initialise with given string as head node (does not parse this string).
- Ex (int)
- result_t state () const
- void update_state (result_t)
- void reset_state ()
- bool changed_state ()

  A status query method mainly to implement a simple method to apply algorithms until they converge.
- bool is_rational () const

  Test if the expression is a rational number.
- multiplier_t to_rational () const
- std::ostream & print_entire_tree (std::ostream &str) const

  Output helpers mainly for debugging purposes.
- iterator named_parent (iterator it, const std::string &) const

  Step up until matching node is found (if current node matches, do nothing)
- iterator erase_expression (iterator it)
- hashval_t calc_hash (iterator it) const

  Calculate the hash value for the subtree starting at 'it'.
- multiplier_t arg_to_num (sibling_iterator, unsigned int) const
- unsigned int number_of_steps (iterator it) const
- unsigned int number_of_equations () const
- unsigned int equation_number (iterator it) const
- nset_t::iterator equation_label (iterator it) const
- iterator equation_by_number (unsigned int i) const
- iterator equation_by_name (nset_t::iterator it) const
- iterator equation_by_name (nset_t::iterator it, unsigned int &) const
- iterator equation_by_number_or_name (iterator it, unsigned int last_used_equation) const
- iterator equation_by_number_or_name (iterator it, unsigned int last_used_equation, unsigned int &) const
- std::string equation_number_or_name (iterator it, unsigned int last_used_equation) const
- iterator procedure_by_name (nset_t::iterator it) const
- iterator replace_index (iterator position, const iterator &from, bool keep_parent_rel=false)

  Replace the index-like object (originally intended to replace indices only, but now used also for e.g.
- iterator move_index (iterator position, const iterator &from)

  As in replace_index, but moves the index rather than making a copy (so that iterators.
- void list_wrap_single_element (iterator &)

  Make sure that the node pointed to is a \comma object, i.e.
- void list_unwrap_single_element (iterator &)
- iterator flatten_and_erase (iterator position)

  Replace the node with the children of the node, useful for e.g.
- bool operator== (const Ex &other) const

  Compare two Ex objects for exact equality; no dummy equivalence or other things that require property information.

- void push_history (Ex selector)

  Push a copy of the current state of the expression onto the history stack.
- Ex pop_history ()

  Pop the most recent state of the expression off the history stack; returns the selector that got us there.
- int history_size () const

  Return the size of the history; 0 means no history, just the current expression.

Static Public Member Functions

- static std::ostream & print_python (std::ostream &str, Ex::iterator it)

  Display expression in Python/Cadabra input form.
- static std::ostream & print_recursive_treeform (std::ostream &str, Ex::iterator it)
- static std::ostream & print_recursive_treeform (std::ostream &str, Ex::iterator it, unsigned int &number)
- static sibling_iterator arg (iterator, unsigned int)

  Quick access to arguments or argument lists for A(B)(C,D) type nodes.
- static unsigned int arg_size (sibling_iterator)

Private Attributes

- result_t state_
- std::vector< tree< str_node > > history
- std::vector< tree< str_node > > selectors

  Patterns which describe how to get from one history step to the next.

9.71.2 Member Enumeration Documentation

9.71.2.1 enum cadabra::Ex::result_t

Keeping track of what algorithms have done to this expression.

After a reset_state (or at initialisation), the expression sits in the 'checkpointed' state. When an algorithm acts, it can then move to 'no_action' (unchanged), 'applied' (changed) or 'error'. Once it is in 'error', it will stay there until the next 'reset'. FIXME: the following should implement a stack of states, so that it can be used with nested functions.

Enumerator

l_checkpointed

l_no_action

l_applied

l_error

9.71.3 Constructor & Destructor Documentation

9.71.3.1 cadabra::Ex::Ex ( )

9.71.3.2 cadabra::Ex::Ex (tree< str_node >::iterator *it*)

9.71.3.3 cadabra::Ex::Ex (const str_node & *x*)

9.71.3.4 cadabra::Ex::Ex (const Ex & *other*)

9.71.3.5 cadabra::Ex::Ex (const std::string & *str*)

Initialise with given string as head node (does not parse this string).

9.71.3.6 cadabra::Ex::Ex (int *val*)

9.71.4 Member Function Documentation

9.71.4.1 Ex::sibling_iterator cadabra::Ex::arg (iterator *it,* unsigned int *num*) [static]

Quick access to arguments or argument lists for A(B)(C,D) type nodes.

9.71.4.2 unsigned int cadabra::Ex::arg_size (sibling_iterator *sib*) [static]

9.71.4.3 multiplier_t cadabra::Ex::arg_to_num (sibling_iterator *sib,* unsigned int *num*) const

9.71.4.4 hashval_t cadabra::Ex::calc_hash (iterator *it*) const

Calculate the hash value for the subtree starting at 'it'.

9.71.4.5 bool cadabra::Ex::changed_state ( )

A status query method mainly to implement a simple method to apply algorithms until they converge.

Returns true when the expression is in 'checkpointed' or 'applied' state. Will set the state to 'no_action'.

9.71.4.6 Ex::iterator cadabra::Ex::equation_by_name (nset_t::iterator *it*) const

9.71.4.7 Ex::iterator cadabra::Ex::equation_by_name (nset_t::iterator *it,* unsigned int & *tmp*) const

9.71.4.8 Ex::iterator cadabra::Ex::equation_by_number (unsigned int *i*) const

9.71.4.9 Ex::iterator cadabra::Ex::equation_by_number_or_name (iterator *it,* unsigned int *last_used_equation*) const

9.71.4.10 Ex::iterator cadabra::Ex::equation_by_number_or_name (iterator *it,* unsigned int *last_used_equation,* unsigned int & *real_eqno*) const

9.71.4.11 nset_t::iterator cadabra::Ex::equation_label (iterator *it*) const

9.71.4.12 unsigned int cadabra::Ex::equation_number (iterator *it*) const

9.71.4.13 std::string cadabra::Ex::equation_number_or_name (iterator *it,* unsigned int *last_used_equation*) const

9.71.4.14 Ex::iterator cadabra::Ex::erase_expression (iterator *it*)

9.71.4.15 Ex::iterator cadabra::Ex::flatten_and_erase (iterator *position*)

Replace the node with the children of the node, useful for e.g.

\prod{A} -> A. This algorithm takes care of the multiplier of the top node, i.e. it does 2\prod{A} -> 2 A. Returns an iterator to the new location of the first child of the original node.

9.71.4.16 int cadabra::Ex::history_size ( ) const

Return the size of the history; 0 means no history, just the current expression.

9.71.4.17 bool cadabra::Ex::is_rational ( ) const

Test if the expression is a rational number.

FIXME: add tests for integers as well.

9.71.4.18 void cadabra::Ex::list_unwrap_single_element (iterator & *it*)

9.71.4.19 void cadabra::Ex::list_wrap_single_element (iterator & *it*)

Make sure that the node pointed to is a \comma object, i.e.

wrap the node if not already inside such a \comma. DEPRECATED: in favour of 'do_list' in Functional.hh.

9.71.4.20 Ex::iterator cadabra::Ex::move_index (iterator *position,* const iterator & *from*)

As in replace_index, but moves the index rather than making a copy (so that iterators.

pointing to the original remain valid).

9.71.4.21 Ex::iterator cadabra::Ex::named_parent (iterator *it,* const std::string &) const

Step up until matching node is found (if current node matches, do nothing)

9.71.4.22 unsigned int cadabra::Ex::number_of_equations ( ) const

9.71.4.23 unsigned int cadabra::Ex::number_of_steps (iterator *it*) const

9.71.4.24 bool cadabra::Ex::operator== (const Ex & *other*) const

Compare two Ex objects for exact equality; no dummy equivalence or other things that require property information.

9.71.4.25 Ex cadabra::Ex::pop_history ( )

Pop the most recent state of the expression off the history stack; returns the selector that got us there.

9.71.4.26 std::ostream & cadabra::Ex::print_entire_tree (std::ostream & *str*) const

Output helpers mainly for debugging purposes.

9.71.4.27 std::ostream & cadabra::Ex::print_python (std::ostream & *str,* Ex::iterator *it*) [static]

Display expression in Python/Cadabra input form.

This is fairly straightforward so not handled with a separate DisplayBase derived class.

9.71.4.28 std::ostream & cadabra::Ex::print_recursive_treeform (std::ostream & *str,* Ex::iterator *it*) [static]

9.71.4.29 std::ostream & cadabra::Ex::print_recursive_treeform (std::ostream & *str,* Ex::iterator *it,* unsigned int & *number*) [static]

9.71.4.30 Ex::iterator cadabra::Ex::procedure_by_name (nset_t::iterator *it*) const

9.71.4.31 void cadabra::Ex::push_history (Ex *selector*)

Push a copy of the current state of the expression onto the history stack.

9.71.4.32 Ex::iterator cadabra::Ex::replace_index (iterator *position,* const iterator & *from,* bool *keep_parent_rel* = false)

Replace the index-like object (originally intended to replace indices only, but now used also for e.g.

normal function arguments, as in

$$\partial_z A(z)$$

with a replacement of z).

Note: this originally kept the bracket and parent_rel, but that is not a good idea, because it prevents us from changing those. If we want to use a _{z} pattern replacing a A(z) index, it is better to make a rule that matches (z) and at the time we find and match _{z}. So this should be handled by the replacement_map logic in Compare.cc.

9.71.4.33 void cadabra::Ex::reset_state ( )

9.71.4.34 Ex::result_t cadabra::Ex::state ( ) const

9.71.4.35 multiplier_t cadabra::Ex::to_rational ( ) const

9.71.4.36 void cadabra::Ex::update_state (Ex::result_t *newstate*)

9.71.5 Member Data Documentation

9.71.5.1 std::vector<tree<str_node> > cadabra::Ex::history [private]

9.71.5.2 std::vector<tree<str_node> > cadabra::Ex::selectors [private]

Patterns which describe how to get from one history step to the next.

9.71.5.3 result_t cadabra::Ex::state_ [private]

The documentation for this class was generated from the following files:

- core/Storage.hh
- core/Storage.cc

9.72 cadabra::Ex_comparator Class Reference

9.72.1 Description

A generic tree comparison class which will take into account index contractions and will also keep track of a replacement list for all types of cadabra wildcards.

The entry point is typically 'equal_subtree' or 'match_subproduct'.

`#include <Compare.hh>`

Public Types

- enum match_t { match_t::node_match =0, match_t::subtree_match =1, match_t::match_index_less =2, match_t::match_index_greater =3, match_t::no_match_indexpos_less =4, match_t::no_match_indexpos_greater =5, match_t::no_match_less =6, match_t::no_match_greater =7 }
- enum useprops_t { useprops_t::always =0, useprops_t::not_at_top, useprops_t::never =2 }
- typedef std::map< Ex, Ex, tree_exact_less_no_wildcards_obj > replacement_map_t

  Map for the replacement of nodes (indices, patterns).
- typedef std::map< nset_t::iterator, Ex::iterator, nset_it_less > subtree_replacement_map_t

  Map for the replacement of entire subtrees (object patterns).

Public Member Functions

- Ex_comparator (const Properties &)
- void clear ()

  Reset the object for a new match.
- match_t equal_subtree (Ex::iterator i1, Ex::iterator i2, useprops_t use_props=useprops_t::always, bool ignore_parent_rel=false)

  Match two subtrees taking into account symbol properties.
- match_t match_subproduct (const Ex &, Ex::sibling_iterator lhs, Ex::sibling_iterator tofind, Ex::sibling_iterator st, Ex::iterator conditions)

  Find a sub-product in a product.
- match_t match_subsum (const Ex &, Ex::sibling_iterator lhs, Ex::sibling_iterator tofind, Ex::sibling_iterator st, Ex::iterator conditions)

  Find a sub-sum in a sum.
- bool satisfies_conditions (Ex::iterator conditions, std::string &error)

  Check whether the a match found by calling equal_subtree or match_subproduct satisfies the conditions as stated.
- bool should_swap (Ex::iterator obj, match_t subtree_comparison)

  Determine whether two objects should be swapped according to the available SortOrder properties.
- int can_swap (Ex::iterator one, Ex::iterator two, match_t subtree_comparison, bool ignore_implicit_indices=false)

  Determine whether obj and obj+1 be exchanged? If yes, return the sign, if no return zero.
- int can_move_adjacent (Ex::iterator prod, Ex::sibling_iterator one, Ex::sibling_iterator two, bool fix_one=false)

  Determine whether object 'one' and 'two' can be moved next to each other by moving either one or the other: if fix_one==true the first node is kept fixed, otherwise the second node is kept fixed.

Public Attributes

- replacement_map_t replacement_map
- subtree_replacement_map_t subtree_replacement_map
- replacement_map_t index_value_map

  Map for matching of index names to index values.
- std::vector< Ex::sibling_iterator > factor_locations

  Information to keep track of where individual factors/terms in a sub-product/sub-sum were found, and (for sub-products) whether moving them into the searched-for order leads to sign flips.
- std::vector< int > factor_moving_signs
- multiplier_t term_ratio
- bool lhs_contains_dummies

  Flag to indicate whether additional care must be taken to handle dummies in the lhs of the pattern.

Protected Member Functions

- match_t compare (const Ex::iterator &, const Ex::iterator &, bool nobrackets=false, useprops_t use_↩ props=useprops_t::always, bool ignore_parent_rel=false)

  Internal entry point.
- int can_swap_prod_obj (Ex::iterator prod, Ex::iterator obj, bool)
- int can_swap_prod_prod (Ex::iterator prod1, Ex::iterator prod2, bool)
- int can_swap_sum_obj (Ex::iterator sum, Ex::iterator obj, bool)
- int can_swap_prod_sum (Ex::iterator prod, Ex::iterator sum, bool)
- int can_swap_sum_sum (Ex::iterator sum1, Ex::iterator sum2, bool)
- int can_swap_ilist_ilist (Ex::iterator obj1, Ex::iterator obj2)
- std::string tab () const
- match_t report (match_t r) const

Protected Attributes

- const Properties & properties

Static Protected Attributes

- static int offset =0

9.72.2 Member Typedef Documentation

9.72.2.1 typedef std::map<Ex, Ex, tree_exact_less_no_wildcards_obj> cadabra::Ex_comparator↩ ::replacement_map_t

Map for the replacement of nodes (indices, patterns).

9.72.2.2 typedef std::map<nset_t::iterator, Ex::iterator, nset_it_less> cadabra::Ex_comparator::subtree_↩ replacement_map_t

Map for the replacement of entire subtrees (object patterns).

9.72.3 Member Enumeration Documentation

9.72.3.1 enum cadabra::Ex_comparator::match_t [strong]

Enumerator

node_match

subtree_match

match_index_less

match_index_greater

no_match_indexpos_less

no_match_indexpos_greater

no_match_less

no_match_greater

9.72.3.2 enum cadabra::Ex_comparator::useprops_t [strong]

Enumerator

always

not_at_top

never

9.72.4 Constructor & Destructor Documentation

9.72.4.1 cadabra::Ex_comparator::Ex_comparator (const Properties & *k*)

9.72.5 Member Function Documentation

9.72.5.1 int cadabra::Ex_comparator::can_move_adjacent (Ex::iterator *prod,* Ex::sibling_iterator *one,* Ex::sibling_iterator *two,* bool *fix_one* = false)

Determine whether object 'one' and 'two' can be moved next to each other by moving either one or the other: if fix_one==true the first node is kept fixed, otherwise the second node is kept fixed.

9.72.5.2 int cadabra::Ex_comparator::can_swap (Ex::iterator *one,* Ex::iterator *two,* match_t *subtree_comparison,* bool *ignore_implicit_indices* = false)

Determine whether obj and obj+1 be exchanged? If yes, return the sign, if no return zero.

This is the general entry point for two arbitrary nodes (which may be a product or sum).

The last flag ('ignore_implicit_indices') is used to disable all checks dealing with implicit indices (this is useful for algorithms which re-order objects with implicit indices, which would otherwise always receive a 0 from this function).

9.72.5.3 int cadabra::Ex_comparator::can_swap_ilist_ilist (Ex::iterator *obj1,* Ex::iterator *obj2*) [protected]

9.72.5.4 int cadabra::Ex_comparator::can_swap_prod_obj (Ex::iterator *prod,* Ex::iterator *obj,* bool *ignore_implicit_indices*) [protected]

9.72.5.5 int cadabra::Ex_comparator::can_swap_prod_prod (Ex::iterator *prod1,* Ex::iterator *prod2,* bool *ignore_implicit_indices*) [protected]

9.72.5.6 int cadabra::Ex_comparator::can_swap_prod_sum (Ex::iterator *prod,* Ex::iterator *sum,* bool *ignore_implicit_indices*) [protected]

9.72.5.7 int cadabra::Ex_comparator::can_swap_sum_obj (Ex::iterator *sum,* Ex::iterator *obj,* bool *ignore_implicit_indices*) [protected]

9.72.5.8 int cadabra::Ex_comparator::can_swap_sum_sum (Ex::iterator *sum1,* Ex::iterator *sum2,* bool *ignore_implicit_indices*) [protected]

9.72.5.9 void cadabra::Ex_comparator::clear ( )

Reset the object for a new match.

9.72.5.10 **Ex_comparator::match_t** cadabra::Ex_comparator::compare (const Ex::iterator & *one,* const Ex::iterator & *two,* bool *nobrackets* = `false`, **useprops_t** *use_props* = **useprops_t::always**, bool *ignore_parent_rel* = `false`) [protected]

Internal entry point.

This comparison function tries to match a single node in the tree, except when the node is an index. Indices are considered to be leaf-nodes, and for these a full subtree match will be attempted (using subtree_compare).

9.72.5.11 **Ex_comparator::match_t** cadabra::Ex_comparator::equal_subtree (Ex::iterator *i1,* Ex::iterator *i2,* **useprops_t** *use_props* = **useprops_t::always**, bool *ignore_parent_rel* = `false`)

Match two subtrees taking into account symbol properties.

'i1' can be a pattern. Returns subtree_match or one of the no_match results. You need to fill lhs_contains_↩ dummies before calling! If use_props is false, it will not try to fetch any property information at the TOP level of the comparison. Properties will always be used at levels.

9.72.5.12 **Ex_comparator::match_t** cadabra::Ex_comparator::match_subproduct (const Ex & *tr,* Ex::sibling_iterator *lhs,* Ex::sibling_iterator *tofind,* Ex::sibling_iterator *st,* Ex::iterator *conditions*)

Find a sub-product in a product.

The 'lhs' iterator points to the product which we want to find, the 'tofind' iterator to the current factor which we are looking for. The product in which to search is pointed to by 'st'. Once 'tofind' is found, this routine calls itself to find the next factor in 'lhs'. If the next factor cannot be found, we backtrack and try to find the previous factor again (it may have appeared multiple times).

9.72.5.13 Ex_comparator::match_t cadabra::Ex_comparator::match_subsum (const Ex & *tr,* Ex::sibling_iterator *lhs,* Ex::sibling_iterator *tofind,* Ex::sibling_iterator *st,* Ex::iterator *conditions*)

Find a sub-sum in a sum.

The 'lhs' iterator points to the sum which we want to find, the 'tofind' iterator to the current term which we are looking for. The sum in which to search is pointed to by 'st'. Once 'tofind' is found, this routine calls itself to find the next term in 'lhs'. Since Cadabra assumes all terms in a sum commute, we do not need the backtracking logic of subproduct.

9.72.5.14 Ex_comparator::match_t cadabra::Ex_comparator::report (Ex_comparator::match_t *r*) const [protected]

9.72.5.15 bool cadabra::Ex_comparator::satisfies_conditions (Ex::iterator *conditions,* std::string & *error*)

Check whether the a match found by calling equal_subtree or match_subproduct satisfies the conditions as stated.

FIXME: document possible conditions.

9.72.5.16 bool cadabra::Ex_comparator::should_swap (Ex::iterator *obj,* match_t *subtree_comparison*)

Determine whether two objects should be swapped according to the available SortOrder properties.

9.72.5.17 std::string cadabra::Ex_comparator::tab ( ) const [protected]

9.72.6 Member Data Documentation

9.72.6.1 std::vector<Ex::sibling_iterator> cadabra::Ex_comparator::factor_locations

Information to keep track of where individual factors/terms in a sub-product/sub-sum were found, and (for sub-products) whether moving them into the searched-for order leads to sign flips.

9.72.6.2 std::vector<int> cadabra::Ex_comparator::factor_moving_signs

9.72.6.3 replacement_map_t cadabra::Ex_comparator::index_value_map

Map for matching of index names to index values.

Note: this is in the opposite order from replacement_map!

9.72.6.4 bool cadabra::Ex_comparator::lhs_contains_dummies

Flag to indicate whether additional care must be taken to handle dummies in the lhs of the pattern.

FIXME: would be better if this were automatic.

9.72.6.5 int cadabra::Ex_comparator::offset =0 [static], [protected]

9.72.6.6 const Properties& cadabra::Ex_comparator::properties [protected]

9.72.6.7 replacement_map_t cadabra::Ex_comparator::replacement_map

9.72.6.8 subtree_replacement_map_t cadabra::Ex_comparator::subtree_replacement_map

9.72.6.9 multiplier_t cadabra::Ex_comparator::term_ratio

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.73 cadabra::Ex_is_equivalent Class Reference

9.73.1 Description

Basic comparison operator for tree iterators, so we can use them as keys in maps.

`#include <Compare.hh>`

Public Member Functions

- Ex_is_equivalent (const Properties &)
- bool operator() (const Ex &, const Ex &)

Private Attributes

- const Properties & properties

9.73.2 Constructor & Destructor Documentation

9.73.2.1 cadabra::Ex_is_equivalent::Ex_is_equivalent (const Properties & *k*)

9.73.3 Member Function Documentation

9.73.3.1 bool cadabra::Ex_is_equivalent::operator() (const Ex & *one*, const Ex & *two*)

9.73.4 Member Data Documentation

9.73.4.1 const Properties& cadabra::Ex_is_equivalent::properties [private]

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.74 cadabra::Ex_is_less Class Reference

`#include <Compare.hh>`

Public Member Functions

- Ex_is_less (const Properties &, int mod_prel)
- bool operator() (const Ex &, const Ex &)

Private Attributes

- const Properties & properties
- int mod_prel

9.74.1 Constructor & Destructor Documentation

9.74.1.1 cadabra::Ex_is_less::Ex_is_less (const Properties & *k,* int *mod_prel*)

9.74.2 Member Function Documentation

9.74.2.1 bool cadabra::Ex_is_less::operator() (const Ex & *one,* const Ex & *two*)

9.74.3 Member Data Documentation

9.74.3.1 int cadabra::Ex_is_less::mod_prel [private]

9.74.3.2 const Properties& cadabra::Ex_is_less::properties [private]

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.75 cadabra::exchange Class Reference

`#include <Exchange.hh>`

Classes

- struct identical_tensors_t
- struct tensor_type_t

Static Public Member Functions

- static int collect_identical_tensors (const Properties &pr, Ex &tr, Ex::iterator it, std::vector< identical_↩ tensors_t > &idts)
- static unsigned int possible_singlets (Ex &, Ex::iterator)
- static bool get_node_gs (const Properties &, Ex &, Ex::iterator, std::vector< std::vector< int > > &)

9.75.1 Member Function Documentation

9.75.1.1 int exchange::collect_identical_tensors (const Properties & *pr,* Ex & *tr,* Ex::iterator *it,* std::vector< identical_tensors_t > & *idts*) [static]

9.75.1.2 bool exchange::get_node_gs (const Properties & *properties,* Ex & *tr,* Ex::iterator *it,* std::vector< std::vector< int > > & *gs*) [static]

9.75.1.3 static unsigned int cadabra::exchange::possible_singlets (Ex & , Ex::iterator) [static]

The documentation for this class was generated from the following files:

- core/Exchange.hh
- core/Exchange.cc

9.76 exec_stream_t Class Reference

```
#include <exec-stream.h>
```

Classes

- class error_t
- class next_arg_impl_t
- class next_arg_t

Public Types

- enum stream_kind_t {
  s_in =1, s_out =2, s_err =4, s_all =s_in|s_out|s_err,
  s_child =8 }
- typedef unsigned long timeout_t
- typedef unsigned long error_code_t

Public Member Functions

- exec_stream_t ()
- exec_stream_t (std::string const &program, std::string const &arguments)
- template<class iterator >
  exec_stream_t (std::string const &program, iterator args_begin, iterator args_end)
- ~exec_stream_t ()
- void set_buffer_limit (int stream_kind, std::size_t size)
- void set_wait_timeout (int stream_kind, timeout_t milliseconds)
- void set_binary_mode (int stream_kind)
- void set_text_mode (int stream_kind)
- void start (std::string const &program, std::string const &arguments)
- template<class iterator >
  void start (std::string const &program, iterator args_begin, iterator args_end)
- void start (std::string const &program, char const *arg1, char const *arg2)
- void start (std::string const &program, char *arg1, char *arg2)
- bool close_in ()
- bool close ()
- void kill ()
- int exit_code ()
- std::ostream & in ()
- std::istream & out ()
- std::istream & err ()

Private Member Functions

- exec_stream_t (exec_stream_t const &)
- exec_stream_t & operator= (exec_stream_t const &)
- void exceptions (bool enable)
- void new_impl ()
- void start (std::string const &program, next_arg_t &next_arg)

Private Attributes

- impl_t * m_impl

Friends

- struct impl_t

9.76.1 Member Typedef Documentation

9.76.1.1 typedef unsigned long exec_stream_t::error_code_t

9.76.1.2 typedef unsigned long exec_stream_t::timeout_t

9.76.2 Member Enumeration Documentation

9.76.2.1 enum exec_stream_t::stream_kind_t

Enumerator

s_in

s_out

s_err

s_all

s_child

9.76.3 Constructor & Destructor Documentation

9.76.3.1 exec_stream_t::exec_stream_t ( )

9.76.3.2 exec_stream_t::exec_stream_t (std::string const & *program,* std::string const & *arguments*)

9.76.3.3 template<class iterator > exec_stream_t::exec_stream_t (std::string const & *program,* iterator *args_begin,* iterator *args_end*) [inline]

9.76.3.4 exec_stream_t::~exec_stream_t ( )

9.76.3.5 exec_stream_t::exec_stream_t (**exec_stream_t** const &) [private]

9.76.4 Member Function Documentation

9.76.4.1 bool exec_stream_t::close ( )

9.76.4.2 bool exec_stream_t::close_in ( )

9.76.4.3 std::istream & exec_stream_t::err ( )

9.76.4.4 void exec_stream_t::exceptions (bool *enable*) [private]

9.76.4.5 int exec_stream_t::exit_code ( )

9.76.4.6 std::ostream & exec_stream_t::in ( )

9.76.4.7 void exec_stream_t::kill ( )

9.76.4.8 void exec_stream_t::new_impl ( ) [private]

9.76.4.9 **exec_stream_t**& exec_stream_t::operator= (**exec_stream_t** const &) [private]

9.76.4.10 std::istream & exec_stream_t::out ( )

9.76.4.11 void exec_stream_t::set_binary_mode (int *stream_kind*)

9.76.4.12 void exec_stream_t::set_buffer_limit (int *stream_kind,* std::size_t *size*)

9.76.4.13 void exec_stream_t::set_text_mode (int *stream_kind*)

9.76.4.14 void exec_stream_t::set_wait_timeout (int *stream_kind,* **timeout_t** *milliseconds*)

9.76.4.15 void exec_stream_t::start (std::string const & *program,* std::string const & *arguments*)

9.76.4.16 template<class iterator > void exec_stream_t::start (std::string const & *program,* iterator *args_begin,* iterator *args_end*) [inline]

9.76.4.17 void exec_stream_t::start (std::string const & *program,* char const * *arg1,* char const * *arg2*) [inline]

9.76.4.18 void exec_stream_t::start (std::string const & *program,* char * *arg1,* char * *arg2*) [inline]

9.76.4.19 void exec_stream_t::start (std::string const & *program,* next_arg_t & *next_arg*) [private]

9.76.5 Friends And Related Function Documentation

9.76.5.1 friend struct impl_t [friend]

9.76.6 Member Data Documentation

9.76.6.1 impl_t* exec_stream_t::m_impl [private]

The documentation for this class was generated from the following files:

- frontend/common/exec-stream.h
- frontend/common/exec-stream.cc

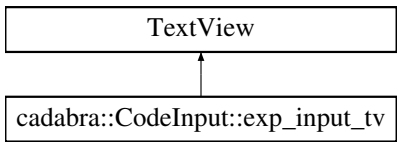
9.77 cadabra::CodeInput::exp_input_tv Class Reference

9.77.1 Description

The actual text widget used by CodeInput.

`#include <CodeInput.hh>`

Inheritance diagram for cadabra::CodeInput::exp_input_tv:



Public Member Functions

- exp_input_tv (DTree::iterator, Glib::RefPtr< Gtk::TextBuffer >, double scale)
- virtual bool on_key_press_event (GdkEventKey *) override
- virtual bool on_draw (const Cairo::RefPtr< Cairo::Context > &) override
- virtual bool on_focus_in_event (GdkEventFocus *) override
- virtual void on_show () override
- void shift_enter_pressed ()

Public Attributes

- sigc::signal1< bool, DTree::iterator > content_execute
- sigc::signal2< bool, std::string, DTree::iterator > content_changed
- sigc::signal3< bool, std::string, int, DTree::iterator > content_insert
- sigc::signal3< bool, int, int, DTree::iterator > content_erase
- sigc::signal1< bool, DTree::iterator > cell_got_focus
- friend CodeInput

Private Attributes

- double scale_
- DTree::iterator datacell

9.77.2 Constructor & Destructor Documentation

9.77.2.1 CodeInput::exp_input_tv::exp_input_tv (DTree::iterator *it,* Glib::RefPtr< Gtk::TextBuffer > *tb,* double *scale*)

9.77.3 Member Function Documentation

9.77.3.1 bool CodeInput::exp_input_tv::on_draw (const Cairo::RefPtr< Cairo::Context > & *cr*) [override], [virtual]

9.77.3.2 bool CodeInput::exp_input_tv::on_focus_in_event (GdkEventFocus * *event*) [override], [virtual]

9.77.3.3 bool CodeInput::exp_input_tv::on_key_press_event (GdkEventKey * *event*) [override], [virtual]

9.77.3.4 void CodeInput::exp_input_tv::on_show ( ) [override], [virtual]

9.77.3.5 void CodeInput::exp_input_tv::shift_enter_pressed ( )

9.77.4 Member Data Documentation

9.77.4.1 sigc::signal1<bool, DTree::iterator> cadabra::CodeInput::exp_input_tv::cell_got_focus

9.77.4.2 friend cadabra::CodeInput::exp_input_tv::CodeInput

9.77.4.3 sigc::signal2<bool, std::string, DTree::iterator> cadabra::CodeInput::exp_input_tv::content_changed

9.77.4.4 sigc::signal3<bool, int, int, DTree::iterator> cadabra::CodeInput::exp_input_tv::content_erase

9.77.4.5 sigc::signal1<bool, DTree::iterator> cadabra::CodeInput::exp_input_tv::content_execute

9.77.4.6 sigc::signal3<bool, std::string, int, DTree::iterator> cadabra::CodeInput::exp_input_tv::content_insert

9.77.4.7 DTree::iterator cadabra::CodeInput::exp_input_tv::datacell [private]

9.77.4.8 double cadabra::CodeInput::exp_input_tv::scale_ [private]

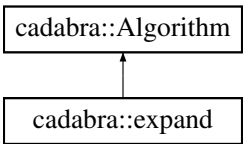
The documentation for this class was generated from the following files:

- frontend/gtkmm/CodeInput.hh
- frontend/gtkmm/CodeInput.cc

9.78 cadabra::expand Class Reference

`#include <expand.hh>`

Inheritance diagram for cadabra::expand:



Public Member Functions

- expand (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Private Attributes

- iterator mx_first
- iterator mx_last
- iterator ii_first
- iterator ii_last
- bool one_index

Additional Inherited Members

9.78.1 Constructor & Destructor Documentation

9.78.1.1 expand::expand (const Kernel & *k*, Ex & *e*)

9.78.2 Member Function Documentation

9.78.2.1 Algorithm::result_t expand::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.78.2.2 bool expand::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.78.3 Member Data Documentation

9.78.3.1 iterator cadabra::expand::ii_first [private]

9.78.3.2 iterator cadabra::expand::ii_last [private]

9.78.3.3 iterator cadabra::expand::mx_first [private]

9.78.3.4 iterator cadabra::expand::mx_last [private]

9.78.3.5 bool cadabra::expand::one_index [private]

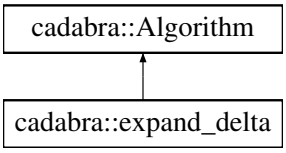
The documentation for this class was generated from the following files:

- core/algorithms/expand.hh
- core/algorithms/expand.cc

9.79 cadabra::expand_delta Class Reference

`#include <expand_delta.hh>`

Inheritance diagram for cadabra::expand_delta:



Public Member Functions

- expand_delta (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Additional Inherited Members

9.79.1 Constructor & Destructor Documentation

9.79.1.1 expand_delta::expand_delta (const Kernel & *k*, Ex & *tr*)

9.79.2 Member Function Documentation

9.79.2.1 Algorithm::result_t expand_delta::apply (iterator & *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.79.2.2 bool expand_delta::can_apply (iterator *st*) [override], [virtual]

Implements cadabra::Algorithm.

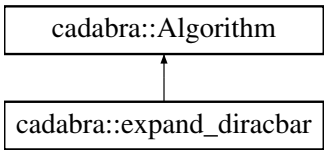
The documentation for this class was generated from the following files:

- core/algorithms/expand_delta.hh
- core/algorithms/expand_delta.cc

9.80 cadabra::expand_diracbar Class Reference

`#include <expand_diracbar.hh>`

Inheritance diagram for cadabra::expand_diracbar:



Public Member Functions

- expand_diracbar (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Additional Inherited Members

9.80.1 Constructor & Destructor Documentation

9.80.1.1 expand_diracbar::expand_diracbar (const Kernel & *k*, Ex & *e*)

9.80.2 Member Function Documentation

9.80.2.1 Algorithm::result_t expand_diracbar::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.80.2.2 bool expand_diracbar::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

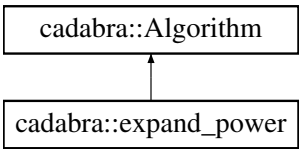
The documentation for this class was generated from the following files:

- core/algorithms/expand_diracbar.hh
- core/algorithms/expand_diracbar.cc

9.81 cadabra::expand_power Class Reference

`#include <expand_power.hh>`

Inheritance diagram for cadabra::expand_power:



Public Member Functions

- expand_power (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Additional Inherited Members

9.81.1 Constructor & Destructor Documentation

9.81.1.1 expand_power::expand_power (const Kernel & *k*, Ex & *e*)

9.81.2 Member Function Documentation

9.81.2.1 Algorithm::result_t expand_power::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.81.2.2 bool expand_power::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

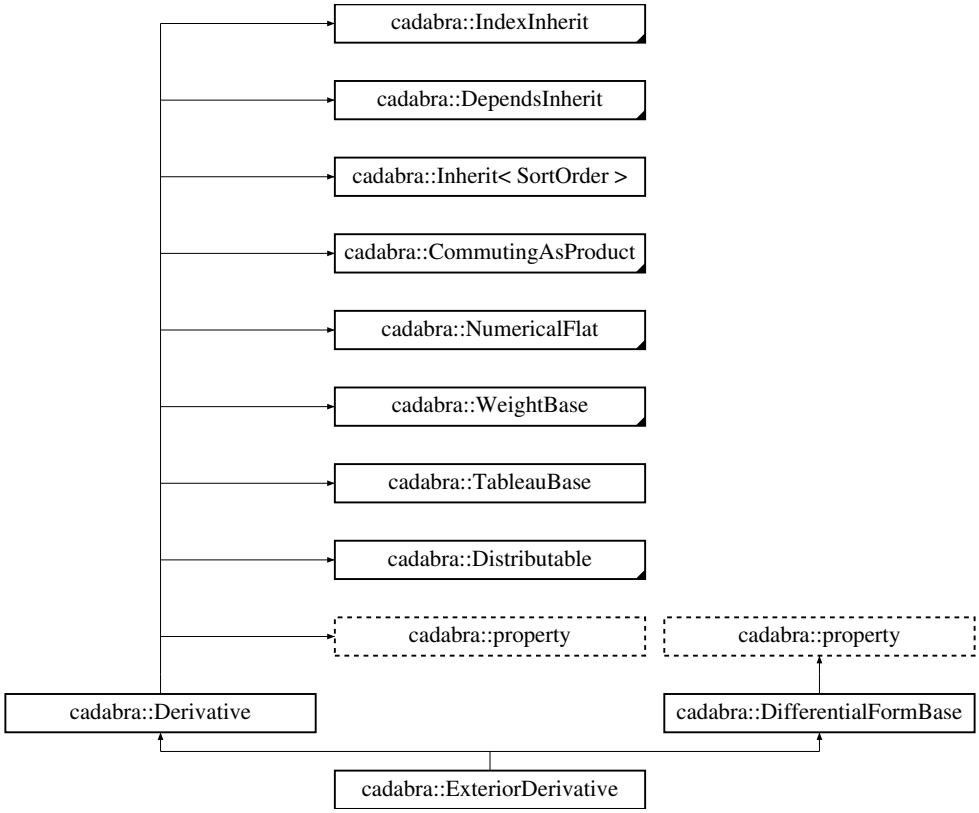
The documentation for this class was generated from the following files:

- core/algorithms/expand_power.hh
- core/algorithms/expand_power.cc

9.82 cadabra::ExteriorDerivative Class Reference

`#include <ExteriorDerivative.hh>`

Inheritance diagram for cadabra::ExteriorDerivative:



Public Member Functions

- virtual std::string name () const override
- virtual Ex degree (const Properties &, Ex::iterator) const override

Additional Inherited Members

9.82.1 Member Function Documentation

9.82.1.1 Ex ExteriorDerivative::degree (const Properties & *props*, Ex::iterator *it*) const [override], [virtual]

Implements cadabra::DifferentialFormBase.

9.82.1.2 std::string ExteriorDerivative::name ( ) const [override], [virtual]

Reimplemented from cadabra::Derivative.

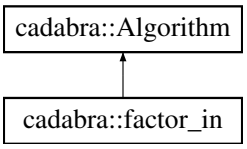
The documentation for this class was generated from the following files:

- core/properties/ExteriorDerivative.hh
- core/properties/ExteriorDerivative.cc

9.83 cadabra::factor_in Class Reference

`#include <factor_in.hh>`

Inheritance diagram for cadabra::factor_in:



Public Member Functions

- factor_in (const Kernel &, Ex &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Protected Types

- typedef std::multimap< hashval_t, Ex::sibling_iterator > term_hash_t
- typedef term_hash_t::iterator term_hash_iterator_t

Protected Member Functions

- bool compare_restricted (iterator one, iterator two) const
- bool compare_prod_nonprod (iterator prod, iterator nonprod) const
- hashval_t calc_restricted_hash (iterator it) const
- void fill_hash_map (iterator)

Protected Attributes

- Ex & factors
- std::set< Ex, tree_exact_less_for_indexmap_obj > factnodes
- term_hash_t term_hash

Additional Inherited Members

9.83.1 Member Typedef Documentation

9.83.1.1 typedef term_hash_t::iterator cadabra::factor_in::term_hash_iterator_t [protected]

9.83.1.2 typedef std::multimap<hashval_t, Ex::sibling_iterator> cadabra::factor_in::term_hash_t [protected]

9.83.2 Constructor & Destructor Documentation

9.83.2.1 factor_in::factor_in (const Kernel & *k*, Ex & *tr*, Ex & *factors_*)

9.83.3 Member Function Documentation

9.83.3.1 Algorithm::result_t factor_in::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.83.3.2 hashval_t factor_in::calc_restricted_hash (iterator *it*) const [protected]

9.83.3.3 bool factor_in::can_apply (iterator *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.83.3.4 bool factor_in::compare_prod_nonprod (iterator *prod*, iterator *nonprod*) const [protected]

9.83.3.5 bool factor_in::compare_restricted (iterator *one*, iterator *two*) const [protected]

9.83.3.6 void factor_in::fill_hash_map (iterator *it*) [protected]

9.83.4 Member Data Documentation

9.83.4.1 std::set<Ex, tree_exact_less_for_indexmap_obj> cadabra::factor_in::factnodes [protected]

9.83.4.2 Ex& cadabra::factor_in::factors [protected]

9.83.4.3 term_hash_t cadabra::factor_in::term_hash [protected]

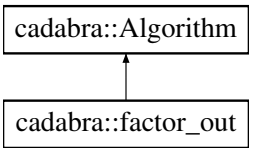
The documentation for this class was generated from the following files:

- core/algorithms/factor_in.hh
- core/algorithms/factor_in.cc

9.84 cadabra::factor_out Class Reference

`#include <factor_out.hh>`

Inheritance diagram for cadabra::factor_out:



Public Member Functions

- factor_out (const Kernel &, Ex &, Ex &, bool right)
- virtual bool can_apply (iterator) override

  Check if the expression is a sum with more than one term.
- virtual result_t apply (iterator &) override

Private Types

- typedef std::vector< Ex > to_factor_out_t

Private Attributes

- bool to_right
- to_factor_out_t to_factor_out

Additional Inherited Members

9.84.1 Member Typedef Documentation

9.84.1.1 typedef std::vector<Ex> cadabra::factor_out::to_factor_out_t [private]

9.84.2 Constructor & Destructor Documentation

9.84.2.1 factor_out::factor_out (const Kernel & *k,* Ex & *e,* Ex & *args,* bool *right*)

9.84.3 Member Function Documentation

9.84.3.1 Algorithm::result_t factor_out::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.84.3.2 bool factor_out::can_apply (iterator *st*) [override], [virtual]

Check if the expression is a sum with more than one term.

Implements cadabra::Algorithm.

9.84.4 Member Data Documentation

9.84.4.1 to_factor_out_t cadabra::factor_out::to_factor_out [private]

9.84.4.2 bool cadabra::factor_out::to_right [private]

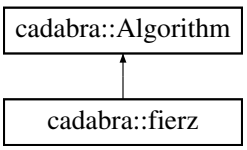
The documentation for this class was generated from the following files:

- core/algorithms/factor_out.hh
- core/algorithms/factor_out.cc

9.85 cadabra::fierz Class Reference

`#include <fierz.hh>`

Inheritance diagram for cadabra::fierz:



Public Member Functions

- fierz (const Kernel &, Ex &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Private Attributes

- Ex spinor_list
- iterator spin1
- iterator spin2
- iterator spin3
- iterator spin4
- const Spinor * prop1
- const Spinor * prop2
- const Spinor * prop3
- const Spinor * prop4
- iterator gam1
- iterator gam2
- int dim
- int spinordim
- const Indices * indprop

Additional Inherited Members

9.85.1 Constructor & Destructor Documentation

9.85.1.1 fierz::fierz (const Kernel & *k,* Ex & *e,* Ex & *args*)

9.85.2 Member Function Documentation

9.85.2.1 Algorithm::result_t fierz::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.85.2.2 bool fierz::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.85.3 Member Data Documentation

9.85.3.1 int cadabra::fierz::dim [private]

9.85.3.2 iterator cadabra::fierz::gam1 [private]

9.85.3.3 iterator cadabra::fierz::gam2 [private]

9.85.3.4 const Indices* cadabra::fierz::indprop [private]

9.85.3.5 const Spinor* cadabra::fierz::prop1 [private]

9.85.3.6 const Spinor * cadabra::fierz::prop2 [private]

9.85.3.7 const Spinor * cadabra::fierz::prop3 [private]

9.85.3.8 const Spinor * cadabra::fierz::prop4 [private]

9.85.3.9 iterator cadabra::fierz::spin1 [private]

9.85.3.10 iterator cadabra::fierz::spin2 [private]

9.85.3.11 iterator cadabra::fierz::spin3 [private]

9.85.3.12 iterator cadabra::fierz::spin4 [private]

9.85.3.13 Ex cadabra::fierz::spinor_list [private]

9.85.3.14 int cadabra::fierz::spinordim [private]

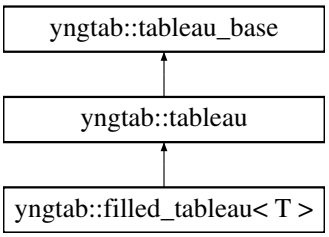
The documentation for this class was generated from the following files:

- core/algorithms/fierz.hh
- core/algorithms/fierz.cc

9.86 yngtab::filled_tableau< T > Class Template Reference

`#include <YoungTab.hh>`

Inheritance diagram for yngtab::filled_tableau< T >:



Classes

- class in_column_iterator

  An iterator which stays inside a given column of a tableau.
- class iterator

  An iterator over all boxes of a tableau, left to right, top to bottom.
- class iterator_base

Public Types

- typedef T value_type

Public Member Functions

- virtual ~filled_tableau ()
- virtual unsigned int number_of_rows () const
- virtual unsigned int row_size (unsigned int row) const
- virtual void add_box (unsigned int row)
- virtual void remove_box (unsigned int row)
- std::pair< int, int > find (const T &) const
- virtual void clear ()
- void copy_shape (const tableau &)
- T & operator() (unsigned int row, unsigned int col)
- const T & operator() (unsigned int row, unsigned int col) const
- const T & operator[ ] (unsigned int boxnum) const
- void add_box (unsigned int rownum, T val)
- void swap_columns (unsigned int c1, unsigned int c2)
- bool compare_without_multiplicity (const filled_tableau< T > &other) const
- bool has_nullifying_trace () const
- void sort_within_columns ()
- void sort_columns ()
- void canonicalise ()

  Sort equal-length columns and sort within columns.
- std::pair< int, int > nonstandard_loc () const
- template<class StrictWeakOrdering >
  void sort_within_columns (StrictWeakOrdering comp)

- template<class StrictWeakOrdering >
  void sort_columns (StrictWeakOrdering comp)
- template<class StrictWeakOrdering >
  void canonicalise (StrictWeakOrdering comp, bool only_col_ex=false)
- void projector (combin::symmetriser< T > &, bool modulo_monoterm=false) const
- void projector (combin::symmetriser< T > &, combin::range_vector_t &) const
- yngrat_t projector_normalisation () const
- filled_tableau< T > & operator= (const filled_tableau< T > &)
- in_column_iterator begin_column (unsigned int column_number)
- in_column_iterator end_column (unsigned int column_number)
- iterator begin () const
- iterator end () const
- template<class OutputIterator >
  OutputIterator Garnir_set (OutputIterator, unsigned int, unsigned int) const

Private Types

- typedef std::vector< T > box_row
- typedef std::vector< box_row > row_stack

Private Attributes

- row_stack rows

Additional Inherited Members

9.86.1 Member Typedef Documentation

9.86.1.1 template<class T> typedef std::vector<T> yngtab::filled_tableau< T >::box_row [private]

9.86.1.2 template<class T> typedef std::vector<box_row> yngtab::filled_tableau< T >::row_stack [private]

9.86.1.3 template<class T> typedef T yngtab::filled_tableau< T >::value_type

9.86.2 Constructor & Destructor Documentation

9.86.2.1 template<class T > yngtab::filled_tableau< T >::~filled_tableau ( ) [virtual]

9.86.3 Member Function Documentation

9.86.3.1 template<class T > void yngtab::filled_tableau< T >::add_box (unsigned int *row*) [virtual]

Reimplemented from yngtab::tableau.

9.86.3.2 template<class T> void yngtab::filled_tableau< T >::add_box (unsigned int *rownum,* T *val*)

9.86.3.3 template<class T > filled_tableau< T >::iterator yngtab::filled_tableau< T >::begin ( ) const

9.86.3.4 template<class T > filled_tableau< T >::in_column_iterator yngtab::filled_tableau< T >::begin_column (unsigned int *column_number*)

9.86.3.5 template<class T > void yngtab::filled_tableau< T >::canonicalise ( )

Sort equal-length columns and sort within columns.

9.86.3.6 template<class T > template<class StrictWeakOrdering > void yngtab::filled_tableau< T >::canonicalise (StrictWeakOrdering *comp,* bool *only_col_ex* = `false`)

9.86.3.7 template<class T > void yngtab::filled_tableau< T >::clear ( ) `[virtual]`

Reimplemented from yngtab::tableau.

9.86.3.8 template<class T> bool yngtab::filled_tableau< T >::compare_without_multiplicity (const filled_tableau< T > & *other*) const

9.86.3.9 template<class T > void yngtab::filled_tableau< T >::copy_shape (const tableau & *other*)

9.86.3.10 template<class T > filled_tableau< T >::iterator yngtab::filled_tableau< T >::end ( ) const

9.86.3.11 template<class T > filled_tableau< T >::in_column_iterator yngtab::filled_tableau< T >::end_column (unsigned int *column_number*)

9.86.3.12 template<class T> std::pair< int, int > yngtab::filled_tableau< T >::find (const T & *obj*) const

9.86.3.13 template<class T > template<class OutputIterator > OutputIterator yngtab::filled_tableau< T >::Garnir_set (OutputIterator *it,* unsigned int *row,* unsigned int *col*) const

9.86.3.14 template<class T > bool yngtab::filled_tableau< T >::has_nullifying_trace ( ) const

9.86.3.15 template<class T > std::pair< int, int > yngtab::filled_tableau< T >::nonstandard_loc ( ) const

9.86.3.16 template<class T > unsigned int yngtab::filled_tableau< T >::number_of_rows ( ) const `[virtual]`

Reimplemented from yngtab::tableau.

9.86.3.17 template<class T > T & yngtab::filled_tableau< T >::operator() (unsigned int *row,* unsigned int *col*)

9.86.3.18 template<class T > const T & yngtab::filled_tableau< T >::operator() (unsigned int *row,* unsigned int *col*) const

9.86.3.19 template<class T> filled_tableau< T > & yngtab::filled_tableau< T >::operator= (const filled_tableau< T > & *other*)

9.86.3.20 template<class T > const T & yngtab::filled_tableau< T >::operator[ ] (unsigned int *boxnum*) const

9.86.3.21 template<class T> void yngtab::filled_tableau< T >::projector (combin::symmetriser< T > & *sym,* bool *modulo_monoterm* = `false`) const

9.86.3.22 template<class T> void yngtab::filled_tableau< T >::projector (combin::symmetriser< T > & *sym,* combin::range_vector_t & *sublengths_scattered*) const

anti-symmetrise over boxes in columns

9.86.3.23 template<class T > yngrat_t yngtab::filled_tableau< T >::projector_normalisation ( ) const

9.86.3.24 template<class T > void yngtab::filled_tableau< T >::remove_box (unsigned int *row*) `[virtual]`

Reimplemented from yngtab::tableau.

9.86.3.25 template<class T > unsigned int yngtab::filled_tableau< T >::row_size (unsigned int *row*) const `[virtual]`

Reimplemented from yngtab::tableau.

9.86.3.26 template<class T > void yngtab::filled_tableau< T >::sort_columns ( )

9.86.3.27 template<class T > template<class StrictWeakOrdering > void yngtab::filled_tableau< T >::sort_columns (StrictWeakOrdering *comp*)

9.86.3.28 template<class T > void yngtab::filled_tableau< T >::sort_within_columns ( )

9.86.3.29 template<class T > template<class StrictWeakOrdering > void yngtab::filled_tableau< T >::sort_within_columns (StrictWeakOrdering *comp*)

9.86.3.30 template<class T > void yngtab::filled_tableau< T >::swap_columns (unsigned int *c1,* unsigned int *c2*)

9.86.4 Member Data Documentation

9.86.4.1 template<class T> row_stack yngtab::filled_tableau< T >::rows `[private]`

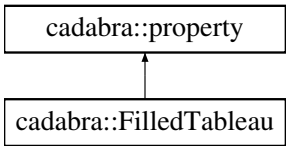
The documentation for this class was generated from the following file:

- core/YoungTab.hh

9.87 cadabra::FilledTableau Class Reference

`#include <FilledTableau.hh>`

Inheritance diagram for cadabra::FilledTableau:



Public Member Functions

- virtual ~FilledTableau ()
- virtual std::string name () const
- virtual bool parse (Ex &, Ex::iterator, Ex::iterator, keyval_t &)

Public Attributes

- int dimension

Additional Inherited Members

9.87.1 Constructor & Destructor Documentation

9.87.1.1 virtual cadabra::FilledTableau::~FilledTableau ( ) [inline], [virtual]

9.87.2 Member Function Documentation

9.87.2.1 std::string FilledTableau::name ( ) const [virtual]

Implements cadabra::property.

9.87.2.2 bool FilledTableau::parse (Ex & *tr,* Ex::iterator *pat,* Ex::iterator *prop,* keyval_t & *keyvals*) [virtual]

9.87.3 Member Data Documentation

9.87.3.1 int cadabra::FilledTableau::dimension

The documentation for this class was generated from the following files:

- core/properties/FilledTableau.hh
- core/properties/FilledTableau.cc

9.88 cadabra::str_node::flag_t Struct Reference

`#include <Storage.hh>`

Public Attributes

- bool keep_after_eval: 1
- bracket_t bracket: 3
- parent_rel_t parent_rel: 3
- bool line_per_node: 1

9.88.1 Member Data Documentation

9.88.1.1 bracket_t cadabra::str_node::flag_t::bracket

9.88.1.2 bool cadabra::str_node::flag_t::keep_after_eval

9.88.1.3 bool cadabra::str_node::flag_t::line_per_node

9.88.1.4 parent_rel_t cadabra::str_node::flag_t::parent_rel

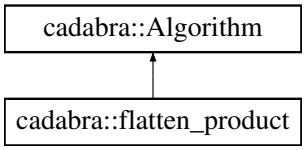
The documentation for this struct was generated from the following file:

- core/Storage.hh

9.89 cadabra::flatten_product Class Reference

`#include <flatten_product.hh>`

Inheritance diagram for cadabra::flatten_product:



Public Member Functions

- flatten_product (const Kernel &, Ex &)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Public Attributes

- bool make_consistent_only
- bool is_diff

Additional Inherited Members

9.89.1 Constructor & Destructor Documentation

9.89.1.1 flatten_product::flatten_product (const Kernel & *k*, Ex & *tr*)

9.89.2 Member Function Documentation

9.89.2.1 Algorithm::result_t flatten_product::apply (iterator & *it*) [virtual]

Implements cadabra::Algorithm.

9.89.2.2 bool flatten_product::can_apply (iterator *it*) [virtual]

Implements cadabra::Algorithm.

9.89.3 Member Data Documentation

9.89.3.1 bool cadabra::flatten_product::is_diff

9.89.3.2 bool cadabra::flatten_product::make_consistent_only

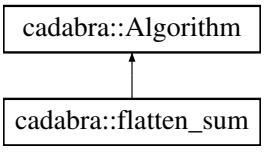
The documentation for this class was generated from the following files:

- core/algorithms/flatten_product.hh
- core/algorithms/flatten_product.cc

9.90 cadabra::flatten_sum Class Reference

```
#include <flatten_sum.hh>
```

Inheritance diagram for cadabra::flatten_sum:



Public Member Functions

- flatten_sum (const Kernel &, Ex &)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Public Attributes

- bool make_consistent_only

Additional Inherited Members

9.90.1 Constructor & Destructor Documentation

9.90.1.1 flatten_sum::flatten_sum (const Kernel & *k,* Ex & *tr*)

9.90.2 Member Function Documentation

9.90.2.1 Algorithm::result_t flatten_sum::apply (iterator & *it*) [virtual]

Implements cadabra::Algorithm.

9.90.2.2 bool flatten_sum::can_apply (iterator *it*) [virtual]

Implements cadabra::Algorithm.

9.90.3 Member Data Documentation

9.90.3.1 bool cadabra::flatten_sum::make_consistent_only

The documentation for this class was generated from the following files:

- core/algorithms/flatten_sum.hh
- core/algorithms/flatten_sum.cc

9.91 snoop::Flush Class Reference

```
#include <Snoop.hh>
```

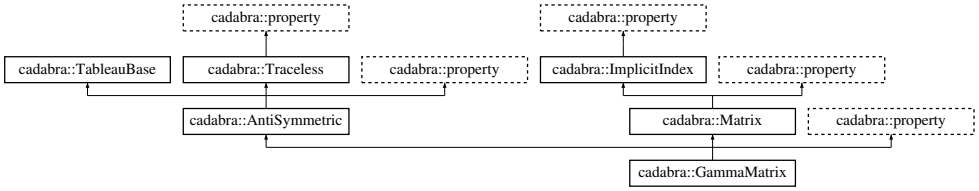
The documentation for this class was generated from the following file:

- client_server/Snoop.hh

9.92 cadabra::GammaMatrix Class Reference

`#include <GammaMatrix.hh>`

Inheritance diagram for cadabra::GammaMatrix:



Public Member Functions

- virtual std::string name () const override
- virtual void latex (std::ostream &) const override

  Display the property on the stream.
- virtual bool parse (const Kernel &, keyval_t &keyvals) override

Public Attributes

- Ex metric

Additional Inherited Members

9.92.1 Member Function Documentation

9.92.1.1 void GammaMatrix::latex (std::ostream & *str*) const [override], [virtual]

Display the property on the stream.

Generate a LaTeX representation of the property, assuming LaTeX is in text mode (so it needs dollar symbols to switch to maths).

Reimplemented from cadabra::property.

9.92.1.2 std::string GammaMatrix::name ( ) const [override], [virtual]

Implements cadabra::property.

9.92.1.3 bool GammaMatrix::parse (const Kernel & *kernel,* keyval_t & *keyvals*) [override], [virtual]

Reimplemented from cadabra::property.

9.92.2 Member Data Documentation

9.92.2.1 Ex cadabra::GammaMatrix::metric

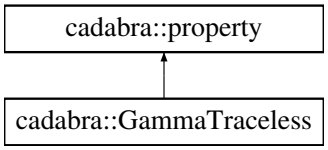
The documentation for this class was generated from the following files:

- core/properties/GammaMatrix.hh
- core/properties/GammaMatrix.cc

9.93 cadabra::GammaTraceless Class Reference

`#include <GammaTraceless.hh>`

Inheritance diagram for cadabra::GammaTraceless:



Public Member Functions

- virtual ~GammaTraceless ()
- virtual std::string name () const

Additional Inherited Members

9.93.1 Constructor & Destructor Documentation

9.93.1.1 virtual cadabra::GammaTraceless::~GammaTraceless ( ) [inline], [virtual]

9.93.2 Member Function Documentation

9.93.2.1 std::string GammaTraceless::name ( ) const [virtual]

Implements cadabra::property.

The documentation for this class was generated from the following files:

- core/properties/GammaTraceless.hh
- core/properties/GammaTraceless.cc

9.94 cadabra::GUIBase Class Reference

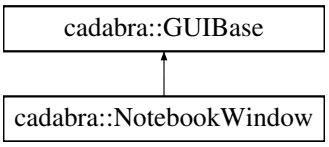
9.94.1 Description

Abstract base class with methods that need to be implemented by any GUI.

You need to derive from this class as well as from the DocumentThread class.

`#include <GUIBase.hh>`

Inheritance diagram for cadabra::GUIBase:



Public Member Functions

- virtual void update_cell (const DTree &, DTree::iterator)=0

  The basic manipulations that a GUI needs to implement are adding, removing and updating (refreshing the display of) a cell.
- virtual void remove_cell (const DTree &, DTree::iterator)=0

  Remove a single cell.
- virtual void remove_all_cells ()=0

  Remove all GUI cells from the display (used as a quick way to clear all before loading a new document).
- virtual void add_cell (const DTree &, DTree::iterator, bool visible)=0

  Add a GUI cell corresponding to the document cell at the iterator.
- virtual void position_cursor (const DTree &, DTree::iterator, int)=0

  Position the cursor in the current canvas in the widget corresponding to the indicated cell.
- virtual size_t get_cursor_position (const DTree &, DTree::iterator)=0

  Retrieve the position of the cursor in the current cell.
- virtual void process_data ()=0

  When the ComputeThread needs to modify the document, it stores an ActionBase object on the stack (see the DocumenThread class) and then wakes up the GUI thread signalling it to process this action.

- virtual void on_connect ()=0

  Network status is propagated from the ComputeThread to the.
- virtual void on_disconnect (const std::string &reason)=0
- virtual void on_network_error ()=0
- virtual void on_kernel_runstatus (bool)=0

9.94.2 Member Function Documentation

9.94.2.1 virtual void cadabra::GUIBase::add_cell (const DTree & , DTree::iterator , bool *visible*) [pure virtual]

Add a GUI cell corresponding to the document cell at the iterator.

The GUI needs to figure out from the location of this cell in the DTree where to insert the cell in the visual display. If the 'visible' flag is false, hide the cell from view independent of whether its hidden flag is set (this is only used when constructing a document on load time and we do not want to show cells until they have all been added to the document).

Implemented in cadabra::NotebookWindow.

9.94.2.2 virtual size_t cadabra::GUIBase::get_cursor_position (const DTree & , DTree::iterator) [pure virtual]

Retrieve the position of the cursor in the current cell.

Implemented in cadabra::NotebookWindow.

9.94.2.3 virtual void cadabra::GUIBase::on_connect ( ) [pure virtual]

Network status is propagated from the ComputeThread to the.

GUI using the following methods. These get called on the compute thread (as opposed to the functions above, which get called on the gui thread).

Implemented in cadabra::NotebookWindow.

9.94.2.4 virtual void cadabra::GUIBase::on_disconnect (const std::string & *reason*) [pure virtual]

Implemented in cadabra::NotebookWindow.

9.94.2.5 virtual void cadabra::GUIBase::on_kernel_runstatus (bool) [pure virtual]

Implemented in cadabra::NotebookWindow.

9.94.2.6 virtual void cadabra::GUIBase::on_network_error ( ) [pure virtual]

Implemented in cadabra::NotebookWindow.

9.94.2.7 virtual void cadabra::GUIBase::position_cursor (const DTree & , DTree::iterator , int) [pure virtual]

Position the cursor in the current canvas in the widget corresponding to the indicated cell.

Implemented in cadabra::NotebookWindow.

9.94.2.8 virtual void cadabra::GUIBase::process_data ( ) [pure virtual]

When the ComputeThread needs to modify the document, it stores an ActionBase object on the stack (see the DocumenThread class) and then wakes up the GUI thread signalling it to process this action.

The following member should wake up the GUI thread and make it enter the processing part.

Implemented in cadabra::NotebookWindow.

9.94.2.9 virtual void cadabra::GUIBase::remove_all_cells ( ) [pure virtual]

Remove all GUI cells from the display (used as a quick way to clear all before loading a new document).

Implemented in cadabra::NotebookWindow.

9.94.2.10 virtual void cadabra::GUIBase::remove_cell (const DTree & , DTree::iterator) [pure virtual]

Remove a single cell.

Implemented in cadabra::NotebookWindow.

9.94.2.11 virtual void cadabra::GUIBase::update_cell (const DTree & , DTree::iterator) [pure virtual]

The basic manipulations that a GUI needs to implement are adding, removing and updating (refreshing the display of) a cell.

The code in DocumentThread will call these to make the GUI update its display. Called on the document thread.

Implemented in cadabra::NotebookWindow.

The documentation for this class was generated from the following file:

- client_server/GUIBase.hh

9.95 cadabra::DataCell::id_t Class Reference

9.95.1 Description

Each cell is identified by a serial number 'id' which is used to keep track of it across network calls, and a bool indicating whether the client or the server has created this cell.

`#include <DataCell.hh>`

Public Member Functions

- id_t ()
- bool operator< (const id_t &other) const

Public Attributes

- uint64_t id
- bool created_by_client

9.95.2 Constructor & Destructor Documentation

9.95.2.1 DataCell::id_t::id_t ( )

9.95.3 Member Function Documentation

9.95.3.1 bool DataCell::id_t::operator< (const id_t & *other*) const

9.95.4 Member Data Documentation

9.95.4.1 bool cadabra::DataCell::id_t::created_by_client

9.95.4.2 uint64_t cadabra::DataCell::id_t::id

The documentation for this class was generated from the following files:

- client_server/DataCell.hh
- client_server/DataCell.cc

9.96 cadabra::exchange::identical_tensors_t Struct Reference

`#include <Exchange.hh>`

Public Attributes

- unsigned int number_of_indices
- std::vector< Ex::sibling_iterator > tensors
- std::vector< int > seq_numbers_of_first_indices
- const SelfCommutingBehaviour * comm
- const Spinor * spino
- const TableauBase * tab
- const Traceless * traceless
- const GammaTraceless * gammatraceless
- int extra_sign

9.96.1 Member Data Documentation

9.96.1.1 const SelfCommutingBehaviour* cadabra::exchange::identical_tensors_t::comm

9.96.1.2 int cadabra::exchange::identical_tensors_t::extra_sign

9.96.1.3 const GammaTraceless* cadabra::exchange::identical_tensors_t::gammatraceless

9.96.1.4 unsigned int cadabra::exchange::identical_tensors_t::number_of_indices

9.96.1.5 std::vector<int> cadabra::exchange::identical_tensors_t::seq_numbers_of_first_indices

9.96.1.6 const Spinor* cadabra::exchange::identical_tensors_t::spino

9.96.1.7 const TableauBase* cadabra::exchange::identical_tensors_t::tab

9.96.1.8 std::vector<Ex::sibling_iterator> cadabra::exchange::identical_tensors_t::tensors

9.96.1.9 const Traceless* cadabra::exchange::identical_tensors_t::traceless

The documentation for this struct was generated from the following file:

- core/Exchange.hh

9.97 Images Class Reference

`#include <Permutations.hh>`

Public Member Functions

- template<class iterator >
  void find (iterator start1, iterator end1, iterator start2, iterator end2)
  Find the permutation that takes [start1, end1> to [start2, end2>.

Public Attributes

- std::vector< int > images

9.97.1 Member Function Documentation

9.97.1.1 template<class iterator > void Images::find (iterator *start1,* iterator *end1,* iterator *start2,* iterator *end2*)

Find the permutation that takes [start1, end1> to [start2, end2>.

9.97.2 Member Data Documentation

9.97.2.1 std::vector<int> Images::images

The documentation for this class was generated from the following file:

- core/Permutations.hh

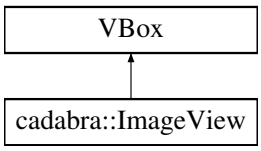
9.98 cadabra::ImageView Class Reference

9.98.1 Description

An image viewing widget.

`#include <ImageView.hh>`

Inheritance diagram for cadabra::ImageView:



Public Member Functions

- ImageView ()
- virtual ~ImageView ()
- void set_image_from_base64 (const std::string &b64)

Private Attributes

- Gtk::Image image

9.98.2 Constructor & Destructor Documentation

9.98.2.1 ImageView::ImageView ( )

9.98.2.2 ImageView::~ImageView ( ) [virtual]

9.98.3 Member Function Documentation

9.98.3.1 void ImageView::set_image_from_base64 (const std::string & *b64*)

9.98.4 Member Data Documentation

9.98.4.1 Gtk::Image cadabra::ImageView::image [private]

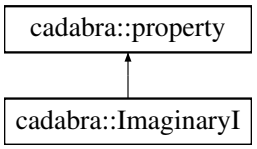
The documentation for this class was generated from the following files:

- frontend/gtkmm/ImageView.hh
- frontend/gtkmm/ImageView.cc

9.99 cadabra::ImaginaryI Class Reference

`#include <ImaginaryI.hh>`

Inheritance diagram for cadabra::ImaginaryI:



Public Member Functions

- virtual std::string name () const override

Additional Inherited Members

9.99.1 Member Function Documentation

9.99.1.1 std::string ImaginaryI::name ( ) const [override], [virtual]

Implements cadabra::property.

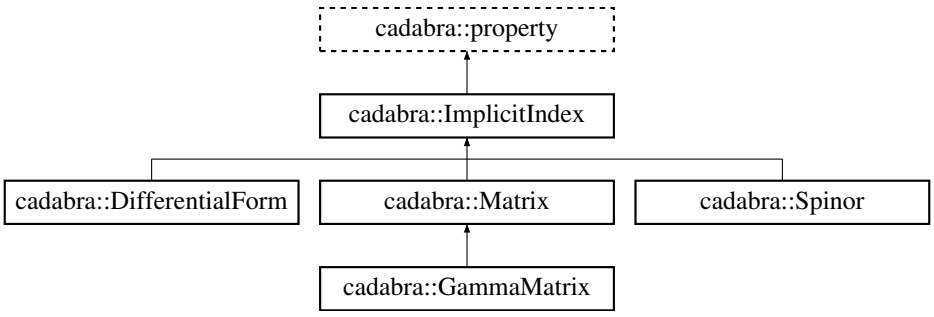
The documentation for this class was generated from the following files:

- core/properties/ImaginaryI.hh
- core/properties/ImaginaryI.cc

9.100 cadabra::ImplicitIndex Class Reference

`#include <ImplicitIndex.hh>`

Inheritance diagram for cadabra::ImplicitIndex:



Public Member Functions

- virtual bool parse (const Kernel &, keyval_t &) override
- virtual std::string name () const override
- virtual std::string unnamed_argument () const override
- virtual void latex (std::ostream &str) const override

  Display the property on the stream.

Public Attributes

- std::vector< std::string > set_names

Additional Inherited Members

9.100.1 Member Function Documentation

9.100.1.1 void ImplicitIndex::latex (std::ostream & *str*) const [override], [virtual]

Display the property on the stream.

Generate a LaTeX representation of the property, assuming LaTeX is in text mode (so it needs dollar symbols to switch to maths).

Reimplemented from cadabra::property.

Reimplemented in cadabra::GammaMatrix.

9.100.1.2 std::string ImplicitIndex::name ( ) const [override], [virtual]

Implements cadabra::property.

Reimplemented in cadabra::DifferentialForm, cadabra::Spinor, cadabra::GammaMatrix, and cadabra::Matrix.

9.100.1.3 bool ImplicitIndex::parse (const Kernel & , keyval_t & *keyvals*) [override], [virtual]

Reimplemented from cadabra::property.

Reimplemented in cadabra::DifferentialForm, cadabra::Spinor, and cadabra::GammaMatrix.

9.100.1.4 virtual std::string cadabra::ImplicitIndex::unnamed_argument ( ) const [inline], [override], [virtual]

Reimplemented from cadabra::property.

9.100.2 Member Data Documentation

9.100.2.1 std::vector<std::string> cadabra::ImplicitIndex::set_names

The documentation for this class was generated from the following files:

- core/properties/ImplicitIndex.hh
- core/properties/ImplicitIndex.cc

9.101 yngtab::filled_tableau< T >::in_column_iterator Class Reference

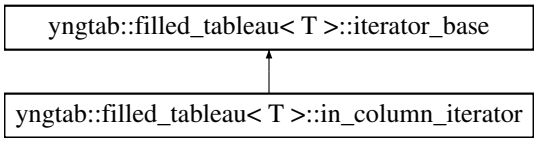
9.101.1 Description

template<class T>
class yngtab::filled_tableau< T >::in_column_iterator

An iterator which stays inside a given column of a tableau.

`#include <YoungTab.hh>`

Inheritance diagram for yngtab::filled_tableau< T >::in_column_iterator:



Public Member Functions

- in_column_iterator (unsigned int r, unsigned int c, filled_tableau< T > *)
- T & operator* () const
- T * operator-> () const
- in_column_iterator & operator++ ()
- in_column_iterator operator++ (int)
- in_column_iterator & operator-- ()
- in_column_iterator operator-- (int)
- in_column_iterator operator+ (unsigned int)
- in_column_iterator operator- (unsigned int)
- in_column_iterator & operator+= (unsigned int)
- in_column_iterator & operator-= (unsigned int)
- bool operator< (const in_column_iterator &other) const
- bool operator> (const in_column_iterator &other) const
- bool operator<= (const in_column_iterator &other) const
- bool operator>= (const in_column_iterator &other) const
- ptrdiff_t operator- (const in_column_iterator &) const
- bool operator== (const in_column_iterator &) const
- bool operator!= (const in_column_iterator &) const

Private Attributes

- filled_tableau< T > * tab
- unsigned int column_number
- unsigned int row_number

Friends

- class filled_tableau< T >

Additional Inherited Members

9.101.2 Constructor & Destructor Documentation

9.101.2.1 template<class T> **yngtab::filled_tableau< T >::in_column_iterator::in_column_iterator** (unsigned int *r,* unsigned int *c,* **filled_tableau< T > *** *t*)

9.101.3 Member Function Documentation

9.101.3.1 template<class T > bool **yngtab::filled_tableau< T >::in_column_iterator::operator!=** (const **in_column_iterator** & *other*) const

9.101.3.2 template<class T > T & **yngtab::filled_tableau< T >::in_column_iterator::operator*** ( ) const

9.101.3.3 template<class T > **filled_tableau< T >::in_column_iterator yngtab::filled_tableau< T >::in_column_iterator::operator+** (unsigned int *n*)

9.101.3.4 template<class T > **filled_tableau< T >::in_column_iterator & yngtab::filled_tableau< T >::in_column_iterator::operator++** ( )

9.101.3.5 template<class T > **filled_tableau< T >::in_column_iterator yngtab::filled_tableau< T >::in_column_iterator::operator++** (int)

9.101.3.6 template<class T > **filled_tableau< T >::in_column_iterator & yngtab::filled_tableau< T >::in_column_iterator::operator+=** (unsigned int *n*)

9.101.3.7 template<class T > **filled_tableau< T >::in_column_iterator yngtab::filled_tableau< T >::in_column_iterator::operator-** (unsigned int *n*)

9.101.3.8 template<class T > ptrdiff_t **yngtab::filled_tableau< T >::in_column_iterator::operator-** (const **in_column_iterator** & *other*) const

9.101.3.9 template<class T > **filled_tableau< T >::in_column_iterator & yngtab::filled_tableau< T >::in_column_iterator::operator--** ( )

9.101.3.10 template<class T > **filled_tableau< T >::in_column_iterator yngtab::filled_tableau< T >::in_column_iterator::operator--** (int)

9.101.3.11 template<class T > filled_tableau< T >::in_column_iterator & yngtab::filled_tableau< T >::in_column_iterator::operator-= (unsigned int *n*)

9.101.3.12 template<class T > T * yngtab::filled_tableau< T >::in_column_iterator::operator-> ( ) const

9.101.3.13 template<class T > bool yngtab::filled_tableau< T >::in_column_iterator::operator< (const in_column_iterator & *other*) const

9.101.3.14 template<class T > bool yngtab::filled_tableau< T >::in_column_iterator::operator<= (const in_column_iterator & *other*) const

9.101.3.15 template<class T > bool yngtab::filled_tableau< T >::in_column_iterator::operator== (const in_column_iterator & *other*) const

9.101.3.16 template<class T > bool yngtab::filled_tableau< T >::in_column_iterator::operator> (const in_column_iterator & *other*) const

9.101.3.17 template<class T > bool yngtab::filled_tableau< T >::in_column_iterator::operator>= (const in_column_iterator & *other*) const

9.101.4 Friends And Related Function Documentation

9.101.4.1 template<class T> friend class filled_tableau< T > [friend]

9.101.5 Member Data Documentation

9.101.5.1 template<class T> unsigned int yngtab::filled_tableau< T >::in_column_iterator::column_number [private]

9.101.5.2 template<class T> unsigned int yngtab::filled_tableau< T >::in_column_iterator::row_number [private]

9.101.5.3 template<class T> filled_tableau<T>* yngtab::filled_tableau< T >::in_column_iterator::tab [private]

The documentation for this class was generated from the following file:

- core/YoungTab.hh

9.102 cadabra::index_iterator Class Reference

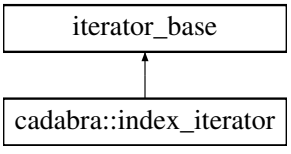
9.102.1 Description

An iterator which iterates over indices even if they are at lower levels, i.e.

taking into account the "Inherit" property of nodes. Needs access to Properties in the current scope in order to determine which objects are indices.

`#include <IndexIterator.hh>`

Inheritance diagram for cadabra::index_iterator:



Public Member Functions

- index_iterator (const Properties &)
- index_iterator (const index_iterator &)
- index_iterator & operator= (const index_iterator &)
- bool operator== (const index_iterator &) const
- bool operator!= (const index_iterator &) const
- index_iterator & operator++ ()
- index_iterator operator++ (int)
- index_iterator & operator+= (unsigned int)

Static Public Member Functions

- static index_iterator create (const Properties &, const iterator_base &)
- static index_iterator begin (const Properties &, const iterator_base &, int offset=0)
- static index_iterator end (const Properties &, const iterator_base &)

Public Attributes

- Ex::iterator halt
- Ex::iterator walk
- Ex::iterator roof

Private Member Functions

- bool is_index (Ex::iterator) const

Private Attributes

- const Properties * properties

9.102.2 Constructor & Destructor Documentation

9.102.2.1 index_iterator::index_iterator (const Properties & *k*)

9.102.2.2 index_iterator::index_iterator (const index_iterator & *other*)

9.102.3 Member Function Documentation

9.102.3.1 index_iterator index_iterator::begin (const Properties & *properties,* const iterator_base & *it,* int *offset* = `0`) `[static]`

9.102.3.2 index_iterator index_iterator::create (const Properties & *k,* const iterator_base & *other*) `[static]`

9.102.3.3 index_iterator index_iterator::end (const Properties & *properties,* const iterator_base & *it*) `[static]`

9.102.3.4 bool cadabra::index_iterator::is_index (Ex::iterator) const [private]

9.102.3.5 bool index_iterator::operator!= (const index_iterator & *other*) const

9.102.3.6 index_iterator & index_iterator::operator++ ( )

9.102.3.7 index_iterator cadabra::index_iterator::operator++ (int)

9.102.3.8 index_iterator & index_iterator::operator+= (unsigned int *num*)

9.102.3.9 index_iterator & index_iterator::operator= (const index_iterator & *other*)

9.102.3.10 bool index_iterator::operator== (const index_iterator & *other*) const

9.102.4 Member Data Documentation

9.102.4.1 Ex::iterator cadabra::index_iterator::halt

9.102.4.2 const Properties* cadabra::index_iterator::properties [private]

9.102.4.3 Ex::iterator cadabra::index_iterator::roof

9.102.4.4 Ex::iterator cadabra::index_iterator::walk

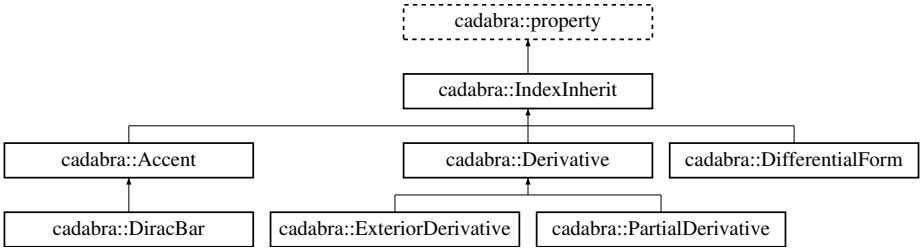
The documentation for this class was generated from the following files:

- core/IndexIterator.hh
- core/IndexIterator.cc

9.103 cadabra::IndexInherit Class Reference

`#include <IndexInherit.hh>`

Inheritance diagram for cadabra::IndexInherit:



Public Member Functions

- virtual std::string name () const

Additional Inherited Members

9.103.1 Member Function Documentation

9.103.1.1 virtual std::string cadabra::IndexInherit::name ( ) const [inline], [virtual]

Implements cadabra::property.

Reimplemented in cadabra::Accent, cadabra::Derivative, cadabra::DifferentialForm, cadabra::ExteriorDerivative, cadabra::DiracBar, and cadabra::PartialDerivative.

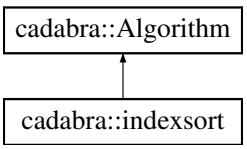
The documentation for this class was generated from the following file:

- core/properties/IndexInherit.hh

9.104 cadabra::indexsort Class Reference

`#include <indexsort.hh>`

Inheritance diagram for cadabra::indexsort:



Classes

- class less_indexed_treenode

Public Member Functions

- indexsort (const Kernel &, Ex &)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Private Attributes

- const TableauBase * tb

Additional Inherited Members

9.104.1 Constructor & Destructor Documentation

9.104.1.1 indexsort::indexsort (const Kernel & *k*, Ex & *tr*)

9.104.2 Member Function Documentation

9.104.2.1 Algorithm::result_t indexsort::apply (iterator & *st*) [virtual]

Implements cadabra::Algorithm.

9.104.2.2 bool indexsort::can_apply (iterator *st*) [virtual]

Implements cadabra::Algorithm.

9.104.3 Member Data Documentation

9.104.3.1 const TableauBase* cadabra::indexsort::tb [private]

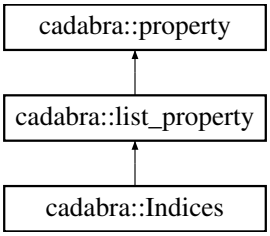
The documentation for this class was generated from the following files:

- core/algorithms/indexsort.hh
- core/algorithms/indexsort.cc

9.105 cadabra::Indices Class Reference

`#include <Indices.hh>`

Inheritance diagram for cadabra::Indices:



Public Types

- enum position_t { free, fixed, independent }

Public Member Functions

- Indices ()
- virtual bool parse (const Kernel &, keyval_t &) override
- virtual std::string name () const override
- virtual std::string unnamed_argument () const override
- virtual match_t equals (const property *) const override
- virtual void latex (std::ostream &) const override

  Display the property on the stream.

Public Attributes

- std::string set_name
- std::string parent_name
- enum cadabra::Indices::position_t position_type
- std::vector< Ex > values

Private Member Functions

- void collect_index_values (Ex::iterator ind_values)

  Given the right-hand side of a 'values={...}' node, generate a list of all index values in index_values.

9.105.1 Member Enumeration Documentation

9.105.1.1 enum cadabra::Indices::position_t

Enumerator

free

fixed

independent

9.105.2 Constructor & Destructor Documentation

9.105.2.1 Indices::Indices ( )

9.105.3 Member Function Documentation

9.105.3.1 void Indices::collect_index_values (Ex::iterator *ind_values*) [private]

Given the right-hand side of a 'values={...}' node, generate a list of all index values in index_values.

9.105.3.2 property::match_t Indices::equals (const property * *other*) const [override], [virtual]

Reimplemented from cadabra::property.

9.105.3.3 void Indices::latex (std::ostream & *str*) const [override], [virtual]

Display the property on the stream.

Generate a LaTeX representation of the property, assuming LaTeX is in text mode (so it needs dollar symbols to switch to maths).

Reimplemented from cadabra::property.

9.105.3.4 std::string Indices::name ( ) const [override], [virtual]

Implements cadabra::property.

9.105.3.5 bool Indices::parse (const Kernel & , keyval_t & *keyvals*) [override], [virtual]

Reimplemented from cadabra::property.

9.105.3.6 virtual std::string cadabra::Indices::unnamed_argument ( ) const [inline], [override], [virtual]

Reimplemented from cadabra::property.

9.105.4 Member Data Documentation

9.105.4.1 std::string cadabra::Indices::parent_name

9.105.4.2 enum cadabra::Indices::position_t cadabra::Indices::position_type

9.105.4.3 std::string cadabra::Indices::set_name

9.105.4.4 std::vector<Ex> cadabra::Indices::values

The documentation for this class was generated from the following files:

- core/properties/Indices.hh
- core/properties/Indices.cc

9.106 cadabra::Inherit< T > Class Template Reference

9.106.1 Description

template<class T>
class cadabra::Inherit< T >

If a property X derives from Inherit<Y>, and get<Y> is called on an object which has an X property (but no Y property), then the get<Y> will look at the non-index child of the object to see if that has a Y property.

FIXME: need to decided what to do if there are more non-index children.

```
#include <Props.hh>
```

Public Member Functions

- virtual ~Inherit ()
- virtual std::string name () const

9.106.2 Constructor & Destructor Documentation

9.106.2.1 template<class T> virtual cadabra::Inherit< T >::~Inherit ( ) [inline], [virtual]

9.106.3 Member Function Documentation

9.106.3.1 template<class T> virtual std::string cadabra::Inherit< T >::name ( ) const [inline], [virtual]

Reimplemented in cadabra::Derivative, cadabra::ExteriorDerivative, and cadabra::PartialDerivative.

The documentation for this class was generated from the following file:

- core/Props.hh

9.107 cadabra::Integer Class Reference

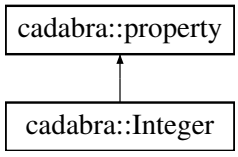
9.107.1 Description

Property indicating that a symbolic object always takes integer values.

Optionally takes a range over which it runs, which can be symbolic.

`#include <Integer.hh>`

Inheritance diagram for cadabra::Integer:



Public Member Functions

- virtual ~Integer ()
- virtual std::string name () const override
- virtual bool parse (const Kernel &, keyval_t &keyvals) override
- virtual void display (std::ostream &) const
- virtual std::string unnamed_argument () const override

Public Attributes

- Ex from
- Ex to
- Ex difference

Additional Inherited Members

9.107.2 Constructor & Destructor Documentation

9.107.2.1 virtual cadabra::Integer::~Integer ( ) [inline], [virtual]

9.107.3 Member Function Documentation

9.107.3.1 void Integer::display (std::ostream & *str*) const [virtual]

9.107.3.2 std::string Integer::name ( ) const [override], [virtual]

Implements cadabra::property.

9.107.3.3 bool Integer::parse (const Kernel & *kernel,* keyval_t & *keyvals*) [override], [virtual]

Reimplemented from cadabra::property.

9.107.3.4 virtual std::string cadabra::Integer::unnamed_argument ( ) const [inline], [override], [virtual]

Reimplemented from cadabra::property.

9.107.4 Member Data Documentation

9.107.4.1 Ex cadabra::Integer::difference

9.107.4.2 Ex cadabra::Integer::from

9.107.4.3 Ex cadabra::Integer::to

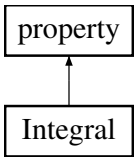
The documentation for this class was generated from the following files:

- core/properties/Integer.hh
- core/properties/Integer.cc

9.108 Integral Class Reference

`#include <Integral.hh>`

Inheritance diagram for Integral:



Public Member Functions

- virtual ~Integral ()
- virtual std::string name () const
- virtual bool parse (const Properties &, keyval_t &keyvals) override
- virtual void display (std::ostream &) const

9.108.1 Constructor & Destructor Documentation

9.108.1.1 virtual Integral::~Integral ( ) [inline], [virtual]

9.108.2 Member Function Documentation

9.108.2.1 virtual void Integral::display (std::ostream &) const [virtual]

9.108.2.2 virtual std::string Integral::name ( ) const [virtual]

9.108.2.3 virtual bool Integral::parse (const Properties & , keyval_t & *keyvals*) [override], [virtual]

The documentation for this class was generated from the following file:

- core/properties/Integral.hh

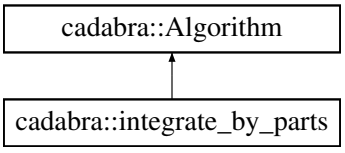
9.109 cadabra::integrate_by_parts Class Reference

9.109.1 Description

Integrate by parts away from the indicated derivative object.

`#include <integrate_by_parts.hh>`

Inheritance diagram for cadabra::integrate_by_parts:



Public Member Functions

- integrate_by_parts (const Kernel &, Ex &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Private Member Functions

- result_t handle_term (iterator, iterator &)
- bool int_and_derivative_related (iterator int_it, iterator der_it) const
- Ex wrap (iterator, sibling_iterator, sibling_iterator) const
- bool derivative_acting_on_arg (iterator der_it) const

Private Attributes

- Ex away_from

Additional Inherited Members

9.109.2 Constructor & Destructor Documentation

9.109.2.1 integrate_by_parts::integrate_by_parts (const Kernel & *k,* Ex & *tr,* Ex & *af*)

9.109.3 Member Function Documentation

9.109.3.1 Algorithm::result_t integrate_by_parts::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.109.3.2 bool integrate_by_parts::can_apply (iterator *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.109.3.3 bool integrate_by_parts::derivative_acting_on_arg (iterator *der_it*) const [private]

9.109.3.4 Algorithm::result_t integrate_by_parts::handle_term (iterator *int_it,* iterator & *it*) [private]

9.109.3.5 bool integrate_by_parts::int_and_derivative_related (iterator *int_it,* iterator *der_it*) const [private]

9.109.3.6 Ex integrate_by_parts::wrap (iterator *prod,* sibling_iterator *from,* sibling_iterator *to*) const [private]

9.109.4 Member Data Documentation

9.109.4.1 Ex cadabra::integrate_by_parts::away_from [private]

The documentation for this class was generated from the following files:

- core/algorithms/integrate_by_parts.hh
- core/algorithms/integrate_by_parts.cc

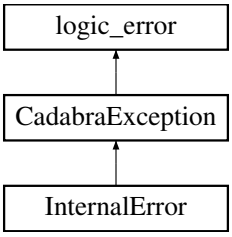
9.110 InternalError Class Reference

9.110.1 Description

Exception thrown when there the Cadabra code detects an internal inconsistency; this should never happen, but is better than bailing out with an assert.

`#include <Exceptions.hh>`

Inheritance diagram for InternalError:



Public Member Functions

- InternalError (std::string="")
- std::string py_what () const

9.110.2 Constructor & Destructor Documentation

9.110.2.1 InternalError::InternalError (std::string *s* = " ")

9.110.3 Member Function Documentation

9.110.3.1 std::string InternalError::py_what ( ) const

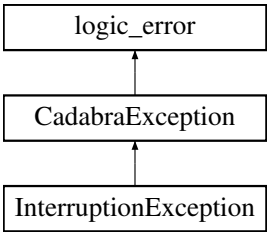
The documentation for this class was generated from the following files:

- core/Exceptions.hh
- core/Exceptions.cc

9.111 InterruptionException Class Reference

`#include <Exceptions.hh>`

Inheritance diagram for InterruptionException:



Public Member Functions

- InterruptionException (std::string="")

9.111.1 Constructor & Destructor Documentation

9.111.1.1 InterruptionException::InterruptionException (std::string *s* = " ")

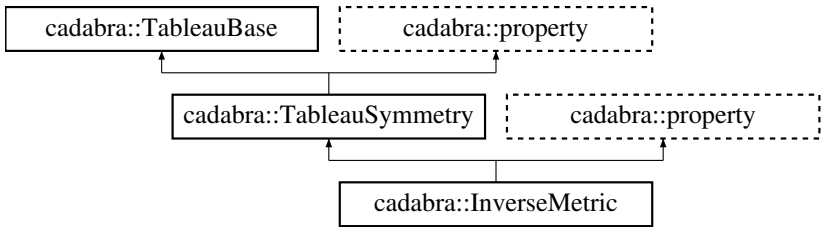
The documentation for this class was generated from the following files:

- core/Exceptions.hh
- core/Exceptions.cc

9.112 cadabra::InverseMetric Class Reference

`#include <InverseMetric.hh>`

Inheritance diagram for cadabra::InverseMetric:



Public Member Functions

- InverseMetric ()
- virtual std::string name () const override
- virtual bool parse (const Kernel &, keyval_t &) override
- virtual void validate (const Kernel &, const Ex &) const override

Public Attributes

- int signature

Additional Inherited Members

9.112.1 Constructor & Destructor Documentation

9.112.1.1 InverseMetric::InverseMetric ( )

9.112.2 Member Function Documentation

9.112.2.1 std::string InverseMetric::name ( ) const [override], [virtual]

Implements cadabra::property.

9.112.2.2 bool InverseMetric::parse (const Kernel & , keyval_t & *keyvals*) [override], [virtual]

Reimplemented from cadabra::property.

9.112.2.3 void InverseMetric::validate (const Kernel & , const Ex & *tr*) const [override], [virtual]

Reimplemented from cadabra::property.

9.112.3 Member Data Documentation

9.112.3.1 int cadabra::InverseMetric::signature

The documentation for this class was generated from the following files:

- core/properties/InverseMetric.hh
- core/properties/InverseMetric.cc

9.113 iterable_converter Class Reference

Public Member Functions

- template<typename Container >
  iterable_converter & from_python ()

Static Public Member Functions

- static void * convertible (PyObject *object)
- template<typename Container >
  static void construct (PyObject *object, boost::python::converter::rvalue_from_python_stage1_data *data)

9.113.1 Member Function Documentation

9.113.1.1 template<typename Container > static void iterable_converter::construct (PyObject * *object*, boost::python::converter::rvalue_from_python_stage1_data * *data*) [inline], [static]

9.113.1.2 static void* iterable_converter::convertible (PyObject * *object*) [inline], [static]

9.113.1.3 template<typename Container > iterable_converter& iterable_converter::from_python ( ) [inline]

The documentation for this class was generated from the following file:

- core/PythonCdb.cc

9.114 yngtab::filled_tableau< T >::iterator Class Reference

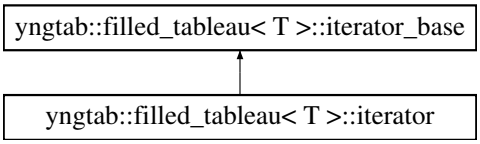
9.114.1 Description

template<class T>
class yngtab::filled_tableau< T >::iterator

An iterator over all boxes of a tableau, left to right, top to bottom.

`#include <YoungTab.hh>`

Inheritance diagram for yngtab::filled_tableau< T >::iterator:



Public Member Functions

- iterator (unsigned int r, unsigned int c, filled_tableau< T > *)
- T & operator* () const
- T * operator-> () const
- iterator & operator++ ()
- iterator operator++ (int)
- iterator & operator-- ()
- iterator operator-- (int)
- iterator operator+ (unsigned int)
- iterator operator- (unsigned int)
- iterator & operator+= (unsigned int)
- iterator & operator-= (unsigned int)
- bool operator< (const iterator &other) const
- bool operator> (const iterator &other) const
- ptrdiff_t operator- (const iterator &) const
- bool operator== (const iterator &) const
- bool operator!= (const iterator &) const

Private Attributes

- filled_tableau< T > * tab
- unsigned int column_number
- unsigned int row_number

Friends

- class filled_tableau< T >

Additional Inherited Members

9.114.2 Constructor & Destructor Documentation

9.114.2.1 template<class T> yngtab::filled_tableau< T >::iterator::iterator (unsigned int *r*, unsigned int *c*, filled_tableau< T > * *t*)

9.114.3 Member Function Documentation

9.114.3.1 template<class T > bool yngtab::filled_tableau< T >::iterator::operator!= (const iterator & *other*) const

9.114.3.2 template<class T > T & yngtab::filled_tableau< T >::iterator::operator* ( ) const

9.114.3.3 template<class T > filled_tableau< T >::iterator yngtab::filled_tableau< T >::iterator::operator+ (unsigned int *n*)

9.114.3.4 template<class T > filled_tableau< T >::iterator & yngtab::filled_tableau< T >::iterator::operator++ ( )

9.114.3.5 template<class T > filled_tableau< T >::iterator yngtab::filled_tableau< T >::iterator::operator++ (int)

9.114.3.6 template<class T > filled_tableau< T >::iterator & yngtab::filled_tableau< T >::iterator::operator+= (unsigned int *n*)

9.114.3.7 template<class T > filled_tableau< T >::iterator yngtab::filled_tableau< T >::iterator::operator- (unsigned int *n*)

9.114.3.8 template<class T > ptrdiff_t yngtab::filled_tableau< T >::iterator::operator- (const iterator & *other*) const

9.114.3.9 template<class T > filled_tableau< T >::iterator & yngtab::filled_tableau< T >::iterator::operator-- ( )

9.114.3.10 template<class T > filled_tableau< T >::iterator yngtab::filled_tableau< T >::iterator::operator-- (int)

9.114.3.11 template<class T > filled_tableau< T >::iterator & yngtab::filled_tableau< T >::iterator::operator-= (unsigned int *n*)

9.114.3.12 template<class T > T * yngtab::filled_tableau< T >::iterator::operator-> ( ) const

9.114.3.13 template<class T > bool yngtab::filled_tableau< T >::iterator::operator< (const iterator & *other*) const

9.114.3.14 template<class T > bool yngtab::filled_tableau< T >::iterator::operator== (const iterator & *other*) const

9.114.3.15 template<class T > bool yngtab::filled_tableau< T >::iterator::operator> (const iterator & *other*) const

9.114.4 Friends And Related Function Documentation

9.114.4.1 template<class T> friend class filled_tableau< T > [friend]

9.114.5 Member Data Documentation

9.114.5.1 template<class T> unsigned int yngtab::filled_tableau< T >::iterator::column_number [private]

9.114.5.2 template<class T> unsigned int yngtab::filled_tableau< T >::iterator::row_number [private]

9.114.5.3 template<class T> filled_tableau<T>* yngtab::filled_tableau< T >::iterator::tab [private]

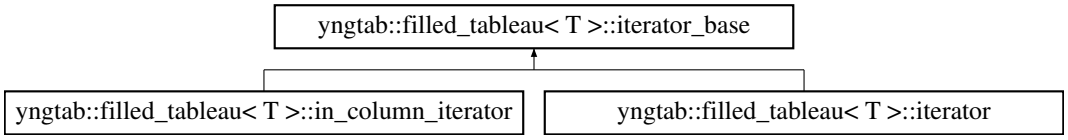
The documentation for this class was generated from the following file:

- core/YoungTab.hh

9.115 yngtab::filled_tableau< T >::iterator_base Class Reference

`#include <YoungTab.hh>`

Inheritance diagram for yngtab::filled_tableau< T >::iterator_base:



Public Types

- typedef T value_type
- typedef T * pointer
- typedef T & reference
- typedef size_t size_type
- typedef ptrdiff_t difference_type
- typedef std::random_access_iterator_tag iterator_category

9.115.1 Member Typedef Documentation

9.115.1.1 template<class T> typedef ptrdiff_t yngtab::filled_tableau< T >::iterator_base::difference_type

9.115.1.2 template<class T> typedef std::random_access_iterator_tag yngtab::filled_tableau< T >::iterator_base::iterator_category

9.115.1.3 template<class T> typedef T* yngtab::filled_tableau< T >::iterator_base::pointer

9.115.1.4 template<class T> typedef T& yngtab::filled_tableau< T >::iterator_base::reference

9.115.1.5 template<class T> typedef size_t yngtab::filled_tableau< T >::iterator_base::size_type

9.115.1.6 template<class T> typedef T yngtab::filled_tableau< T >::iterator_base::value_type

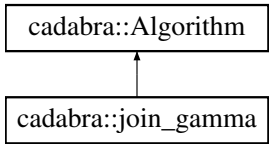
The documentation for this class was generated from the following file:

- core/YoungTab.hh

9.116 cadabra::join_gamma Class Reference

`#include <join_gamma.hh>`

Inheritance diagram for cadabra::join_gamma:



Public Member Functions

- join_gamma (const Kernel &, Ex &, bool expand, bool use_gendelta)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Public Attributes

- bool expand
- std::vector< int > only_expand
- const GammaMatrix * gm1
- const GammaMatrix * gm2

Private Member Functions

- void regroup_indices_ (sibling_iterator, sibling_iterator, unsigned int, std::vector< Ex > &, std::vector< Ex > &)
- void append_prod_ (const std::vector< Ex > &r1, const std::vector< Ex > &r2, unsigned int num1, unsigned int num2, unsigned int i, multiplier_t mult, Ex &rep, iterator loc)

Private Attributes

- bool use_generalised_delta_
- Ex::iterator gamma_name_
- str_node::bracket_t gamma_bracket_

Additional Inherited Members

9.116.1 Constructor & Destructor Documentation

9.116.1.1 join_gamma::join_gamma (const Kernel & *kernel,* Ex & *tr_,* bool *expand,* bool *use_gendelta*)

9.116.2 Member Function Documentation

9.116.2.1 void join_gamma::append_prod_ (const std::vector< Ex > & *r1,* const std::vector< Ex > & *r2,* unsigned int *num1,* unsigned int *num2,* unsigned int *i,* multiplier_t *mult,* Ex & *rep,* iterator *loc*) [private]

9.116.2.2 Algorithm::result_t join_gamma::apply (iterator & *st*) [virtual]

Implements cadabra::Algorithm.

9.116.2.3 bool join_gamma::can_apply (iterator *st*) [virtual]

Implements cadabra::Algorithm.

9.116.2.4 void join_gamma::regroup_indices_ (sibling_iterator *gam1*, sibling_iterator *gam2*, unsigned int *i*, std::vector< Ex > & *r1*, std::vector< Ex > & *r2*) [private]

9.116.3 Member Data Documentation

9.116.3.1 bool cadabra::join_gamma::expand

9.116.3.2 str_node::bracket_t cadabra::join_gamma::gamma_bracket_ [private]

9.116.3.3 Ex::iterator cadabra::join_gamma::gamma_name_ [private]

9.116.3.4 const GammaMatrix* cadabra::join_gamma::gm1

9.116.3.5 const GammaMatrix * cadabra::join_gamma::gm2

9.116.3.6 std::vector<int> cadabra::join_gamma::only_expand

9.116.3.7 bool cadabra::join_gamma::use_generalised_delta_ [private]

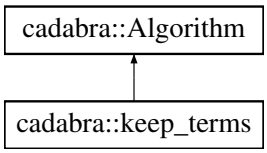
The documentation for this class was generated from the following files:

- core/algorithms/join_gamma.hh
- core/algorithms/join_gamma.cc

9.117 cadabra::keep_terms Class Reference

`#include <keep_terms.hh>`

Inheritance diagram for cadabra::keep_terms:



Public Member Functions

- keep_terms (const Kernel &, Ex &, std::vector< int > terms)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Private Attributes

- std::vector< int > terms_

Additional Inherited Members

9.117.1 Constructor & Destructor Documentation

9.117.1.1 keep_terms::keep_terms (const Kernel & *k,* Ex & *tr,* std::vector< int > *terms*)

9.117.2 Member Function Documentation

9.117.2.1 Algorithm::result_t keep_terms::apply (iterator & *it*) [virtual]

Implements cadabra::Algorithm.

9.117.2.2 bool keep_terms::can_apply (iterator *it*) [virtual]

Implements cadabra::Algorithm.

9.117.3 Member Data Documentation

9.117.3.1 std::vector<int> cadabra::keep_terms::terms_ [private]

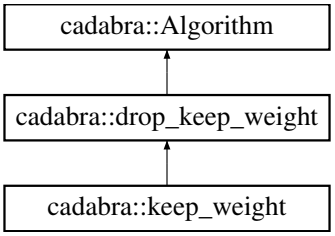
The documentation for this class was generated from the following files:

- core/algorithms/keep_terms.hh
- core/algorithms/keep_terms.cc

9.118 cadabra::keep_weight Class Reference

`#include <drop_weight.hh>`

Inheritance diagram for cadabra::keep_weight:



Public Member Functions

- keep_weight (const Kernel &, Ex &, Ex &)
- virtual result_t apply (iterator &) override

Additional Inherited Members

9.118.1 Constructor & Destructor Documentation

9.118.1.1 keep_weight::keep_weight (const Kernel & *k*, Ex & *e*, Ex & *a*)

9.118.2 Member Function Documentation

9.118.2.1 Algorithm::result_t keep_weight::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

The documentation for this class was generated from the following files:

- core/algorithms/drop_weight.hh
- core/algorithms/drop_weight.cc

9.119 cadabra::Kernel Class Reference

`#include <Kernel.hh>`

Public Member Functions

- Kernel ()
- Kernel (const Kernel &other)=delete
- ~Kernel ()
- void inject_property (property *prop, std::shared_ptr< Ex > pattern, std::shared_ptr< Ex > property_↩ arguments)

  Inject a property into the system and attach it to the given pattern.
- std::shared_ptr< Ex > ex_from_string (const std::string &)

  Create an Ex expression object from a string, which will be parsed.

Public Attributes

- Properties properties

9.119.1 Constructor & Destructor Documentation

9.119.1.1 Kernel::Kernel ( )

9.119.1.2 cadabra::Kernel::Kernel (const Kernel & *other*) [delete]

9.119.1.3 Kernel::~Kernel ( )

9.119.2 Member Function Documentation

9.119.2.1 std::shared_ptr< cadabra::Ex > Kernel::ex_from_string (const std::string & *s*)

Create an Ex expression object from a string, which will be parsed.

9.119.2.2 void Kernel::inject_property (property * *prop*, std::shared_ptr< Ex > *pattern*, std::shared_ptr< Ex > *property_arguments*)

Inject a property into the system and attach it to the given pattern.

9.119.3 Member Data Documentation

9.119.3.1 Properties cadabra::Kernel::properties

The documentation for this class was generated from the following files:

- core/Kernel.hh
- core/Kernel.cc

9.120 cadabra::keyval_t Class Reference

9.120.1 Description

Arguments to properties get parsed into a keyval_t structure.

```
#include <Props.hh>
```

Public Types

- typedef std::pair< std::string, Ex::iterator > kvpair_t
- typedef std::list< kvpair_t > kvlist_t
- typedef kvlist_t::const_iterator const_iterator
- typedef kvlist_t::iterator iterator
- typedef kvpair_t value_type

Public Member Functions

- const_iterator find (const std::string &) const
- iterator find (const std::string &)
- const_iterator begin () const
- const_iterator end () const
- void push_back (const kvpair_t &)
- void erase (iterator)

Private Attributes

- kvlist_t keyvals

9.120.2 Member Typedef Documentation

9.120.2.1 typedef kvlist_t::const_iterator cadabra::keyval_t::const_iterator

9.120.2.2 typedef kvlist_t::iterator cadabra::keyval_t::iterator

9.120.2.3 typedef std::list<kvpair_t> cadabra::keyval_t::kvlist_t

9.120.2.4 typedef std::pair<std::string, Ex::iterator> cadabra::keyval_t::kvpair_t

9.120.2.5 typedef kvpair_t cadabra::keyval_t::value_type

9.120.3 Member Function Documentation

9.120.3.1 keyval_t::const_iterator keyval_t::begin ( ) const

9.120.3.2 keyval_t::const_iterator keyval_t::end ( ) const

9.120.3.3 void keyval_t::erase (iterator *it*)

9.120.3.4 keyval_t::const_iterator keyval_t::find (const std::string & *key*) const

9.120.3.5 keyval_t::iterator keyval_t::find (const std::string & *key*)

9.120.3.6 void keyval_t::push_back (const kvpair_t & *kv*)

9.120.4 Member Data Documentation

9.120.4.1 kvlist_t cadabra::keyval_t::keyvals [private]

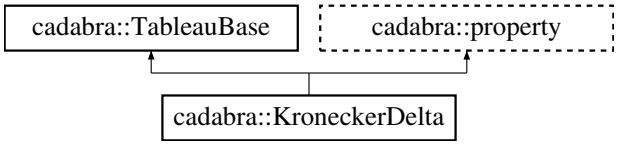
The documentation for this class was generated from the following files:

- core/Props.hh
- core/Props.cc

9.121 cadabra::KroneckerDelta Class Reference

`#include <KroneckerDelta.hh>`

Inheritance diagram for cadabra::KroneckerDelta:



Public Member Functions

- virtual ~KroneckerDelta ()
- virtual std::string name () const
- virtual unsigned int size (const Properties &, Ex &, Ex::iterator) const
- virtual tab_t get_tab (const Properties &, Ex &, Ex::iterator, unsigned int) const

Additional Inherited Members

9.121.1 Constructor & Destructor Documentation

9.121.1.1 virtual cadabra::KroneckerDelta::~KroneckerDelta ( ) [inline], [virtual]

9.121.2 Member Function Documentation

9.121.2.1 TableauBase::tab_t KroneckerDelta::get_tab (const Properties & *properties,* Ex & *tr,* Ex::iterator *it,* unsigned int *num*) const [virtual]

Implements cadabra::TableauBase.

9.121.2.2 std::string KroneckerDelta::name ( ) const [virtual]

Implements cadabra::property.

9.121.2.3 unsigned int KroneckerDelta::size (const Properties & , Ex & , Ex::iterator) const [virtual]

Implements cadabra::TableauBase.

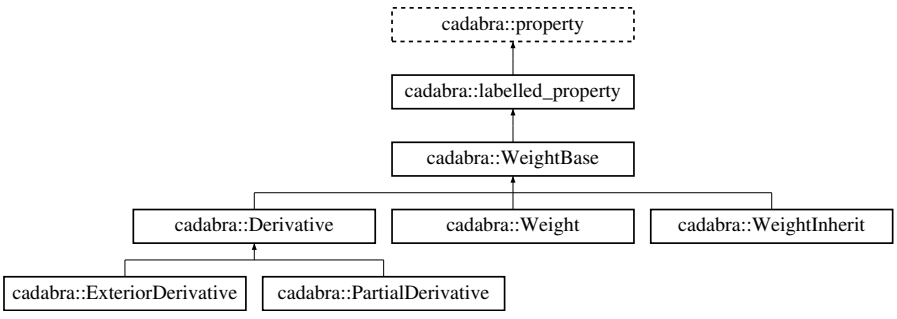
The documentation for this class was generated from the following files:

- core/properties/KroneckerDelta.hh
- core/properties/KroneckerDelta.cc

9.122 cadabra::labelled_property Class Reference

`#include <Props.hh>`

Inheritance diagram for cadabra::labelled_property:



Public Member Functions

- virtual bool parse (const Kernel &, keyval_t &) override

Public Attributes

- std::string label

Additional Inherited Members

9.122.1 Member Function Documentation

9.122.1.1 bool labelled_property::parse (const Kernel & , keyval_t & *keyvals*) [override], [virtual]

Reimplemented from cadabra::property.

Reimplemented in cadabra::WeightInherit, and cadabra::Weight.

9.122.2 Member Data Documentation

9.122.2.1 std::string cadabra::labelled_property::label

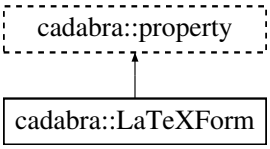
The documentation for this class was generated from the following files:

- core/Props.hh
- core/Props.cc

9.123 cadabra::LaTeXForm Class Reference

`#include <LaTeXForm.hh>`

Inheritance diagram for cadabra::LaTeXForm:



Public Member Functions

- virtual std::string name () const override
- virtual bool parse (const Kernel &, keyval_t &) override
- virtual std::string unnamed_argument () const override
- std::string latex_form () const

Private Attributes

- std::string latex_

Additional Inherited Members

9.123.1 Member Function Documentation

9.123.1.1 std::string LaTeXForm::latex_form ( ) const

9.123.1.2 std::string LaTeXForm::name ( ) const [override], [virtual]

Implements cadabra::property.

9.123.1.3 bool LaTeXForm::parse (const Kernel & , keyval_t & *keyvals*) [override], [virtual]

Reimplemented from cadabra::property.

9.123.1.4 std::string LaTeXForm::unnamed_argument ( ) const [override], [virtual]

Reimplemented from cadabra::property.

9.123.2 Member Data Documentation

9.123.2.1 std::string cadabra::LaTeXForm::latex_ [private]

The documentation for this class was generated from the following files:

- core/properties/LaTeXForm.hh
- core/properties/LaTeXForm.cc

9.124 cadabra::indexsort::less_indexed_treenode Class Reference

`#include <indexsort.hh>`

Public Member Functions

- less_indexed_treenode (const Kernel &, Ex &, iterator it)
- bool operator() (unsigned int, unsigned int) const

Private Attributes

- const Kernel & kernel
- Ex & tr
- Ex::iterator it

9.124.1 Constructor & Destructor Documentation

9.124.1.1 indexsort::less_indexed_treenode::less_indexed_treenode (const Kernel & *k*, Ex & *t*, iterator *it*)

9.124.2 Member Function Documentation

9.124.2.1 bool indexsort::less_indexed_treenode::operator() (unsigned int *i1*, unsigned int *i2*) const

9.124.3 Member Data Documentation

9.124.3.1 Ex::iterator cadabra::indexsort::less_indexed_treenode::it [private]

9.124.3.2 const Kernel& cadabra::indexsort::less_indexed_treenode::kernel [private]

9.124.3.3 Ex& cadabra::indexsort::less_indexed_treenode::tr [private]

The documentation for this class was generated from the following files:

- core/algorithms/indexsort.hh
- core/algorithms/indexsort.cc

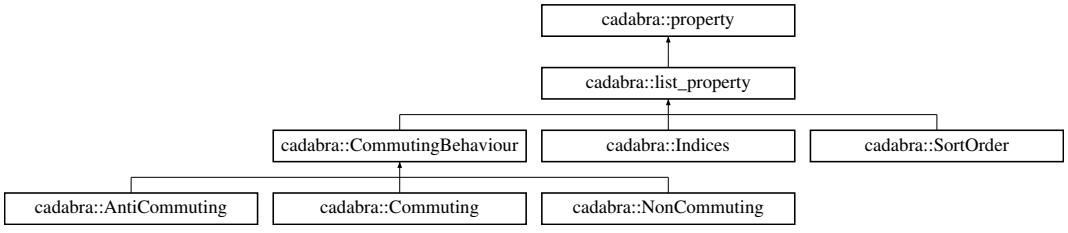
9.125 cadabra::list_property Class Reference

9.125.1 Description

Something cannot be both a list property and a normal property at the same time, so we can safely inherit without virtual.

```
#include <Props.hh>
```

Inheritance diagram for cadabra::list_property:



Additional Inherited Members

The documentation for this class was generated from the following file:

- core/Props.hh

9.126 snoop::Snoop::LogEntry Class Reference

9.126.1 Description

C++ representation of a log entry.

`#include <Snoop.hh>`

Public Member Functions

- LogEntry ()
- LogEntry (int log_id_, int client_log_id_, int id_, const std::string &, uint64_t, uint64_t, const std::string &, int, const std::string &, const std::string &, const std::string &, int status)
- std::string to_json (bool human_readable) const
- void from_json (const Json::Value &)

Public Attributes

- int log_id
- int client_log_id
- int id
- std::string uuid
- uint64_t create_millis
- uint64_t receive_millis
- std::string loc_file
- int loc_line
- std::string loc_method
- std::string type
- std::string message
- int server_status

9.126.2 Constructor & Destructor Documentation

9.126.2.1 Snoop::LogEntry::LogEntry ( )

9.126.2.2 Snoop::LogEntry::LogEntry (int *log_id_*, int *client_log_id_*, int *id_*, const std::string & *c1b*, uint64_t *c2*, uint64_t *c2b*, const std::string & *c3*, int *c4*, const std::string & *c5*, const std::string & *c6*, const std::string & *c7*, int *status*)

9.126.3 Member Function Documentation

9.126.3.1 void Snoop::LogEntry::from_json (const Json::Value & *entry*)

9.126.3.2 std::string Snoop::LogEntry::to_json (bool *human_readable*) const

9.126.4 Member Data Documentation

9.126.4.1 int snoop::Snoop::LogEntry::client_log_id

9.126.4.2 uint64_t snoop::Snoop::LogEntry::create_millis

9.126.4.3 int snoop::Snoop::LogEntry::id

9.126.4.4 std::string snoop::Snoop::LogEntry::loc_file

9.126.4.5 int snoop::Snoop::LogEntry::loc_line

9.126.4.6 std::string snoop::Snoop::LogEntry::loc_method

9.126.4.7 int snoop::Snoop::LogEntry::log_id

9.126.4.8 std::string snoop::Snoop::LogEntry::message

9.126.4.9 uint64_t snoop::Snoop::LogEntry::receive_millis

9.126.4.10 int snoop::Snoop::LogEntry::server_status

9.126.4.11 std::string snoop::Snoop::LogEntry::type

9.126.4.12 std::string snoop::Snoop::LogEntry::uuid

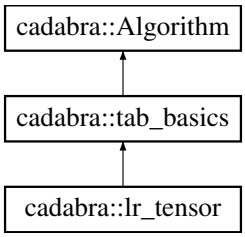
The documentation for this class was generated from the following files:

- client_server/Snoop.hh
- client_server/Snoop.cc

9.127 cadabra::lr_tensor Class Reference

`#include <lr_tensor.hh>`

Inheritance diagram for cadabra::lr_tensor:



Public Member Functions

- lr_tensor (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Public Attributes

- sibling_iterator tab1
- sibling_iterator tab2

Private Member Functions

- void do_tableau (iterator &)
- void do_filledtableau (iterator &)

Additional Inherited Members

9.127.1 Constructor & Destructor Documentation

9.127.1.1 lr_tensor::lr_tensor (const Kernel & *k,* Ex & *tr*)

9.127.2 Member Function Documentation

9.127.2.1 Algorithm::result_t lr_tensor::apply (iterator & *it*) `[override], [virtual]`

Implements cadabra::Algorithm.

9.127.2.2 bool lr_tensor::can_apply (iterator *it*) `[override], [virtual]`

Implements cadabra::Algorithm.

9.127.2.3 void lr_tensor::do_filledtableau (iterator & *it*) [private]

9.127.2.4 void lr_tensor::do_tableau (iterator & *it*) [private]

9.127.3 Member Data Documentation

9.127.3.1 sibling_iterator cadabra::lr_tensor::tab1

9.127.3.2 sibling_iterator cadabra::lr_tensor::tab2

The documentation for this class was generated from the following files:

- core/algorithms/lr_tensor.hh
- core/algorithms/lr_tensor.cc

9.128 cadabra::map_sympy Class Reference

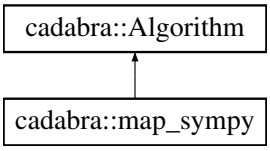
9.128.1 Description

Functionality to act with Sympy on all scalar parts of an expression, and keep the result in-place.

This is a higher-level thing than 'sympy::apply' in the SympyCdb.cc module.

```
#include <map_sympy.hh>
```

Inheritance diagram for cadabra::map_sympy:



Public Member Functions

- map_sympy (const Kernel &, Ex &, const std::string &head)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Private Attributes

- std::string head_
- std::vector< Ex::iterator > left
- std::set< Ex::iterator > index_factors

Additional Inherited Members

9.128.2 Constructor & Destructor Documentation

9.128.2.1 map_sympy::map_sympy (const Kernel & *k*, Ex & *tr*, const std::string & *head*)

9.128.3 Member Function Documentation

9.128.3.1 Algorithm::result_t map_sympy::apply (iterator & *it*) [virtual]

Implements cadabra::Algorithm.

9.128.3.2 bool map_sympy::can_apply (iterator *st*) [virtual]

Implements cadabra::Algorithm.

9.128.4 Member Data Documentation

9.128.4.1 std::string cadabra::map_sympy::head_ [private]

9.128.4.2 std::set<Ex::iterator> cadabra::map_sympy::index_factors [private]

9.128.4.3 std::vector<Ex::iterator> cadabra::map_sympy::left [private]

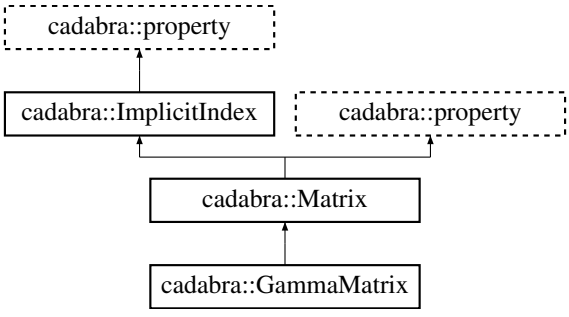
The documentation for this class was generated from the following files:

- core/algorithms/map_sympy.hh
- core/algorithms/map_sympy.cc

9.129 cadabra::Matrix Class Reference

`#include <Matrix.hh>`

Inheritance diagram for cadabra::Matrix:



Public Member Functions

- virtual ~Matrix ()
- virtual std::string name () const

Additional Inherited Members

9.129.1 Constructor & Destructor Documentation

9.129.1.1 virtual cadabra::Matrix::~Matrix ( ) [inline], [virtual]

9.129.2 Member Function Documentation

9.129.2.1 std::string Matrix::name ( ) const [virtual]

Implements cadabra::property.

Reimplemented in cadabra::GammaMatrix.

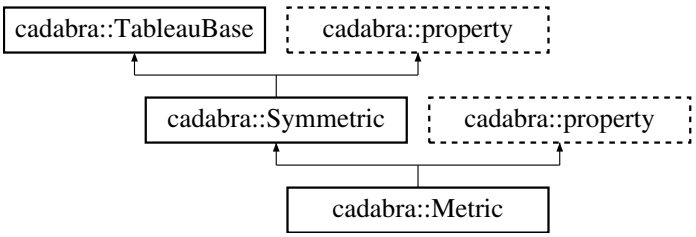
The documentation for this class was generated from the following files:

- core/properties/Matrix.hh
- core/properties/Matrix.cc

9.130 cadabra::Metric Class Reference

`#include <Metric.hh>`

Inheritance diagram for cadabra::Metric:



Public Member Functions

- Metric ()
- virtual std::string name () const override
- virtual bool parse (const Kernel &, keyval_t &) override
- virtual void validate (const Kernel &, const Ex &) const override
- virtual void latex (std::ostream &) const override

  Display the property on the stream.

Public Attributes

- int signature

Additional Inherited Members

9.130.1 Constructor & Destructor Documentation

9.130.1.1 Metric::Metric ( )

9.130.2 Member Function Documentation

9.130.2.1 void Metric::latex (std::ostream & *str*) const [override], [virtual]

Display the property on the stream.

Generate a LaTeX representation of the property, assuming LaTeX is in text mode (so it needs dollar symbols to switch to maths).

Reimplemented from cadabra::property.

9.130.2.2 std::string Metric::name ( ) const [override], [virtual]

Implements cadabra::property.

9.130.2.3 bool Metric::parse (const Kernel & , keyval_t & *keyvals*) [override], [virtual]

Reimplemented from cadabra::property.

9.130.2.4 void Metric::validate (const Kernel & , const Ex & *tr*) const [override], [virtual]

Reimplemented from cadabra::property.

9.130.3 Member Data Documentation

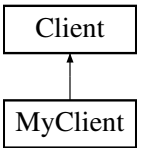
9.130.3.1 int cadabra::Metric::signature

The documentation for this class was generated from the following files:

- core/properties/Metric.hh
- core/properties/Metric.cc

9.131 MyClient Class Reference

Inheritance diagram for MyClient:



Public Member Functions

- MyClient ()
- void on_connect ()
- void on_disconnect ()
- void on_network_error ()
- void on_progress ()
- void before_tree_change (ActionBase &)
- void after_tree_change (ActionBase &)

9.131.1 Constructor & Destructor Documentation

9.131.1.1 MyClient::MyClient ( )

9.131.2 Member Function Documentation

9.131.2.1 void MyClient::after_tree_change (ActionBase & *ab*)

9.131.2.2 void MyClient::before_tree_change (ActionBase & *ab*)

9.131.2.3 void MyClient::on_connect ( )

9.131.2.4 void MyClient::on_disconnect ( )

9.131.2.5 void MyClient::on_network_error ( )

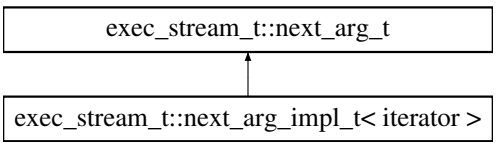
9.131.2.6 void MyClient::on_progress ( )

The documentation for this class was generated from the following file:

- client_server/test_client.cc

9.132 exec_stream_t::next_arg_impl_t< iterator > Class Template Reference

Inheritance diagram for exec_stream_t::next_arg_impl_t< iterator >:



Public Member Functions

- next_arg_impl_t (iterator args_begin, iterator args_end)
- virtual std::string const * next ()

Private Attributes

- iterator m_args_i
- iterator m_args_end
- std::string m_arg

9.132.1 Constructor & Destructor Documentation

9.132.1.1 template<class iterator> exec_stream_t::next_arg_impl_t< iterator >::next_arg_impl_t (iterator *args_begin,* iterator *args_end*) [inline]

9.132.2 Member Function Documentation

9.132.2.1 template<class iterator> virtual std::string const* exec_stream_t::next_arg_impl_t< iterator >::next ( ) [inline], [virtual]

Implements exec_stream_t::next_arg_t.

9.132.3 Member Data Documentation

9.132.3.1 template<class iterator> std::string exec_stream_t::next_arg_impl_t< iterator >::m_arg [private]

9.132.3.2 template<class iterator> iterator exec_stream_t::next_arg_impl_t< iterator >::m_args_end [private]

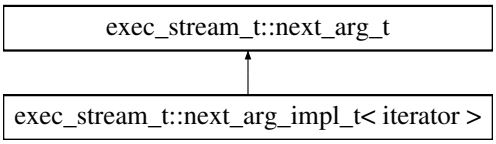
9.132.3.3 template<class iterator> iterator exec_stream_t::next_arg_impl_t< iterator >::m_args_i [private]

The documentation for this class was generated from the following file:

- frontend/common/exec-stream.h

9.133 exec_stream_t::next_arg_t Class Reference

Inheritance diagram for exec_stream_t::next_arg_t:



Public Member Functions

- virtual ~next_arg_t ()
- virtual std::string const * next ()=0

9.133.1 Constructor & Destructor Documentation

9.133.1.1 virtual exec_stream_t::next_arg_t::~next_arg_t ( ) [inline], [virtual]

9.133.2 Member Function Documentation

9.133.2.1 virtual std::string const* exec_stream_t::next_arg_t::next ( ) [pure virtual]

Implemented in exec_stream_t::next_arg_impl_t< iterator >.

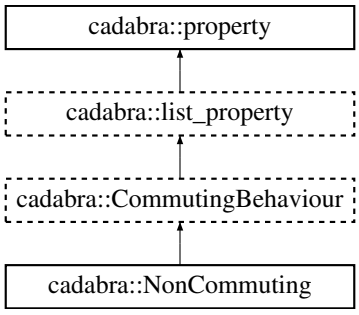
The documentation for this class was generated from the following file:

- frontend/common/exec-stream.h

9.134 cadabra::NonCommuting Class Reference

`#include <NonCommuting.hh>`

Inheritance diagram for cadabra::NonCommuting:



Public Member Functions

- virtual std::string name () const
- virtual int sign () const

Additional Inherited Members

9.134.1 Member Function Documentation

9.134.1.1 std::string NonCommuting::name ( ) const [virtual]

Implements cadabra::property.

9.134.1.2 virtual int cadabra::NonCommuting::sign ( ) const [inline], [virtual]

Implements cadabra::CommutingBehaviour.

The documentation for this class was generated from the following files:

- core/properties/NonCommuting.hh
- core/properties/NonCommuting.cc

9.135 NonScalarException Class Reference

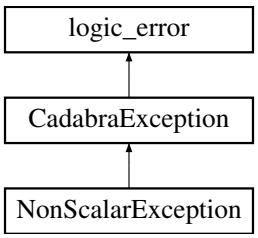
9.135.1 Description

Exception thrown when something requires that an expression is a pure scalar (i.e.

no free indices and no dummy indices), but isn't.

`#include <Exceptions.hh>`

Inheritance diagram for NonScalarException:



Public Member Functions

- NonScalarException (std::string="")
- std::string py_what () const

9.135.2 Constructor & Destructor Documentation

9.135.2.1 NonScalarException::NonScalarException (std::string *s* = " ")

9.135.3 Member Function Documentation

9.135.3.1 std::string NonScalarException::py_what ( ) const

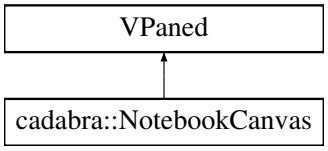
The documentation for this class was generated from the following files:

- core/Exceptions.hh
- core/Exceptions.cc

9.136 cadabra::NotebookCanvas Class Reference

`#include <NotebookCanvas.hh>`

Inheritance diagram for cadabra::NotebookCanvas:



Public Member Functions

- NotebookCanvas ()
- ~NotebookCanvas ()
- void refresh_all ()

Public Attributes

- std::map< DataCell *, VisualCell > visualcells
- Gtk::EventBox ebox
- Gtk::ScrolledWindow scroll
- Gtk::HSeparator bottomline
- std::map< DataCell *, NSTextView * > visualcells

9.136.1 Constructor & Destructor Documentation

9.136.1.1 NotebookCanvas::NotebookCanvas ( )

9.136.1.2 NotebookCanvas::~NotebookCanvas ( )

9.136.2 Member Function Documentation

9.136.2.1 void NotebookCanvas::refresh_all ( )

9.136.3 Member Data Documentation

9.136.3.1 Gtk::HSeparator cadabra::NotebookCanvas::bottomline

9.136.3.2 Gtk::EventBox cadabra::NotebookCanvas::ebox

9.136.3.3 Gtk::ScrolledWindow cadabra::NotebookCanvas::scroll

9.136.3.4 std::map<DataCell *, NSTextView *> cadabra::NotebookCanvas::visualcells

9.136.3.5 std::map<DataCell *, VisualCell> cadabra::NotebookCanvas::visualcells

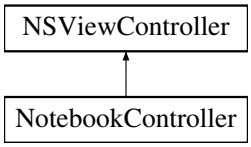
The documentation for this class was generated from the following files:

- frontend/gtkmm/NotebookCanvas.hh
- frontend/gtkmm/NotebookCanvas.cc

9.137 NotebookController Class Reference

```
#import <NotebookController.h>
```

Inheritance diagram for NotebookController:



Properties

- IBOutlet NSTextField * status_label
- IBOutlet NSScrollView * scrollbox

9.137.1 Property Documentation

9.137.1.1 - (IBOutlet NSScrollView∗) scrollbox [read], [write], [atomic], [weak]

9.137.1.2 - (IBOutlet NSTextField∗) status_label [read], [write], [atomic], [weak]

The documentation for this class was generated from the following file:

- frontend/osx/Cadabra/NotebookController.h

9.138 NotebookController() Category Reference

The documentation for this category was generated from the following file:

- frontend/osx/Cadabra/NotebookController.mm

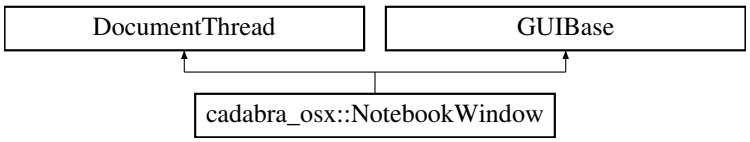
9.139 cadabra_osx::NotebookWindow Class Reference

9.139.1 Description

Objective-C++ class implementing DocumentThread and providing an OS-X notebook interface.

`#include <NotebookWindow.hh>`

Inheritance diagram for cadabra_osx::NotebookWindow:



Public Member Functions

- NotebookWindow (NotebookController ∗)
- virtual void add_cell (const DTree &, DTree::iterator, bool visible) override
- virtual void remove_cell (const DTree &, DTree::iterator) override
- virtual void update_cell (const DTree &, DTree::iterator) override
- virtual void position_cursor (const DTree &, DTree::iterator) override
- virtual void remove_all_cells () override
- virtual void on_connect () override
- virtual void on_disconnect () override
- virtual void on_network_error () override
- virtual void process_data () override

Private Attributes

- NotebookController * controller
- std::vector< NotebookCanvas * > canvasses
- int current_canvas

9.139.2 Constructor & Destructor Documentation

9.139.2.1 NotebookWindow::NotebookWindow (NotebookController * *nc*)

9.139.3 Member Function Documentation

9.139.3.1 void NotebookWindow::add_cell (const DTree & *tr,* DTree::iterator *it,* bool *visible*) [override], [virtual]

9.139.3.2 void NotebookWindow::on_connect ( ) [override], [virtual]

9.139.3.3 void NotebookWindow::on_disconnect ( ) [override], [virtual]

9.139.3.4 void NotebookWindow::on_network_error ( ) [override], [virtual]

9.139.3.5 void NotebookWindow::position_cursor (const DTree & , DTree::iterator) [override], [virtual]

9.139.3.6 void NotebookWindow::process_data ( ) [override], [virtual]

9.139.3.7 void NotebookWindow::remove_all_cells ( ) [override], [virtual]

9.139.3.8 void NotebookWindow::remove_cell (const DTree & , DTree::iterator) [override], [virtual]

9.139.3.9 void NotebookWindow::update_cell (const DTree & , DTree::iterator) [override], [virtual]

9.139.4 Member Data Documentation

9.139.4.1 std::vector<NotebookCanvas *> cadabra_osx::NotebookWindow::canvasses [private]

9.139.4.2 NotebookController* cadabra_osx::NotebookWindow::controller [private]

9.139.4.3 int cadabra_osx::NotebookWindow::current_canvas [private]

The documentation for this class was generated from the following files:

- frontend/osx/Cadabra/Cadabra/NotebookWindow.hh
- frontend/osx/Cadabra/Cadabra/NotebookWindow.mm

9.140 cadabra::NotebookWindow Class Reference

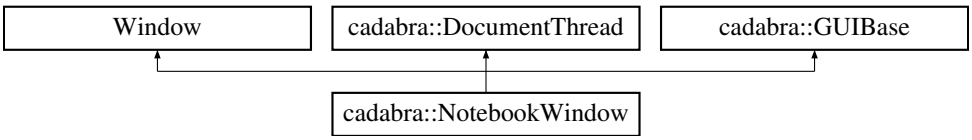
9.140.1 Description

Each notebook has one main window which controls it.

It has a menu bar, a status pane and one or more panels that represent a view on the document.

`#include <NotebookWindow.hh>`

Inheritance diagram for cadabra::NotebookWindow:



Classes

- class Prefs

Public Member Functions

- NotebookWindow (Cadabra *, bool read_only=false)
- ~NotebookWindow ()
- virtual void add_cell (const DTree &, DTree::iterator, bool) override

  Add a GUI cell corresponding to the document cell at the iterator.
- virtual void remove_cell (const DTree &, DTree::iterator) override

  Remove a single cell.
- virtual void remove_all_cells () override

  Remove all GUI cells from the display (used as a quick way to clear all before loading a new document).
- virtual void update_cell (const DTree &, DTree::iterator) override

  The basic manipulations that a GUI needs to implement are adding, removing and updating (refreshing the display of) a cell.
- virtual void position_cursor (const DTree &, DTree::iterator, int pos) override

  Position the cursor in the current canvas in the widget corresponding to the indicated cell.
- virtual size_t get_cursor_position (const DTree &, DTree::iterator) override

  Retrieve the position of the cursor in the current cell.
- virtual void on_connect () override

  Network status is propagated from the ComputeThread to the.
- virtual void on_disconnect (const std::string &) override
- virtual void on_network_error () override
- virtual void on_kernel_runstatus (bool) override
- virtual void process_data () override

  When the ComputeThread needs to modify the document, it stores an ActionBase object on the stack (see the DocumenThread class) and then wakes up the GUI thread signalling it to process this action.
- bool on_vscroll_changed (Gtk::ScrollType, double)
- bool on_scroll (GdkEventScroll *)
- void on_scroll_size_allocate (Gtk::Allocation &)
- void scroll_current_cell_into_view ()
- void set_name (const std::string &)
- void set_title_prefix (const std::string &)
- void load_file (const std::string &notebook_contents)

Public Attributes

- TeXEngine engine
- double scale

Protected Member Functions

- virtual bool on_key_press_event (GdkEventKey *) override
- virtual bool on_delete_event (GdkEventAny *) override
- virtual bool on_configure_event (GdkEventConfigure *cfg) override

Protected Attributes

- DTree::iterator current_cell

Private Member Functions

- void update_title ()
- void set_stop_sensitive (bool)
- void on_file_new ()
- void on_file_open ()
- void on_file_close ()
- void on_file_save ()
- void on_file_save_as ()
- void on_file_export_html ()
- void on_file_export_html_segment ()
- void on_file_export_latex ()
- void on_file_export_python ()
- void on_file_quit ()
- bool quit_safeguard (bool quit)
- void on_edit_undo ()
- void on_edit_insert_above ()
- void on_edit_insert_below ()
- void on_edit_delete ()
- void on_edit_split ()
- void on_edit_cell_is_latex ()
- void on_edit_cell_is_python ()
- void on_view_split ()
- void on_view_close ()
- void on_run_cell ()
- void on_run_runall ()
- void on_run_runtocursor ()
- void on_run_stop ()
- void on_prefs_font_size (int num)
- void on_help_about ()
- void on_help () const
- void on_kernel_restart ()
- std::string save (const std::string &fn) const
- void process_todo_queue ()
- void on_crash_window_closed (int)
- bool cell_got_focus (DTree::iterator, int)
- bool cell_toggle_visibility (DTree::iterator it, int)

- bool cell_content_insert (const std::string &, int, DTree::iterator, int)
- bool cell_content_erase (int, int, DTree::iterator, int)
- bool cell_content_execute (DTree::iterator, int, bool shift_enter_pressed)
- bool cell_content_changed (const std::string &content, DTree::iterator it, int canvas_number)
- void dim_output_cells (DTree::iterator it)
- bool on_tex_error (const std::string &, DTree::iterator)
- void setup_css_provider ()
- void on_text_scaling_factor_changed (const std::string &key)
- bool idle_handler ()

Private Attributes

- Cadabra * cdbapp
- Glib::Dispatcher dispatcher
- Glib::RefPtr< Gtk::ActionGroup > actiongroup
- Glib::RefPtr< Gtk::UIManager > uimanager
- Gtk::VBox topbox
- Gtk::HBox supermainbox
- Gtk::VBox mainbox
- Gtk::HBox statusbarbox
- std::vector< NotebookCanvas * > canvasses
- int current_canvas
- Gtk::ProgressBar progressbar
- Gtk::Spinner kernel_spinner
- bool kernel_spinner_status
- Gtk::Label status_label
- Gtk::Label kernel_label
- std::mutex status_mutex
- std::string status_string
- std::string kernel_string
- std::string name
- std::string title_prefix
- bool modified
- bool read_only
- bool crash_window_hidden
- Glib::RefPtr< Gtk::CssProvider > css_provider
- Glib::RefPtr< Gio::Settings > settings
- int last_configure_width
- DTree::iterator follow_cell
- Prefs prefs
- bool is_configured

Additional Inherited Members

9.140.2 Constructor & Destructor Documentation

9.140.2.1 NotebookWindow::NotebookWindow (Cadabra * *c*, bool *read_only* = `false`)

9.140.2.2 NotebookWindow::~NotebookWindow ( )

9.140.3 Member Function Documentation

9.140.3.1 void NotebookWindow::add_cell (const DTree & , DTree::iterator , bool *visible*) [override], [virtual]

Add a GUI cell corresponding to the document cell at the iterator.

The GUI needs to figure out from the location of this cell in the DTree where to insert the cell in the visual display. If the 'visible' flag is false, hide the cell from view independent of whether its hidden flag is set (this is only used when constructing a document on load time and we do not want to show cells until they have all been added to the document).

Implements cadabra::GUIBase.

9.140.3.2 bool NotebookWindow::cell_content_changed (const std::string & *content,* DTree::iterator *it,* int *canvas_number*) [private]

9.140.3.3 bool NotebookWindow::cell_content_erase (int *start,* int *end,* DTree::iterator *it,* int *canvas_number*) [private]

9.140.3.4 bool NotebookWindow::cell_content_execute (DTree::iterator *it,* int *canvas_number,* bool *shift_enter_pressed*) [private]

9.140.3.5 bool NotebookWindow::cell_content_insert (const std::string & *content,* int *pos,* DTree::iterator *it,* int *canvas_number*) [private]

9.140.3.6 bool NotebookWindow::cell_got_focus (DTree::iterator *it,* int *canvas_number*) [private]

9.140.3.7 bool NotebookWindow::cell_toggle_visibility (DTree::iterator *it,* int *canvas_number*) [private]

9.140.3.8 void NotebookWindow::dim_output_cells (DTree::iterator *it*) [private]

9.140.3.9 size_t NotebookWindow::get_cursor_position (const DTree & , DTree::iterator) [override], [virtual]

Retrieve the position of the cursor in the current cell.

Implements cadabra::GUIBase.

9.140.3.10 bool NotebookWindow::idle_handler ( ) [private]

9.140.3.11 void NotebookWindow::load_file (const std::string & *notebook_contents*)

9.140.3.12 bool NotebookWindow::on_configure_event (GdkEventConfigure * *cfg*) [override], [protected], [virtual]

9.140.3.13 void NotebookWindow::on_connect ( ) [override], [virtual]

Network status is propagated from the ComputeThread to the.

GUI using the following methods. These get called on the compute thread (as opposed to the functions above, which get called on the gui thread).

Implements cadabra::GUIBase.

9.140.3.14 void NotebookWindow::on_crash_window_closed (int) [private]

9.140.3.15 bool NotebookWindow::on_delete_event (GdkEventAny * *event*) [override], [protected], [virtual]

9.140.3.16 void NotebookWindow::on_disconnect (const std::string & *reason*) [override], [virtual]

Implements cadabra::GUIBase.

9.140.3.17 void NotebookWindow::on_edit_cell_is_latex ( ) [private]

9.140.3.18 void NotebookWindow::on_edit_cell_is_python ( ) [private]

9.140.3.19 void NotebookWindow::on_edit_delete ( ) [private]

9.140.3.20 void NotebookWindow::on_edit_insert_above ( ) [private]

9.140.3.21 void NotebookWindow::on_edit_insert_below ( ) [private]

9.140.3.22 void NotebookWindow::on_edit_split ( ) [private]

9.140.3.23 void NotebookWindow::on_edit_undo ( ) [private]

9.140.3.24 void NotebookWindow::on_file_close ( ) [private]

9.140.3.25 void NotebookWindow::on_file_export_html ( ) [private]

9.140.3.26 void NotebookWindow::on_file_export_html_segment ( ) [private]

9.140.3.27 void NotebookWindow::on_file_export_latex ( ) [private]

9.140.3.28 void NotebookWindow::on_file_export_python ( ) [private]

9.140.3.29 void NotebookWindow::on_file_new ( ) [private]

9.140.3.30 void NotebookWindow::on_file_open ( ) [private]

9.140.3.31 void NotebookWindow::on_file_quit ( ) [private]

9.140.3.32 void NotebookWindow::on_file_save ( ) [private]

9.140.3.33 void NotebookWindow::on_file_save_as ( ) [private]

9.140.3.34 void NotebookWindow::on_help ( ) const [private]

9.140.3.35 void NotebookWindow::on_help_about ( ) [private]

9.140.3.36 void NotebookWindow::on_kernel_restart ( ) [private]

9.140.3.37 void NotebookWindow::on_kernel_runstatus (bool *running*) [override], [virtual]

Implements cadabra::GUIBase.

9.140.3.38 bool NotebookWindow::on_key_press_event (GdkEventKey * *event*) [override], [protected], [virtual]

9.140.3.39 void NotebookWindow::on_network_error ( ) [override], [virtual]

Implements cadabra::GUIBase.

9.140.3.40 void NotebookWindow::on_prefs_font_size (int *num*) [private]

9.140.3.41 void NotebookWindow::on_run_cell ( ) [private]

9.140.3.42 void NotebookWindow::on_run_runall ( ) [private]

9.140.3.43 void NotebookWindow::on_run_runtocursor ( ) [private]

9.140.3.44 void NotebookWindow::on_run_stop ( ) [private]

9.140.3.45 bool NotebookWindow::on_scroll (GdkEventScroll * *s*)

9.140.3.46 void NotebookWindow::on_scroll_size_allocate (Gtk::Allocation & *scroll_alloc*)

9.140.3.47 bool NotebookWindow::on_tex_error (const std::string & *str,* DTree::iterator *it*) [private]

9.140.3.48 void NotebookWindow::on_text_scaling_factor_changed (const std::string & *key*) [private]

9.140.3.49 void NotebookWindow::on_view_close ( ) [private]

9.140.3.50 void NotebookWindow::on_view_split ( ) [private]

9.140.3.51 bool NotebookWindow::on_vscroll_changed (Gtk::ScrollType *st,* double *v*)

9.140.3.52 void NotebookWindow::position_cursor (const DTree & , DTree::iterator , int) [override], [virtual]

Position the cursor in the current canvas in the widget corresponding to the indicated cell.

Implements cadabra::GUIBase.

9.140.3.53 void NotebookWindow::process_data ( ) [override], [virtual]

When the ComputeThread needs to modify the document, it stores an ActionBase object on the stack (see the DocumenThread class) and then wakes up the GUI thread signalling it to process this action.

The following member should wake up the GUI thread and make it enter the processing part.

Implements cadabra::GUIBase.

9.140.3.54 void NotebookWindow::process_todo_queue ( ) [private]

9.140.3.55 bool NotebookWindow::quit_safeguard (bool *quit*) [private]

9.140.3.56 void NotebookWindow::remove_all_cells ( ) [override], [virtual]

Remove all GUI cells from the display (used as a quick way to clear all before loading a new document).

Implements cadabra::GUIBase.

9.140.3.57 void NotebookWindow::remove_cell (const DTree & , DTree::iterator) [override], [virtual]

Remove a single cell.

Implements cadabra::GUIBase.

9.140.3.58 std::string NotebookWindow::save (const std::string & *fn*) const [private]

9.140.3.59 void NotebookWindow::scroll_current_cell_into_view ( )

9.140.3.60 void NotebookWindow::set_name (const std::string & *n*)

9.140.3.61 void NotebookWindow::set_stop_sensitive (bool *s*) [private]

9.140.3.62 void NotebookWindow::set_title_prefix (const std::string & *pf*)

9.140.3.63 void cadabra::NotebookWindow::setup_css_provider ( ) [private]

9.140.3.64 void NotebookWindow::update_cell (const DTree & , DTree::iterator) [override], [virtual]

The basic manipulations that a GUI needs to implement are adding, removing and updating (refreshing the display of) a cell.

The code in DocumentThread will call these to make the GUI update its display. Called on the document thread.

Implements cadabra::GUIBase.

9.140.3.65 void NotebookWindow::update_title ( ) [private]

9.140.4 Member Data Documentation

9.140.4.1 Glib::RefPtr<Gtk::ActionGroup> cadabra::NotebookWindow::actiongroup [private]

9.140.4.2 std::vector<NotebookCanvas *> cadabra::NotebookWindow::canvasses [private]

9.140.4.3 Cadabra* cadabra::NotebookWindow::cdbapp [private]

9.140.4.4 bool cadabra::NotebookWindow::crash_window_hidden [private]

9.140.4.5 Glib::RefPtr<Gtk::CssProvider> cadabra::NotebookWindow::css_provider [private]

9.140.4.6 int cadabra::NotebookWindow::current_canvas [private]

9.140.4.7 DTree::iterator cadabra::NotebookWindow::current_cell [protected]

9.140.4.8 Glib::Dispatcher cadabra::NotebookWindow::dispatcher [private]

9.140.4.9 TeXEngine cadabra::NotebookWindow::engine

9.140.4.10 DTree::iterator cadabra::NotebookWindow::follow_cell [private]

9.140.4.11 bool cadabra::NotebookWindow::is_configured [private]

9.140.4.12 Gtk::Label cadabra::NotebookWindow::kernel_label [private]

9.140.4.13 Gtk::Spinner cadabra::NotebookWindow::kernel_spinner [private]

9.140.4.14 bool cadabra::NotebookWindow::kernel_spinner_status [private]

9.140.4.15 std::string cadabra::NotebookWindow::kernel_string [private]

9.140.4.16 int cadabra::NotebookWindow::last_configure_width [private]

9.140.4.17 Gtk::VBox cadabra::NotebookWindow::mainbox [private]

9.140.4.18 bool cadabra::NotebookWindow::modified [private]

9.140.4.19 std::string cadabra::NotebookWindow::name [private]

9.140.4.20 Prefs cadabra::NotebookWindow::prefs [private]

9.140.4.21 Gtk::ProgressBar cadabra::NotebookWindow::progressbar [private]

9.140.4.22 bool cadabra::NotebookWindow::read_only [private]

9.140.4.23 double cadabra::NotebookWindow::scale

9.140.4.24 Glib::RefPtr<Gio::Settings> cadabra::NotebookWindow::settings [private]

9.140.4.25 Gtk::Label cadabra::NotebookWindow::status_label [private]

9.140.4.26 std::mutex cadabra::NotebookWindow::status_mutex [private]

9.140.4.27 std::string cadabra::NotebookWindow::status_string [private]

9.140.4.28 Gtk::HBox cadabra::NotebookWindow::statusbarbox [private]

9.140.4.29 Gtk::HBox cadabra::NotebookWindow::supermainbox [private]

9.140.4.30 std::string cadabra::NotebookWindow::title_prefix [private]

9.140.4.31 Gtk::VBox cadabra::NotebookWindow::topbox [private]

9.140.4.32 Glib::RefPtr<Gtk::UIManager> cadabra::NotebookWindow::uimanager [private]

The documentation for this class was generated from the following files:

- frontend/gtkmm/NotebookWindow.hh
- frontend/gtkmm/NotebookWindow.cc

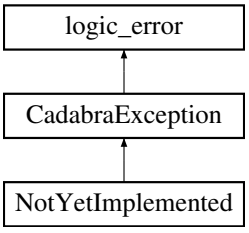
9.141 NotYetImplemented Class Reference

9.141.1 Description

Exception thrown when there the Cadabra code detects an internal inconsistency; this should never happen, but is better than bailing out with an assert.

`#include <Exceptions.hh>`

Inheritance diagram for NotYetImplemented:



Public Member Functions

- NotYetImplemented (std::string="")
- std::string py_what () const

9.141.2 Constructor & Destructor Documentation

9.141.2.1 NotYetImplemented::NotYetImplemented (std::string *s* = " ")

9.141.3 Member Function Documentation

9.141.3.1 std::string NotYetImplemented::py_what ( ) const

The documentation for this class was generated from the following files:

- core/Exceptions.hh
- core/Exceptions.cc

9.142 cadabra::nset_it_less Class Reference

9.142.1 Description

Compare two nset iterators by comparing the strings to which they point.

```
#include <Storage.hh>
```

Public Member Functions

- bool operator() (nset_t::iterator first, nset_t::iterator second) const

9.142.2 Member Function Documentation

9.142.2.1 bool cadabra::nset_it_less::operator() (nset_t::iterator *first*, nset_t::iterator *second*) const

The documentation for this class was generated from the following files:

- core/Storage.hh
- core/Storage.cc

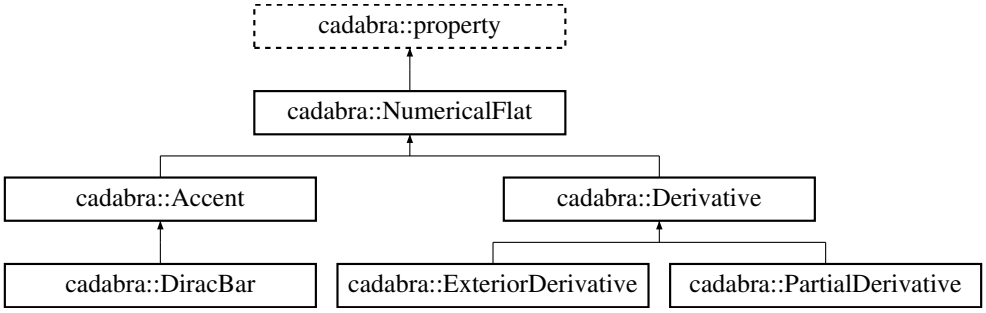
9.143 cadabra::NumericalFlat Class Reference

9.143.1 Description

Property indicating that an operator is numerically flat, so that numerical factors in the argument can be taken outside.

`#include <NumericalFlat.hh>`

Inheritance diagram for cadabra::NumericalFlat:



Public Member Functions

- virtual std::string name () const

Additional Inherited Members

9.143.2 Member Function Documentation

9.143.2.1 std::string NumericalFlat::name ( ) const [virtual]

Implements cadabra::property.

Reimplemented in cadabra::Accent, cadabra::Derivative, cadabra::ExteriorDerivative, cadabra::DiracBar, and cadabra::PartialDerivative.

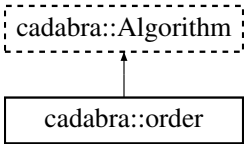
The documentation for this class was generated from the following files:

- core/properties/NumericalFlat.hh
- core/properties/NumericalFlat.cc

9.144 cadabra::order Class Reference

`#include <order.hh>`

Inheritance diagram for cadabra::order:



Public Member Functions

- order (const Kernel &, Ex &, Ex &objs, bool ac)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Protected Attributes

- Ex objects
- bool anticomm

Additional Inherited Members

9.144.1 Constructor & Destructor Documentation

9.144.1.1 order::order (const Kernel & *k,* Ex & *tr,* Ex & *objs,* bool *ac*)

9.144.2 Member Function Documentation

9.144.2.1 Algorithm::result_t order::apply (iterator & *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.144.2.2 bool order::can_apply (iterator *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.144.3 Member Data Documentation

9.144.3.1 bool cadabra::order::anticomm [protected]

9.144.3.2 Ex cadabra::order::objects [protected]

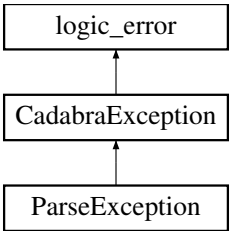
The documentation for this class was generated from the following files:

- core/algorithms/order.hh
- core/algorithms/order.cc

9.145 ParseException Class Reference

`#include <Exceptions.hh>`

Inheritance diagram for ParseException:



Public Member Functions

- ParseException (std::string)

9.145.1 Constructor & Destructor Documentation

9.145.1.1 ParseException::ParseException (std::string *s*)

The documentation for this class was generated from the following files:

- core/Exceptions.hh
- core/Exceptions.cc

9.146 cadabra::Parser Class Reference

`#include <Parser.hh>`

Public Member Functions

- Parser ()
- Parser (std::shared_ptr< Ex >)
- Parser (std::shared_ptr< Ex >, const std::string &)
- void erase ()
- void remove_empty_nodes ()
- void finalise ()
- bool string2tree (const std::string &inp)

Public Attributes

- std::shared_ptr< Ex > tree

Private Types

- enum mode_t {
  m_skipwhite, m_name, m_findchildren, m_singlecharname,
  m_backslashname, m_childgroup, m_initialgroup, m_verbatim,
  m_property }

Private Member Functions

- void advance (unsigned int &i)
- unsigned char get_token (unsigned int i)
- bool is_number (const std::string &str) const
- str_node::bracket_t is_closing_bracket (const unsigned char &br) const
- str_node::bracket_t is_opening_bracket (const unsigned char &br) const
- str_node::parent_rel_t is_link (const unsigned char &ln) const

Private Attributes

- Ex::iterator parts
- std::string str
- std::vector< mode_t > current_mode
- std::vector< str_node::bracket_t > current_bracket
- std::vector< str_node::parent_rel_t > current_parent_rel

9.146.1 Member Enumeration Documentation

9.146.1.1 enum cadabra::Parser::mode_t [private]

Enumerator

m_skipwhite

m_name

m_findchildren

m_singlecharname

m_backslashname

m_childgroup

m_initialgroup

m_verbatim

m_property

9.146.2 Constructor & Destructor Documentation

9.146.2.1 Parser::Parser ( )

9.146.2.2 Parser::Parser (std::shared_ptr< Ex > *t*)

9.146.2.3 Parser::Parser (std::shared_ptr< Ex > *t*, const std::string & *str*)

9.146.3 Member Function Documentation

9.146.3.1 void Parser::advance (unsigned int & *i*) [private]

9.146.3.2 void Parser::erase ( )

9.146.3.3 void Parser::finalise ( )

9.146.3.4 unsigned char Parser::get_token (unsigned int *i*) [private]

9.146.3.5 str_node::bracket_t Parser::is_closing_bracket (const unsigned char & *br*) const [private]

9.146.3.6 str_node::parent_rel_t Parser::is_link (const unsigned char & *ln*) const [private]

9.146.3.7 bool Parser::is_number (const std::string & *str*) const [private]

9.146.3.8 str_node::bracket_t Parser::is_opening_bracket (const unsigned char & *br*) const [private]

9.146.3.9 void Parser::remove_empty_nodes ( )

9.146.3.10 bool Parser::string2tree (const std::string & *inp*)

9.146.4 Member Data Documentation

9.146.4.1 std::vector<str_node::bracket_t> cadabra::Parser::current_bracket [private]

9.146.4.2 std::vector<mode_t> cadabra::Parser::current_mode [private]

9.146.4.3 std::vector<str_node::parent_rel_t> cadabra::Parser::current_parent_rel [private]

9.146.4.4 Ex::iterator cadabra::Parser::parts [private]

9.146.4.5 std::string cadabra::Parser::str [private]

9.146.4.6 std::shared_ptr<Ex> cadabra::Parser::tree

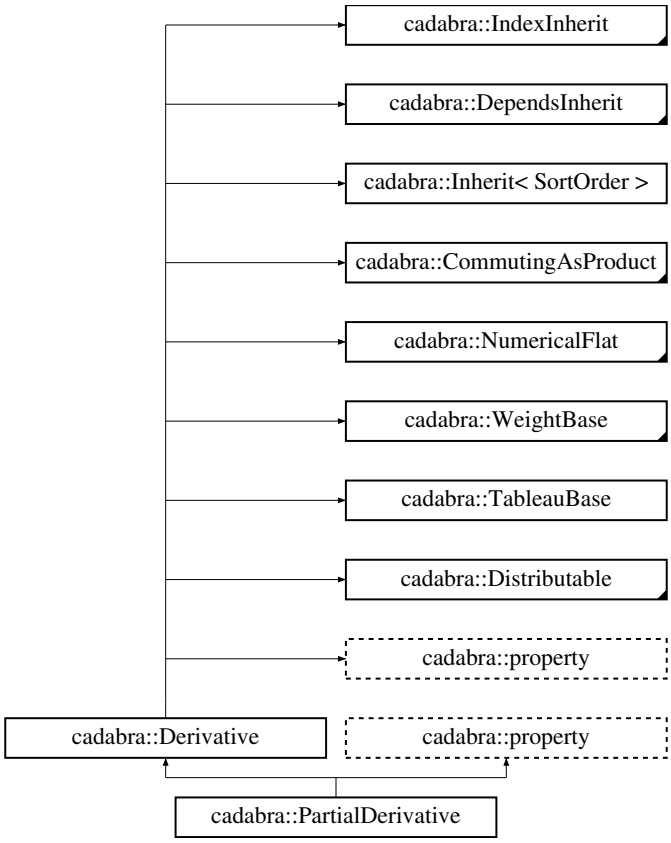
The documentation for this class was generated from the following files:

- core/Parser.hh
- core/Parser.cc

9.147 cadabra::PartialDerivative Class Reference

`#include <PartialDerivative.hh>`

Inheritance diagram for cadabra::PartialDerivative:



Public Member Functions

- virtual ~PartialDerivative ()
- virtual std::string name () const
- virtual unsigned int size (const Properties &, Ex &, Ex::iterator) const
- virtual tab_t get_tab (const Properties &, Ex &, Ex::iterator, unsigned int) const

Additional Inherited Members

9.147.1 Constructor & Destructor Documentation

9.147.1.1 virtual cadabra::PartialDerivative::~PartialDerivative ( ) [inline], [virtual]

9.147.2 Member Function Documentation

9.147.2.1 TableauBase::tab_t PartialDerivative::get_tab (const Properties & *properties,* Ex & *tr,* Ex::iterator *it,* unsigned int *num*) const [virtual]

Reimplemented from cadabra::Derivative.

9.147.2.2 std::string PartialDerivative::name ( ) const [virtual]

Implements cadabra::property.

9.147.2.3 unsigned int PartialDerivative::size (const Properties & *properties*, Ex & *tr*, Ex::iterator *it*) const [virtual]

Reimplemented from cadabra::Derivative.

The documentation for this class was generated from the following files:

- core/properties/PartialDerivative.hh
- core/properties/PartialDerivative.cc

9.148 cadabra::pattern Class Reference

`#include <Props.hh>`

Public Member Functions

- pattern ()
- pattern (const Ex &)
- bool match (const Properties &, const Ex::iterator &, bool ignore_parent_rel=false) const
- bool children_wildcard () const

Public Attributes

- Ex obj

9.148.1 Constructor & Destructor Documentation

9.148.1.1 pattern::pattern ( )

9.148.1.2 pattern::pattern (const Ex & *o*)

9.148.2 Member Function Documentation

9.148.2.1 bool pattern::children_wildcard ( ) const

9.148.2.2 bool pattern::match (const Properties & *properties*, const Ex::iterator & *it*, bool *ignore_parent_rel* = false) const

9.148.3 Member Data Documentation

9.148.3.1 Ex cadabra::pattern::obj

The documentation for this class was generated from the following files:

- core/Props.hh
- core/Props.cc

9.149 Perm Class Reference

`#include <Permutations.hh>`

Public Member Functions

- template<class iterator >
  void find (iterator start1, iterator end1, iterator start2, iterator end2)

  Find the permutation that takes [start1, end1> to [start2, end2>.
- template<class iterator >
  void apply (iterator start1, iterator end1)

  Apply the permutation 'perm' on the given range.

Public Attributes

- std::vector< int > perm

9.149.1 Member Function Documentation

9.149.1.1 template<class iterator > void Perm::apply (iterator *start1,* iterator *end1*)

Apply the permutation 'perm' on the given range.

9.149.1.2 template<class iterator > void Perm::find (iterator *start1,* iterator *end1,* iterator *start2,* iterator *end2*)

Find the permutation that takes [start1, end1> to [start2, end2>.

This will be available in 'perm' afterwards.

9.149.2 Member Data Documentation

9.149.2.1 std::vector<int> Perm::perm

The documentation for this class was generated from the following file:

- core/Permutations.hh

9.150 PermutationException Class Reference

9.150.1 Description

Generic permutation group material.

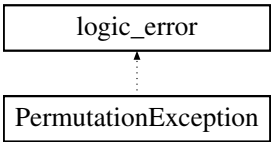
Largely follows the notation of xperm to avoid confusion.

Example: 1->4, 4->3, 3->1, 5->6, 6->5

Perm(3, 2, 4, 1, 6, 5) Images(4, 2, 1, 3, 6, 5)

`#include <Permutations.hh>`

Inheritance diagram for PermutationException:



Public Member Functions

- PermutationException (const std::string &ex)

9.150.2 Constructor & Destructor Documentation

9.150.2.1 PermutationException::PermutationException (const std::string & *ex*) [inline]

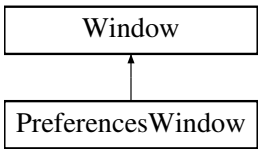
The documentation for this class was generated from the following file:

- core/Permutations.hh

9.151 PreferencesWindow Class Reference

`#include <Preferences.hh>`

Inheritance diagram for PreferencesWindow:



Private Attributes

- Gtk::VBox mainbox

9.151.1 Member Data Documentation

9.151.1.1 Gtk::VBox PreferencesWindow::mainbox [private]

The documentation for this class was generated from the following file:

- frontend/gtkmm/Preferences.hh

9.152 cadabra::NotebookWindow::Prefs Class Reference

Public Member Functions

- Prefs ()

Public Attributes

- int font_step

9.152.1 Constructor & Destructor Documentation

9.152.1.1 NotebookWindow::Prefs::Prefs ( )

9.152.2 Member Data Documentation

9.152.2.1 int cadabra::NotebookWindow::Prefs::font_step

The documentation for this class was generated from the following files:

- frontend/gtkmm/NotebookWindow.hh
- frontend/gtkmm/NotebookWindow.cc

9.153 preprocessor Class Reference

9.153.1 Description

Preprocessing class which takes infix mathematical notation with all sorts of maths shortcuts and transforms it into a string which is properly formatted in prefix notation.

Use the Parser class to turn this string into an Ex expression tree.

```
#include <PreProcessor.hh>
```

Classes

- class accu_t

Public Types

- enum order_labels {
  order_factorial =0, order_pow, order_frac, order_prod,
  order_wedge, order_minus, order_plus, order_dot,
  order_equals, order_unequals, order_less_than, order_greater_than,
  order_conditions, order_arrow, order_set_option, order_colon,
  order_comma, order_tilde }

Public Member Functions

- preprocessor ()
- void erase ()
- void strip_outer_brackets () const

Static Public Attributes

- static const unsigned char orders [ ]
- static const char ∗const order_names [ ]

Private Member Functions

- void parse_ (const std::string &)
- void parse_internal_ ()
- bool unwind_ (unsigned int tolevel, unsigned int bracketgoal=0, bool usebracket=true) const
- unsigned char get_token_ (unsigned char prev_token)
- void show_and_throw_ (const std::string &str) const
- void bracket_strings_ (unsigned int cb, std::string &obrack, std::string &cbrack) const
- bool is_infix_operator_ (unsigned char c) const
- bool is_link_ (unsigned char c) const
- unsigned int is_opening_bracket_ (unsigned char c) const
- unsigned int is_closing_bracket_ (unsigned char c) const
- unsigned int is_bracket_ (unsigned char c) const
- bool is_already_bracketed_ (const std::string &str) const
- bool is_digits_ (const std::string &str) const
- unsigned int current_bracket_ (bool deep=false) const
- void print_stack () const
- bool default_is_product_ () const

Private Attributes

- bool verbatim_
- bool next_is_product_
- bool eat_initial_whitespace_
- unsigned int cur_pos
- std::string cur_str
- accu_t cur
- std::vector< accu_t > accus

Static Private Attributes

- static const unsigned char open_brackets [ ] ={ '{', '(', '[' }
- static const unsigned char close_brackets [ ] ={ '}', ')', ']' }

Friends

- std::istream & operator>> (std::istream &, preprocessor &)
- std::ostream & operator<< (std::ostream &, const preprocessor &)

9.153.2 Member Enumeration Documentation

9.153.2.1 enum preprocessor::order_labels

Enumerator

order_factorial

order_pow

order_frac

order_prod

order_wedge

order_minus

order_plus

order_dot

order_equals

order_unequals

order_less_than

order_greater_than

order_conditions

order_arrow

order_set_option

order_colon

order_comma

order_tilde

9.153.3 Constructor & Destructor Documentation

9.153.3.1 preprocessor::preprocessor ( )

9.153.4 Member Function Documentation

9.153.4.1 void preprocessor::bracket_strings_ (unsigned int *cb,* std::string & *obrack,* std::string & *cbrack*) const [private]

9.153.4.2 unsigned int preprocessor::current_bracket_ (bool *deep* = false) const [private]

9.153.4.3 bool preprocessor::default_is_product_ ( ) const [private]

9.153.4.4 void preprocessor::erase ( )

9.153.4.5 unsigned char preprocessor::get_token_ (unsigned char *prev_token*) [private]

9.153.4.6 bool preprocessor::is_already_bracketed_ (const std::string & *str*) const [private]

9.153.4.7 unsigned int preprocessor::is_bracket_ (unsigned char *c*) const [private]

9.153.4.8 unsigned int preprocessor::is_closing_bracket_ (unsigned char *c*) const [private]

9.153.4.9 bool preprocessor::is_digits_ (const std::string & *str*) const [private]

9.153.4.10 bool preprocessor::is_infix_operator_ (unsigned char *c*) const [private]

9.153.4.11 bool preprocessor::is_link_ (unsigned char *c*) const [private]

9.153.4.12 unsigned int preprocessor::is_opening_bracket_ (unsigned char *c*) const [private]

9.153.4.13 void preprocessor::parse_ (const std::string & *str*) [private]

9.153.4.14 void preprocessor::parse_internal_ ( ) [private]

9.153.4.15 void preprocessor::print_stack ( ) const [private]

9.153.4.16 void preprocessor::show_and_throw_ (const std::string & *str*) const [private]

9.153.4.17 void preprocessor::strip_outer_brackets ( ) const

9.153.4.18 bool preprocessor::unwind_ (unsigned int *tolevel,* unsigned int *bracketgoal* = 0, bool *usebracket* = true) const [private]

9.153.5 Friends And Related Function Documentation

9.153.5.1 std::ostream& operator<< (std::ostream & , const **preprocessor** &) [friend]

9.153.5.2 std::istream& operator>> (std::istream & , **preprocessor** &) [friend]

9.153.6 Member Data Documentation

9.153.6.1 std::vector<**accu_t**> preprocessor::accus [mutable], [private]

9.153.6.2 const unsigned char preprocessor::close_brackets ={ '}', ')', ']' } [static], [private]

9.153.6.3 accu_t preprocessor::cur [mutable], [private]

9.153.6.4 unsigned int preprocessor::cur_pos [private]

9.153.6.5 std::string preprocessor::cur_str [private]

9.153.6.6 bool preprocessor::eat_initial_whitespace_ [private]

9.153.6.7 bool preprocessor::next_is_product_ [private]

9.153.6.8 const unsigned char preprocessor::open_brackets ={ '{', '(', '[' } [static], [private]

9.153.6.9 const char *const preprocessor::order_names [static]

Initial value:

```
={ "\\factorial",

                                                    "\\pow", "\\frac", "\\prod", "\\wedge",
                                                    "\\sub", "\\sum", "\\sequence",
                                                    "\\equals", "\\unequals", "\\less",
                                                    "\\greater", "\\conditional",
                                                    "\\arrow", "\\setoption", "\\declare",
                                                    "\\comma", "\\tie", 0 }
```

9.153.6.10 const unsigned char preprocessor::orders [static]

Initial value:

```
={ '!', tok_pow, '/', '*', tok_wedge,

      tok_sequence, '=', tok_unequals,

      tok_arrow, tok_set_option,

                                                    '-', '+',

                                                    '<', '>', '|',

                                                    tok_declare, ',', '~', 0 }
```

9.153.6.11 bool preprocessor::verbatim_ [private]

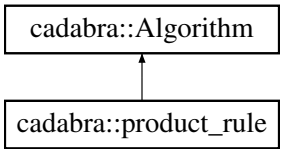
The documentation for this class was generated from the following files:

- core/PreProcessor.hh
- core/PreProcessor.cc

9.154 cadabra::product_rule Class Reference

`#include <product_rule.hh>`

Inheritance diagram for cadabra::product_rule:



Public Member Functions

- product_rule (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Public Attributes

- sibling_iterator prodnode
- unsigned int number_of_indices

Additional Inherited Members

9.154.1 Constructor & Destructor Documentation

9.154.1.1 product_rule::product_rule (const Kernel & *k,* Ex & *tr*)

9.154.2 Member Function Documentation

9.154.2.1 Algorithm::result_t product_rule::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.154.2.2 bool product_rule::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.154.3 Member Data Documentation

9.154.3.1 unsigned int cadabra::product_rule::number_of_indices

9.154.3.2 sibling_iterator cadabra::product_rule::prodnode

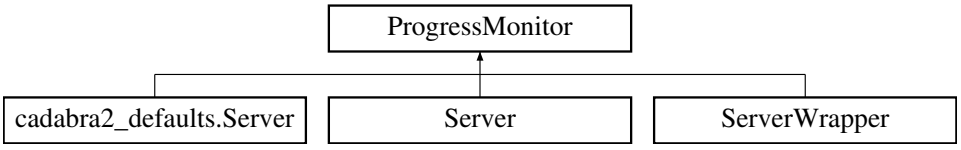
The documentation for this class was generated from the following files:

- core/algorithms/product_rule.hh
- core/algorithms/product_rule.cc

9.155 ProgressMonitor Class Reference

`#include <ProgressMonitor.hh>`

Inheritance diagram for ProgressMonitor:



Classes

- class Block
- class Total

Public Member Functions

- ProgressMonitor ()
- virtual ~ProgressMonitor ()
- virtual void group (std::string name="")
- virtual void progress (int n, int total)
- void print () const
- std::vector< Total > totals () const

Private Attributes

- std::stack< Block > call_stack
- std::map< std::string, Total > call_totals

9.155.1 Constructor & Destructor Documentation

9.155.1.1 ProgressMonitor::ProgressMonitor ( )

9.155.1.2 ProgressMonitor::~ProgressMonitor ( ) [virtual]

9.155.2 Member Function Documentation

9.155.2.1 void ProgressMonitor::group (std::string *name* = "") [virtual]

Reimplemented in ServerWrapper.

9.155.2.2 void ProgressMonitor::print ( ) const

9.155.2.3 void ProgressMonitor::progress (int *n*, int *total*) [virtual]

Reimplemented in ServerWrapper.

9.155.2.4 std::vector< ProgressMonitor::Total > ProgressMonitor::totals ( ) const

9.155.3 Member Data Documentation

9.155.3.1 std::stack<Block> ProgressMonitor::call_stack [private]

9.155.3.2 std::map<std::string, Total> ProgressMonitor::call_totals [private]

The documentation for this class was generated from the following files:

- core/ProgressMonitor.hh
- core/ProgressMonitor.cc

9.156 cadabra::Properties Class Reference

9.156.1 Description

Class holding a collection of properties attached to expressions.

Symbols and expressions do not have a default meaning in Cadabra. They get their meaning by attaching properties to them. When the core manipulator calls an algorithm object, it passes an instance of the Properties class along with the expression tree on which to act, so that the algorithm can figure out what the symbols in the expression tree mean.

`#include <Props.hh>`

Classes

- class registered_property_map_t

Public Types

- typedef std::pair< pattern *, const property * > pat_prop_pair_t
- typedef std::multimap< nset_t::iterator, pat_prop_pair_t, nset_it_less > property_map_t

  We keep two multi-maps: one from the pattern to the property (roughly) and one from the property to the pattern.
- typedef std::multimap< const property *, pattern * > pattern_map_t

Public Member Functions

- void register_property (property *(*)(), const std::string &name)

  Registering properties.
- std::string master_insert (Ex proptree, property *thepropbase)

  Register a property for the indicated Ex.
- void clear ()
- template<class T >
  const T * get (Ex::iterator, bool ignore_parent_rel=false) const
- template<class T >
  const T * get () const
- template<class T >
  const T * get_composite (Ex::iterator, bool ignore_parent_rel=false) const
- template<class T >
  const T * get_composite (Ex::iterator, int &serialnum, bool doserial=true, bool ignore_parent_rel=false) const
- template<class T >
  const T * get_composite (Ex::iterator, const std::string &label) const
- template<class T >
  const T * get_composite (Ex::iterator, int &serialnum, const std::string &label, bool doserial=true) const
- template<class T >
  const T * get_composite (Ex::iterator, Ex::iterator, bool ignore_parent_rel=false) const
- template<class T >
  const T * get_composite (Ex::iterator, Ex::iterator, int &, int &, bool ignore_parent_rel=false) const
- template<class T >
  Ex::iterator head (Ex::iterator, bool ignore_parent_rel=false) const
- bool has (const property *, Ex::iterator)
- int serial_number (const property *, const pattern *) const

Public Attributes

- registered_property_map_t registered_properties
- property_map_t props

  The following two maps own the pointers to the properties and patterns stored in them; use clear() to clean up.
- pattern_map_t pats

Private Member Functions

- void insert_prop (const Ex &, const property *)
- void insert_list_prop (const std::vector< Ex > &, const list_property *)

9.156.2 Member Typedef Documentation

9.156.2.1 typedef std::pair<pattern *, const property *> cadabra::Properties::pat_prop_pair_t

9.156.2.2 typedef std::multimap<const property *, pattern *> cadabra::Properties::pattern_map_t

9.156.2.3 typedef std::multimap<nset_t::iterator, pat_prop_pair_t, nset_it_less> cadabra::Properties::property_map_t

We keep two multi-maps: one from the pattern to the property (roughly) and one from the property to the pattern.

These are both multi-maps because one pattern can have multiple properties assigned to it, and one property can be assigned to multiple properties.

When we delete properties, we check the pats map to see if the reference count for that property has dropped to zero.

9.156.3 Member Function Documentation

9.156.3.1 void Properties::clear ( )

9.156.3.2 template<class T > const T * cadabra::Properties::get (Ex::iterator *it,* bool *ignore_parent_rel* = `false`) const

9.156.3.3 template<class T > const T * cadabra::Properties::get ( ) const

9.156.3.4 template<class T > const T * cadabra::Properties::get_composite (Ex::iterator *it,* bool *ignore_parent_rel* = `false`) const

9.156.3.5 template<class T > const T * cadabra::Properties::get_composite (Ex::iterator *it,* int & *serialnum,* bool *doserial* = `true`, bool *ignore_parent_rel* = `false`) const

9.156.3.6 template<class T > const T * cadabra::Properties::get_composite (Ex::iterator *it,* const std::string & *label*) const

9.156.3.7 template<class T > const T * cadabra::Properties::get_composite (Ex::iterator *it,* int & *serialnum,* const std::string & *label,* bool *doserial* = `true`) const

9.156.3.8 template<class T > const T * cadabra::Properties::get_composite (Ex::iterator *it1,* Ex::iterator *it2,* bool *ignore_parent_rel* = `false`) const

9.156.3.9 template<class T > const T * cadabra::Properties::get_composite (Ex::iterator *it1,* Ex::iterator *it2,* int & *serialnum1,* int & *serialnum2,* bool *ignore_parent_rel* = `false`) const

9.156.3.10 bool Properties::has (const property * *pb,* Ex::iterator *it*)

9.156.3.11 template<class T > Ex::iterator cadabra::Properties::head (Ex::iterator *it,* bool *ignore_parent_rel* = `false`) const

9.156.3.12 void Properties::insert_list_prop (const std::vector< Ex > & *its,* const list_property * *pr*) `[private]`

9.156.3.13 void Properties::insert_prop (const Ex & *et,* const property * *pr*) `[private]`

9.156.3.14 std::string Properties::master_insert (Ex *proptree,* property * *thepropbase*)

Register a property for the indicated Ex.

Takes both normal and list properties and works out which insert calls to make. The property ownership is transferred to us on using this call.

9.156.3.15 void Properties::register_property (property * *)(,* const std::string & *name*)

Registering properties.

When inserting a property or list_property, ownership of the property gets transferred to this class.

9.156.3.16 int Properties::serial_number (const property * *listprop,* const pattern * *pat*) const

9.156.4 Member Data Documentation

9.156.4.1 pattern_map_t cadabra::Properties::pats

9.156.4.2 property_map_t cadabra::Properties::props

The following two maps own the pointers to the properties and patterns stored in them; use clear() to clean up.

Note that pointers can sit in in more than one entry in this map (when they are pointing to list_property objects, which are shared between patterns).

9.156.4.3 registered_property_map_t cadabra::Properties::registered_properties

The documentation for this class was generated from the following files:

- core/Props.hh
- core/Props.cc

9.157 Property< T > Class Template Reference

9.157.1 Description

template<class T>
class Property< T >

Property is a templated wrapper around a C++ property object.

It provides it with _latex, **str** and **repr** methods. In order to have a quick way to figure out in Python whether an object is a property, we derive it from BaseProperty, which is an empty placeholder (in Python BaseProperty is called Property).

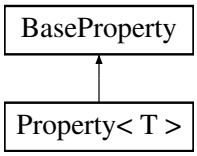
Properties can have arguments. These are not parsed by Python, but rather by the C++ side. There is a number of reasons for doing things this way. The most important of them is that this makes it a lot easier for Cadabra to provide useful feedback on parameters which are not valid. So all properties get initialised with two Cadabra Ex objects: the 1st is the pattern to which the property should be attached, the 2nd is the argument of the property, interpreted as a Cadabra expression.

Cadabra properties cannot be proper Python properties, because we need to give the latter names in order to prevent them from going out of scope. So Cadabra keeps a list of 'anonymous property objects in the current scope'.

The question is now what we do when Python keeps a pointer to these objects, and let that pointer escape local scope (e.g. by returning the Python property object). How do we keep it in scope?

`#include <PythonCdb.hh>`

Inheritance diagram for Property< T >:



Public Member Functions

- Property (std::shared_ptr< cadabra::Ex > obj, std::shared_ptr< cadabra::Ex > params=0)
- std::string str_ () const

  Human-readable form in text, i.e. no special formatting.
- std::string latex_ () const

  Human-readable form using LaTeX markup.
- std::string repr_ () const

  Python-parseable form. FIXME: not correct right now.
- template<>
  std::string latex_ () const

Private Attributes

- T * prop
- std::shared_ptr< cadabra::Ex > for_obj

9.157.2 Constructor & Destructor Documentation

9.157.2.1 template<class Prop > Property< Prop >::Property (std::shared_ptr< cadabra::Ex > *obj*, std::shared_ptr< cadabra::Ex > *params* = 0)

9.157.3 Member Function Documentation

9.157.3.1 template<class Prop > std::string Property< Prop >::latex_ ( ) const

Human-readable form using LaTeX markup.

9.157.3.2 template<> std::string Property< LaTeXForm >::latex_ ( ) const

9.157.3.3 template<class Prop > std::string Property< Prop >::repr_ ( ) const

Python-parseable form. FIXME: not correct right now.

9.157.3.4 template<class Prop > std::string Property< Prop >::str_ ( ) const

Human-readable form in text, i.e. no special formatting.

9.157.4 Member Data Documentation

9.157.4.1 template<class T > std::shared_ptr<cadabra::Ex> Property< T >::for_obj [private]

9.157.4.2 template<class T > T* Property< T >::prop [private]

The documentation for this class was generated from the following files:

- core/PythonCdb.hh
- core/PythonCdb.cc

9.158 cadabra::property Class Reference

9.158.1 Description

Base class for all properties, handling argument parsing and defining the interface.

Properties can have arguments. Parsing of these is done in the properties object itself, with the use of some helper functions. Parsing is done by implementing the virtual function property::parse(const Kernel&, keyval_t&). The argument is a container class which represents the arguments passed to the property as key/value pairs keyval_t type.

Properties will be asked to check that they can be associated to a given pattern through the virtual property↩ ::validate(const Properties&, const Ex&) function. The FIXME: the above two need to be merged, because parse may need access to the actual pattern tree, and once we are there, we may as well do checking. HOWEVER: in TableauSymmetry.cc: FIXME: we get the wrong pattern in case of a list! We should have been fed each individual item in the list, not the list itself.

This suggests that we should be calling once for every pattern, but that is wasteful in case we are just parsing arguments. Can we really avoid calling parse for every pattern?

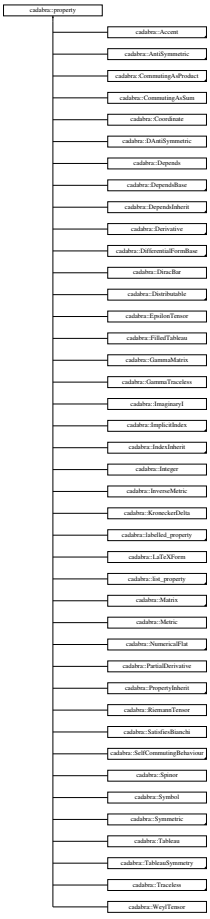
{A_{m n}, A_{m n p}, A_{m n p q}}::TableauSymmetry(shape={2,1}, indices={0,1,2}).

leads to a problem, because the property needs to setup its internal structures but also verify that these can match all objects in the same way.

Make all identical properties point to the same property object, so that normal and list properties become pretty much identical.

`#include <Props.hh>`

Inheritance diagram for cadabra::property:



Public Types

- enum match_t { no_match, id_match, exact_match }

Public Member Functions

- property (bool hidden=false)
- virtual ∼property ()
- bool parse_to_keyvals (const Ex &, keyval_t &)
- virtual bool parse (const Kernel &, keyval_t &keyvals)
- virtual void validate (const Kernel &, const Ex &) const
- virtual void latex (std::ostream &) const

  Display the property on the stream.
- virtual std::string name () const =0
- virtual std::string unnamed_argument () const
- virtual match_t equals (const property ∗) const
- void hidden (bool h)

  Properties can be hidden because they only make sense to the system; they will not be printed when the user asks for a list of properties.
- bool hidden (void) const

Private Member Functions

- bool parse_one_argument (Ex::iterator arg, keyval_t &keyvals)

Private Attributes

- bool hidden_

9.158.2 Member Enumeration Documentation

9.158.2.1 enum cadabra::property::match_t

Enumerator

no_match

id_match

exact_match

9.158.3 Constructor & Destructor Documentation

9.158.3.1 property::property (bool *hidden* = `false`)

9.158.3.2 virtual cadabra::property::∼property ( ) `[inline]`, `[virtual]`

9.158.4 Member Function Documentation

9.158.4.1 property::match_t property::equals (const property ∗) const `[virtual]`

Reimplemented in cadabra::Indices, cadabra::CommutingBehaviour, and cadabra::SortOrder.

9.158.4.2 void property::hidden (bool *h*)

Properties can be hidden because they only make sense to the system; they will not be printed when the user asks for a list of properties.

9.158.4.3 bool property::hidden (void) const

9.158.4.4 void property::latex (std::ostream & *str*) const [virtual]

Display the property on the stream.

Generate a LaTeX representation of the property, assuming LaTeX is in text mode (so it needs dollar symbols to switch to maths).

Reimplemented in cadabra::Indices, cadabra::Metric, cadabra::TableauSymmetry, cadabra::WeylTensor, cadabra::ImplicitIndex, and cadabra::GammaMatrix.

9.158.4.5 virtual std::string cadabra::property::name ( ) const [pure virtual]

Implemented in cadabra::PropertyInherit, cadabra::Accent, cadabra::Derivative, cadabra::WeightInherit, cadabra::Integer, cadabra::EpsilonTensor, cadabra::TableauSymmetry, cadabra::AntiSymmetric, cadabra::DifferentialForm, cadabra::NumericalFlat, cadabra::Weight, cadabra::DependsInherit, cadabra::ExteriorDerivative, cadabra::Indices, cadabra::InverseMetric, cadabra::Metric, cadabra::Spinor, cadabra::WeylTensor, cadabra::DAntiSymmetric, cadabra::Diagonal, cadabra::DiracBar, cadabra::Distributable, cadabra::GammaMatrix, cadabra::GammaTraceless, cadabra::ImplicitIndex, cadabra::KroneckerDelta, cadabra::Matrix, cadabra::PartialDerivative, cadabra::SatisfiesBianchi, cadabra::SelfCommuting, cadabra::Tableau, cadabra::Traceless, cadabra::AntiCommuting, cadabra::Commuting, cadabra::CommutingAsProduct, cadabra::CommutingAsSum, cadabra::Coordinate, cadabra::FilledTableau, cadabra::ImaginaryI, cadabra::IndexInherit, cadabra::LaTeXForm, cadabra::NonCommuting, cadabra::SelfAntiCommuting, cadabra::SelfNonCommuting, cadabra::SortOrder, cadabra::Symbol, cadabra::Symmetric, cadabra::RiemannTensor, and cadabra::Depends.

9.158.4.6 bool property::parse (const Kernel & , keyval_t & *keyvals*) [virtual]

Reimplemented in cadabra::labelled_property, cadabra::WeightInherit, cadabra::Integer, cadabra::DifferentialForm, cadabra::Spinor, cadabra::EpsilonTensor, cadabra::GammaMatrix, cadabra::InverseMetric, cadabra::Metric, cadabra::TableauSymmetry, cadabra::Indices, cadabra::LaTeXForm, cadabra::Weight, cadabra::ImplicitIndex, and cadabra::Depends.

9.158.4.7 bool property::parse_one_argument (Ex::iterator *arg,* keyval_t & *keyvals*) [private]

9.158.4.8 bool property::parse_to_keyvals (const Ex & *tr,* keyval_t & *keyvals*)

9.158.4.9 std::string property::unnamed_argument ( ) const [virtual]

Reimplemented in cadabra::Integer, cadabra::WeightInherit, cadabra::Indices, cadabra::ImplicitIndex, cadabra::LaTeXForm, cadabra::Weight, and cadabra::Depends.

9.158.4.10 void property::validate (const Kernel & , const Ex &) const [virtual]

Reimplemented in cadabra::InverseMetric, cadabra::Metric, cadabra::WeylTensor, and cadabra::RiemannTensor.

9.158.5 Member Data Documentation

9.158.5.1 bool cadabra::property::hidden_ [private]

The documentation for this class was generated from the following files:

- core/Props.hh
- core/Props.cc

9.159 cadabra::PropertyInherit Class Reference

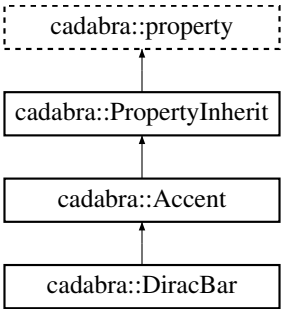
9.159.1 Description

PropertyInherit is like Inherit<T> for all properties.

This is very generic and almost never really useful.

```
#include <Props.hh>
```

Inheritance diagram for cadabra::PropertyInherit:



Public Member Functions

- virtual std::string name () const

Additional Inherited Members

9.159.2 Member Function Documentation

9.159.2.1 virtual std::string cadabra::PropertyInherit::name ( ) const [inline], [virtual]

Implements cadabra::property.

Reimplemented in cadabra::Accent, and cadabra::DiracBar.

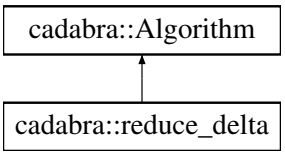
The documentation for this class was generated from the following file:

- core/Props.hh

9.160 cadabra::reduce_delta Class Reference

`#include <reduce_delta.hh>`

Inheritance diagram for cadabra::reduce_delta:



Public Member Functions

- reduce_delta (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Private Member Functions

- bool one_step_ (sibling_iterator)

Additional Inherited Members

9.160.1 Constructor & Destructor Documentation

9.160.1.1 reduce_delta::reduce_delta (const Kernel & *k*, Ex & *e*)

9.160.2 Member Function Documentation

9.160.2.1 Algorithm::result_t reduce_delta::apply (iterator & *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.160.2.2 bool reduce_delta::can_apply (iterator *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.160.2.3 bool reduce_delta::one_step_ (sibling_iterator *dl*) [private]

The documentation for this class was generated from the following files:

- core/algorithms/reduce_delta.hh
- core/algorithms/reduce_delta.cc

9.161 cadabra::Properties::registered_property_map_t Class Reference

`#include <Props.hh>`

Public Types

- typedef std::map< std::string, property *(*)()> internal_property_map_t
- typedef internal_property_map_t::iterator iterator

Public Member Functions

- ~registered_property_map_t ()

Public Attributes

- internal_property_map_t store

9.161.1 Member Typedef Documentation

9.161.1.1 typedef std::map<std::string, property* (*)()> cadabra::Properties::registered_property_map_t::internal_property_map_t

9.161.1.2 typedef internal_property_map_t::iterator cadabra::Properties::registered_property_map_t::iterator

9.161.2 Constructor & Destructor Documentation

9.161.2.1 Properties::registered_property_map_t::~registered_property_map_t ( )

9.161.3 Member Data Documentation

9.161.3.1 internal_property_map_t cadabra::Properties::registered_property_map_t::store

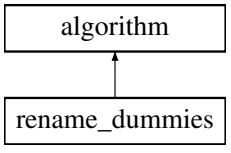
The documentation for this class was generated from the following files:

- core/Props.hh
- core/Props.cc

9.162 rename_dummies Class Reference

`#include <Dummies.hh>`

Inheritance diagram for rename_dummies:



Public Member Functions

- rename_dummies (Ex &, iterator)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

9.162.1 Constructor & Destructor Documentation

9.162.1.1 rename_dummies::rename_dummies (Ex & , iterator)

9.162.2 Member Function Documentation

9.162.2.1 virtual result_t rename_dummies::apply (iterator &) [virtual]

9.162.2.2 virtual bool rename_dummies::can_apply (iterator) [virtual]

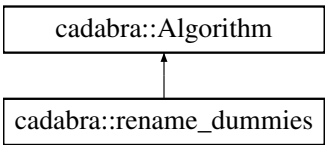
The documentation for this class was generated from the following file:

- core/Dummies.hh

9.163 cadabra::rename_dummies Class Reference

```
#include <rename_dummies.hh>
```

Inheritance diagram for cadabra::rename_dummies:



Public Member Functions

- rename_dummies (const Kernel &, Ex &, std::string, std::string)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Private Attributes

- std::string dset1
- std::string dset2

Additional Inherited Members

9.163.1 Constructor & Destructor Documentation

9.163.1.1 rename_dummies::rename_dummies (const Kernel & *k*, Ex & *tr*, std::string *d1*, std::string *d2*)

9.163.2 Member Function Documentation

9.163.2.1 Algorithm::result_t rename_dummies::apply (iterator & *st*) [virtual]

Implements cadabra::Algorithm.

9.163.2.2 bool rename_dummies::can_apply (iterator *st*) [virtual]

Implements cadabra::Algorithm.

9.163.3 Member Data Documentation

9.163.3.1 std::string cadabra::rename_dummies::dset1 [private]

9.163.3.2 std::string cadabra::rename_dummies::dset2 [private]

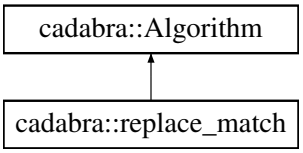
The documentation for this class was generated from the following files:

- core/algorithms/rename_dummies.hh
- core/algorithms/rename_dummies.cc

9.164 cadabra::replace_match Class Reference

`#include <replace_match.hh>`

Inheritance diagram for cadabra::replace_match:



Public Member Functions

- replace_match (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Additional Inherited Members

9.164.1 Constructor & Destructor Documentation

9.164.1.1 replace_match::replace_match (const Kernel & *k,* Ex & *e*)

9.164.2 Member Function Documentation

9.164.2.1 Algorithm::result_t replace_match::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.164.2.2 bool replace_match::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

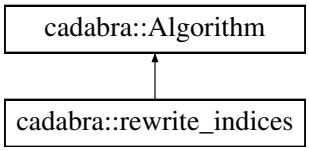
The documentation for this class was generated from the following files:

- core/algorithms/replace_match.hh
- core/algorithms/replace_match.cc

9.165 cadabra::rewrite_indices Class Reference

`#include <rewrite_indices.hh>`

Inheritance diagram for cadabra::rewrite_indices:



Public Member Functions

- rewrite_indices (const Kernel &, Ex &, Ex &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Private Attributes

- Ex preferred
- Ex converters
- bool is_derivative_argument

Additional Inherited Members

9.165.1 Constructor & Destructor Documentation

9.165.1.1 rewrite_indices::rewrite_indices (const Kernel & *k*, Ex & *e*, Ex & *pref*, Ex & *conv*)

9.165.2 Member Function Documentation

9.165.2.1 Algorithm::result_t rewrite_indices::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.165.2.2 bool rewrite_indices::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.165.3 Member Data Documentation

9.165.3.1 Ex cadabra::rewrite_indices::converters [private]

9.165.3.2 bool cadabra::rewrite_indices::is_derivative_argument [private]

9.165.3.3 Ex cadabra::rewrite_indices::preferred [private]

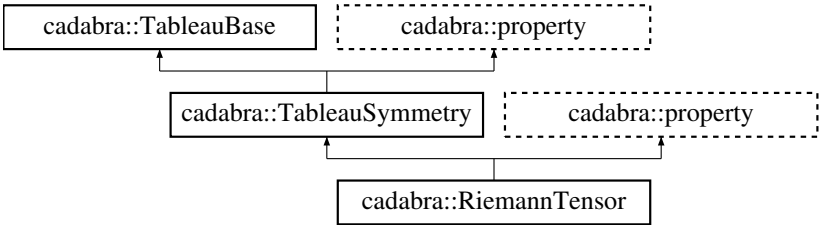
The documentation for this class was generated from the following files:

- core/algorithms/rewrite_indices.hh
- core/algorithms/rewrite_indices.cc

9.166 cadabra::RiemannTensor Class Reference

```
#include <RiemannTensor.hh>
```

Inheritance diagram for cadabra::RiemannTensor:



Public Member Functions

- RiemannTensor ()
- virtual std::string name () const override
- virtual void validate (const Kernel &, const Ex &) const override

Additional Inherited Members

9.166.1 Constructor & Destructor Documentation

9.166.1.1 RiemannTensor::RiemannTensor ( )

9.166.2 Member Function Documentation

9.166.2.1 std::string RiemannTensor::name ( ) const [override], [virtual]

Implements cadabra::property.

9.166.2.2 void RiemannTensor::validate (const Kernel & *kernel*, const Ex & *pat*) const [override], [virtual]

Reimplemented from cadabra::property.

The documentation for this class was generated from the following files:

- core/properties/RiemannTensor.hh
- core/properties/RiemannTensor.cc

9.167 RuntimeException Class Reference

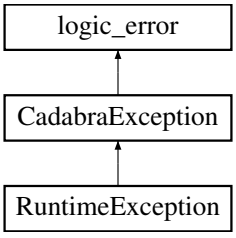
9.167.1 Description

Exception thrown when an algorithm cannot complete, e.g.

because it does not yet know how to process a particular expression. This gets thrown if returning the original expression would be a mathematical error.

```
#include <Exceptions.hh>
```

Inheritance diagram for RuntimeException:



Public Member Functions

- RuntimeException (std::string="")

9.167.2 Constructor & Destructor Documentation

9.167.2.1 RuntimeException::RuntimeException (std::string *s* = " ")

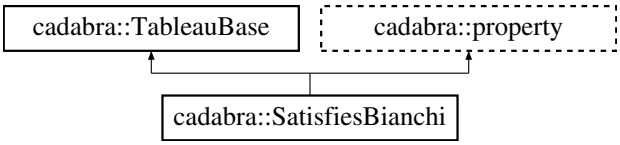
The documentation for this class was generated from the following files:

- core/Exceptions.hh
- core/Exceptions.cc

9.168 cadabra::SatisfiesBianchi Class Reference

`#include <SatisfiesBianchi.hh>`

Inheritance diagram for cadabra::SatisfiesBianchi:



Public Member Functions

- virtual std::string name () const override
- virtual unsigned int size (const Properties &, Ex &, Ex::iterator) const override
- virtual tab_t get_tab (const Properties &, Ex &, Ex::iterator, unsigned int) const override

Additional Inherited Members

9.168.1 Member Function Documentation

9.168.1.1 TableauBase::tab_t SatisfiesBianchi::get_tab (const Properties & *properties*, Ex & *tr*, Ex::iterator *it*, unsigned int *num*) const [override], [virtual]

Implements cadabra::TableauBase.

9.168.1.2 std::string SatisfiesBianchi::name ( ) const [override], [virtual]

Implements cadabra::property.

9.168.1.3 unsigned int SatisfiesBianchi::size (const Properties & *properties,* Ex & *tr,* Ex::iterator *it*) const [override], [virtual]

Implements cadabra::TableauBase.

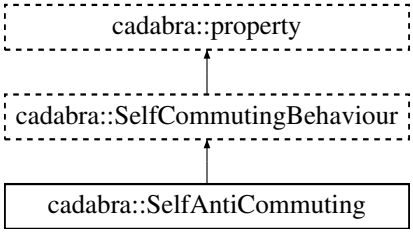
The documentation for this class was generated from the following files:

- core/properties/SatisfiesBianchi.hh
- core/properties/SatisfiesBianchi.cc

9.169 cadabra::SelfAntiCommuting Class Reference

`#include <SelfAntiCommuting.hh>`

Inheritance diagram for cadabra::SelfAntiCommuting:



Public Member Functions

- virtual std::string name () const override
- virtual int sign () const override

Additional Inherited Members

9.169.1 Member Function Documentation

9.169.1.1 std::string SelfAntiCommuting::name ( ) const [override], [virtual]

Implements cadabra::property.

9.169.1.2 int SelfAntiCommuting::sign ( ) const [override], [virtual]

Implements cadabra::SelfCommutingBehaviour.

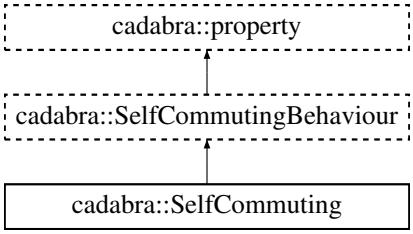
The documentation for this class was generated from the following files:

- core/properties/SelfAntiCommuting.hh
- core/properties/SelfAntiCommuting.cc

9.170 cadabra::SelfCommuting Class Reference

`#include <SelfCommuting.hh>`

Inheritance diagram for cadabra::SelfCommuting:



Public Member Functions

- virtual std::string name () const override
- virtual int sign () const override

Additional Inherited Members

9.170.1 Member Function Documentation

9.170.1.1 std::string SelfCommuting::name ( ) const [override], [virtual]

Implements cadabra::property.

9.170.1.2 int SelfCommuting::sign ( ) const [override], [virtual]

Implements cadabra::SelfCommutingBehaviour.

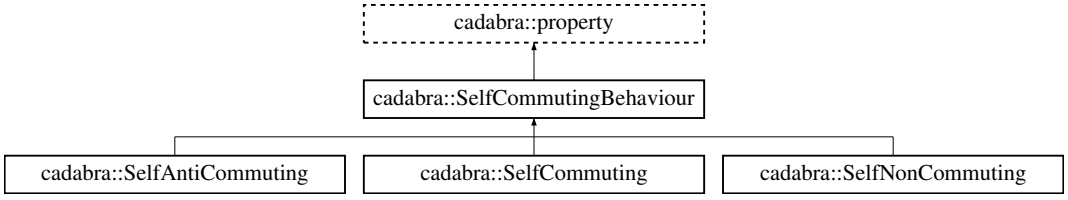
The documentation for this class was generated from the following files:

- core/properties/SelfCommuting.hh
- core/properties/SelfCommuting.cc

9.171 cadabra::SelfCommutingBehaviour Class Reference

`#include <SelfCommutingBehaviour.hh>`

Inheritance diagram for cadabra::SelfCommutingBehaviour:



Public Member Functions

- virtual int sign () const =0

Additional Inherited Members

9.171.1 Member Function Documentation

9.171.1.1 virtual int cadabra::SelfCommutingBehaviour::sign ( ) const [pure virtual]

Implemented in cadabra::SelfCommuting, cadabra::SelfAntiCommuting, and cadabra::SelfNonCommuting.

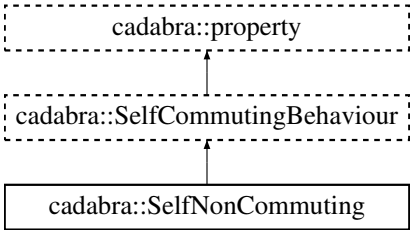
The documentation for this class was generated from the following file:

- core/properties/SelfCommutingBehaviour.hh

9.172 cadabra::SelfNonCommuting Class Reference

`#include <SelfNonCommuting.hh>`

Inheritance diagram for cadabra::SelfNonCommuting:



Public Member Functions

- virtual std::string name () const override
- virtual int sign () const override

Additional Inherited Members

9.172.1 Member Function Documentation

9.172.1.1 std::string SelfNonCommuting::name ( ) const [override], [virtual]

Implements cadabra::property.

9.172.1.2 int SelfNonCommuting::sign ( ) const [override], [virtual]

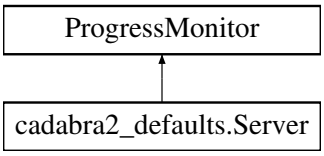
Implements cadabra::SelfCommutingBehaviour.

The documentation for this class was generated from the following files:

- core/properties/SelfNonCommuting.hh
- core/properties/SelfNonCommuting.cc

9.173 cadabra2_defaults.Server Class Reference

Inheritance diagram for cadabra2_defaults.Server:



Public Member Functions

- def send (self, data, typestr)
- def architecture (self)
- def test (self)
- def handles (self, otype)

9.173.1 Member Function Documentation

9.173.1.1 def cadabra2_defaults.Server.architecture (*self*)

9.173.1.2 def cadabra2_defaults.Server.handles (*self, otype*)

9.173.1.3 def cadabra2_defaults.Server.send (*self, data, typestr*)

9.173.1.4 def cadabra2_defaults.Server.test (*self*)

The documentation for this class was generated from the following file:

- core/cadabra2_defaults.py

9.174 Server Class Reference

9.174.1 Description

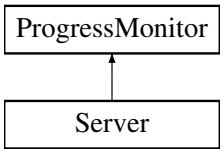
Object representing a Cadabra server, capable of receiving messages on a websocket, running Python code, and sending output back to the client.

Contains the logic to intercept raw Python output but also provides functionality to the Python side which enables clients to send various objects in JSON encoded form. See Server::on_block_finished for the format of these messages.

Every block is run on the same Python scope. They run sequentially, one at a time, on a thread separate from the websocket++ main loop. When the Python code finishes (or when it is interrupted), this thread locks the socket_↩ mutex and calls on_block_finished().

`#include <Server.hh>`

Inheritance diagram for Server:



Classes

- class Block
- class CatchOutput

  Python output catching.
- class Connection

Public Member Functions

- Server ()
- Server (const Server &)=delete
- Server (const std::string &socket)
- ~Server ()
- void run ()

  The only user-visible part: just instantiate a server object and start it with run().

Public Attributes

- CatchOutput catchOut
- CatchOutput catchErr
- Stopwatch server_stopwatch
- Stopwatch sympy_stopwatch

Private Types

- typedef websocketpp::server< websocketpp::config::asio > WebsocketServer
- typedef std::map< websocketpp::connection_hdl, Connection, std::owner_less< websocketpp::connection↩ _hdl > > ConnectionMap

Private Member Functions

- void init ()
- void on_socket_init (websocketpp::connection_hdl hdl, boost::asio::ip::tcp::socket &s)
- void on_message (websocketpp::connection_hdl hdl, WebsocketServer::message_ptr msg)
- void on_open (websocketpp::connection_hdl hdl)
- void on_close (websocketpp::connection_hdl hdl)
- void wait_for_job ()
- std::string run_string (const std::string &, bool handle_output=true)
- void on_block_finished (Block)

  Called by the run_block() thread upon completion of the task.
- void on_block_error (Block)
- void on_kernel_fault (Block)
- std::string architecture () const
- bool handles (const std::string &otype) const
- void send (const std::string &output, const std::string &msg_type)

  Raw code to send a string (which must be JSON formatted) as a message to the client.
- void send_json (const std::string &)
- void stop_block ()

  Halt the currently running block and prevent execution of any further blocks that may still be on the queue.
- void dispatch_message (websocketpp::connection_hdl, const std::string &json_string)

  Takes a JSON encoded message and performs the required action to process it.

Private Attributes

- WebsocketServer wserver
- std::string socket_name
- ConnectionMap connections
- std::mutex ws_mutex
- std::thread runner
- std::mutex block_available_mutex
- std::condition_variable block_available
- std::queue< Block > block_queue
- websocketpp::connection_hdl current_hdl
- uint64_t current_id
- bool started
- std::future< std::string > job
- boost::python::object main_module
- boost::python::object main_namespace
- int cells_ran

9.174.2 Member Typedef Documentation

9.174.2.1 typedef std::map<websocketpp::connection_hdl, Connection, std::owner_less<websocketpp::connection_hdl> > Server::ConnectionMap [private]

9.174.2.2 typedef websocketpp::server<websocketpp::config::asio> Server::WebsocketServer [private]

9.174.3 Constructor & Destructor Documentation

9.174.3.1 Server::Server ( )

9.174.3.2 Server::Server (const Server &) [delete]

9.174.3.3 Server::Server (const std::string & *socket*)

9.174.3.4 Server::~Server ( )

9.174.4 Member Function Documentation

9.174.4.1 std::string Server::architecture ( ) const [private]

9.174.4.2 void Server::dispatch_message (websocketpp::connection_hdl *hdl*, const std::string & *json_string*) [private]

Takes a JSON encoded message and performs the required action to process it.

Where applicable these messages are compatible with IPython's message types, http://ipython.org/ipython-doc/dev/development/messaging.html

9.174.4.3 bool Server::handles (const std::string & *otype*) const [private]

9.174.4.4 void Server::init ( ) [private]

9.174.4.5 void Server::on_block_error (Block *blk*) [private]

9.174.4.6 void Server::on_block_finished (Block *blk*) [private]

Called by the run_block() thread upon completion of the task.

This will send any output generated by printing directly to stdout or stderr from Python (so, output not generated by using the 'display' function). Indicates to the client that this block has finished executing. Will send an empty string if there has been no output 'print'ed.

9.174.4.7 void Server::on_close (websocketpp::connection_hdl *hdl*) [private]

9.174.4.8 void Server::on_kernel_fault (Block *blk*) [private]

9.174.4.9 void Server::on_message (websocketpp::connection_hdl *hdl,* WebsocketServer::message_ptr *msg*) [private]

9.174.4.10 void Server::on_open (websocketpp::connection_hdl *hdl*) [private]

9.174.4.11 void Server::on_socket_init (websocketpp::connection_hdl *hdl,* boost::asio::ip::tcp::socket & *s*) [private]

9.174.4.12 void Server::run ( )

The only user-visible part: just instantiate a server object and start it with run().

This will not return until the server has been shut down.

9.174.4.13 std::string Server::run_string (const std::string & *blk,* bool *handle_output* = true) [private]

9.174.4.14 void Server::send (const std::string & *output,* const std::string & *msg_type*) [private]

Raw code to send a string (which must be JSON formatted) as a message to the client.

Handles communication of the result back to the client in JSON format. This is always of the form

```
{ "header":   { "parent_id":     "...",
                "parent_origin": "client" | "server",
                "cell_id":       "...",
                "cell_origin":   "client" | "server"
```

}, "content": { "output": "..." }, "msg_type": "..." } msg_type can be "output", "latex", "image_png" and so on, corresponding to the possible values of DataCell::CellType.

9.174.4.15 void Server::send_json (const std::string & *msg*) [private]

9.174.4.16 void Server::stop_block ( ) [private]

Halt the currently running block and prevent execution of any further blocks that may still be on the queue.

9.174.4.17 void Server::wait_for_job ( ) [private]

9.174.5 Member Data Documentation

9.174.5.1 std::condition_variable Server::block_available [private]

9.174.5.2 std::mutex Server::block_available_mutex [private]

9.174.5.3 std::queue<Block> Server::block_queue [private]

9.174.5.4 CatchOutput Server::catchErr

9.174.5.5 CatchOutput Server::catchOut

9.174.5.6 int Server::cells_ran [private]

9.174.5.7 ConnectionMap Server::connections [private]

9.174.5.8 websocketpp::connection_hdl Server::current_hdl [private]

9.174.5.9 uint64_t Server::current_id [private]

9.174.5.10 std::future<std::string> Server::job [private]

9.174.5.11 boost::python::object Server::main_module [private]

9.174.5.12 boost::python::object Server::main_namespace [private]

9.174.5.13 std::thread Server::runner [private]

9.174.5.14 Stopwatch Server::server_stopwatch

9.174.5.15 std::string Server::socket_name [private]

9.174.5.16 bool Server::started [private]

9.174.5.17 Stopwatch Server::sympy_stopwatch

9.174.5.18 std::mutex Server::ws_mutex [private]

9.174.5.19 WebsocketServer Server::wserver [private]

The documentation for this class was generated from the following files:

- client_server/Server.hh
- client_server/Server.cc

9.175 ServerWrapper Class Reference

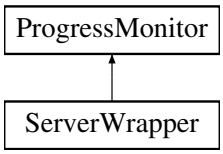
9.175.1 Description

A class which enables access to a Python-side defined Server object with ProgressMonitor interface.

It forwards calls on the group/progress members via Boost.Python to the Python defined Server object, thereby allowing the ProgressMonitor functionality to be exposed to Cadabra algorithms through a a single C++ interface, independent of whether it is implemented in the C++ Server object or in the Python one.

`#include <ServerWrapper.hh>`

Inheritance diagram for ServerWrapper:



Public Member Functions

- ServerWrapper ()
- virtual void group (std::string name="") override
- virtual void progress (int n, int total) override

Private Attributes

- boost::python::object server
- boost::python::object python_group
- boost::python::object python_progress

9.175.2 Constructor & Destructor Documentation

9.175.2.1 ServerWrapper::ServerWrapper ( )

9.175.3 Member Function Documentation

9.175.3.1 void ServerWrapper::group (std::string *name* = " ") [override], [virtual]

Reimplemented from ProgressMonitor.

9.175.3.2 void ServerWrapper::progress (int *n*, int *total*) [override], [virtual]

Reimplemented from ProgressMonitor.

9.175.4 Member Data Documentation

9.175.4.1 boost::python::object ServerWrapper::python_group [private]

9.175.4.2 boost::python::object ServerWrapper::python_progress [private]

9.175.4.3 boost::python::object ServerWrapper::server [private]

The documentation for this class was generated from the following files:

- core/ServerWrapper.hh
- core/ServerWrapper.cc

9.176 snoop::Snoop Class Reference

9.176.1 Description

Logging class with functionality to send log information to a remote server using a websocket connection.

`#include <Snoop.hh>`

Classes

- class AppEntry

  C++ representation of an run entry.
- class LogEntry

  C++ representation of a log entry.

Public Member Functions

- Snoop ()
- ~Snoop ()
- void init (const std::string &app_name, const std::string &app_version, std::string server="", std::string local_log_file="")

  Initialise the logging stream.
- std::string get_user_uuid (const std::string &app_name)

  Get a string which uniquely identifies the current user.
- Snoop & operator() (const std::string &type, std::string fl="", int loc=-1, std::string method="")

  Operator to initialise a logging entry with the type of the log message as well as (optionally) the file, line number and method.
- template<class T >
  Snoop & operator<< (const T &obj)

  Generic operator to log an object to the log message being constructed.
- Snoop & operator<< (const Flush &)

  Flush the log entry to disk/server.
- void set_sync_immediately (bool)

  Set to sync with server after every log line.
- void sync_with_server (bool from_wsthread=false)

  Ensure that the local database is synchronised with the server (this sends multiple app or log entries in one websocket message).
- void sync_runs_with_server (bool from_wsthread=false)

  As above, but only for run entries.
- void sync_logs_with_server (bool from_wsthread=false)

  As above, but only for log entries.

Protected Attributes

- std::ostringstream out_
- bool sync_immediately_
- SnoopImpl * impl
- friend SnoopImpl

9.176.2 Constructor & Destructor Documentation

9.176.2.1 Snoop::Snoop ( )

9.176.2.2 Snoop::~Snoop ( )

9.176.3 Member Function Documentation

9.176.3.1 std::string Snoop::get_user_uuid (const std::string & *app_name*)

Get a string which uniquely identifies the current user.

This is stored in ~/.config/snoop/appname.conf, and in the 'user_id' field in each LogEntry. Note that this is different from the 'uuid' field, which will change from one run to the next.

9.176.3.2 void Snoop::init (const std::string & *app_name*, const std::string & *app_version*, std::string *server* = " ", std::string *local_log_file* = " ")

Initialise the logging stream.

Should be called once at program startup, but can be called multiple times without causing problems.

9.176.3.3 Snoop & Snoop::operator() (const std::string & *type*, std::string *fl* = " ", int *loc* = -1, std::string *method* = " ")

Operator to initialise a logging entry with the type of the log message as well as (optionally) the file, line number and method.

9.176.3.4 template<class T > Snoop& snoop::Snoop::operator<< (const T & *obj*) [inline]

Generic operator to log an object to the log message being constructed.

9.176.3.5 Snoop & Snoop::operator<< (const Flush & *f*)

Flush the log entry to disk/server.

9.176.3.6 void Snoop::set_sync_immediately (bool *s*)

Set to sync with server after every log line.

9.176.3.7 void Snoop::sync_logs_with_server (bool *from_wsthread* = `false`)

As above, but only for log entries.

9.176.3.8 void Snoop::sync_runs_with_server (bool *from_wsthread* = `false`)

As above, but only for run entries.

9.176.3.9 void Snoop::sync_with_server (bool *from_wsthread* = `false`)

Ensure that the local database is synchronised with the server (this sends multiple app or log entries in one web-socket message).

Leave the bool argument at its default argument under all normal circumstances.

9.176.4 Member Data Documentation

9.176.4.1 SnoopImpl* snoop::Snoop::impl [protected]

9.176.4.2 std::ostringstream snoop::Snoop::out_ [protected]

9.176.4.3 friend snoop::Snoop::SnoopImpl [protected]

9.176.4.4 bool snoop::Snoop::sync_immediately_ [protected]

The documentation for this class was generated from the following files:

- client_server/Snoop.hh
- client_server/Snoop.cc

9.177 snoop::SnoopImpl Class Reference

`#include <SnoopPrivate.hh>`

Public Member Functions

- SnoopImpl (Snoop *)
- ~SnoopImpl ()
- Snoop & operator<< (const Flush &)
- void init (const std::string &app_name, const std::string &app_version, std::string server="", std::string local_log_file="")

  Initialise the logging stream.
- std::string get_user_uuid (const std::string &app_name)

  Get a string which uniquely identifies the current user.
- Snoop & operator() (const std::string &type, std::string fl="", int loc=-1, std::string method="")

  Operator to initialise a logging entry with the type of the log message as well as (optionally) the file, line number and method.
- void sync_with_server (bool from_wsthread=false)

  Ensure that the local database is synchronised with the server (this sends multiple app or log entries in one websocket message).
- void sync_runs_with_server (bool from_wsthread=false)

  As above, but only for run entries.
- void sync_logs_with_server (bool from_wsthread=false)

  As above, but only for log entries.
- void start_websocket_client ()

  Start the websocket client.
- void create_tables ()

  Ensure that the required tables are present in the database file.
- void obtain_uuid ()

  Obtain a uuid by finding the last AppEntry stored in the local database.
- bool store_app_entry (Snoop::AppEntry &)

  Store an app entry in the database.
- bool store_app_entry_without_lock (Snoop::AppEntry &)
- bool store_log_entry (Snoop::LogEntry &, bool avoid_server_duplicates)

  Store a log entry in the local database.
- std::vector< Snoop::AppEntry > get_app_registrations (std::string uuid_filter="")

  Return a vector of all aps registered in the database.
- void on_client_open (websocketpp::connection_hdl hdl)
- void on_client_fail (websocketpp::connection_hdl hdl)
- void on_client_close (websocketpp::connection_hdl hdl)
- void on_client_message (websocketpp::connection_hdl hdl, message_ptr msg)

Public Attributes

- Snoop * snoop_
- sqlite3 * db
- Snoop::AppEntry this_app_
- Snoop::LogEntry this_log_
- std::string server_
- sqlite3_stmt * insert_statement

  Prepared statements (only need to prepare these once).
- sqlite3_stmt * id_for_uuid_statement
- std::mutex sqlite_mutex
- WebsocketClient wsclient

  Websocket client to talk to a remote logging server.
- std::thread wsclient_thread

- std::mutex connection_mutex
- std::condition_variable connection_cv
- bool connection_is_open
- bool connection_attempt_failed
- WebsocketClient::connection_ptr connection
- websocketpp::connection_hdl our_connection_hdl

Private Attributes

- std::mutex call_mutex

9.177.1 Constructor & Destructor Documentation

9.177.1.1 SnoopImpl::SnoopImpl (Snoop * *s*)

9.177.1.2 SnoopImpl::~SnoopImpl ( )

9.177.2 Member Function Documentation

9.177.2.1 void SnoopImpl::create_tables ( )

Ensure that the required tables are present in the database file.

9.177.2.2 std::vector< Snoop::AppEntry > SnoopImpl::get_app_registrations (std::string *uuid_filter* = " ")

Return a vector of all aps registered in the database.

If the uuid filter is non-empty, will filter on the given uuid.

9.177.2.3 std::string SnoopImpl::get_user_uuid (const std::string & *app_name*)

Get a string which uniquely identifies the current user.

This is stored in ~/.config/snoop/appname.conf.

9.177.2.4 void SnoopImpl::init (const std::string & *app_name*, const std::string & *app_version*, std::string *server* = " ", std::string *local_log_file* = " ")

Initialise the logging stream.

Should be called once at program startup, but can be called multiple times without causing problems.

9.177.2.5 void SnoopImpl::obtain_uuid ( )

Obtain a uuid by finding the last AppEntry stored in the local database.

Will attempt to re-turn a previously generated uuid but will do so only if one is stored for the current pid; if no entry with the current pid is stored then a new one will always be generated.

9.177.2.6 void SnoopImpl::on_client_close (websocketpp::connection_hdl *hdl*)

9.177.2.7 void SnoopImpl::on_client_fail (websocketpp::connection_hdl *hdl*)

9.177.2.8 void SnoopImpl::on_client_message (websocketpp::connection_hdl *hdl,* message_ptr *msg*)

9.177.2.9 void SnoopImpl::on_client_open (websocketpp::connection_hdl *hdl*)

9.177.2.10 Snoop & SnoopImpl::operator() (const std::string & *type,* std::string *fl* = " ", int *loc* = -1, std::string *method* = " ")

Operator to initialise a logging entry with the type of the log message as well as (optionally) the file, line number and method.

Thread-safe: can be called from different threads at the same time.

9.177.2.11 Snoop & SnoopImpl::operator<< (const Flush &)

9.177.2.12 void SnoopImpl::start_websocket_client ( )

Start the websocket client.

This tries to connect to the server and then waits in a separate thread until the server sends us something (typically in response to something the main thread makes by calling wsclient.send).

9.177.2.13 bool SnoopImpl::store_app_entry (Snoop::AppEntry & *app*)

Store an app entry in the database.

Will update the 'id' field in the AppEntry.

9.177.2.14 bool SnoopImpl::store_app_entry_without_lock (Snoop::AppEntry & *app*)

9.177.2.15 bool SnoopImpl::store_log_entry (Snoop::LogEntry & *log_entry,* bool *avoid_server_duplicates*)

Store a log entry in the local database.

Generates its own receive_millis field (the one given gets overwritten). Will update the 'id' field in the LogEntry. Returns 'true' if the entry was stored, or 'false' if an entry with this client_log_id was already present (except when it is 0).

9.177.2.16 void SnoopImpl::sync_logs_with_server (bool *from_wsthread* = `false`)

As above, but only for log entries.

9.177.2.17 void SnoopImpl::sync_runs_with_server (bool *from_wsthread* = `false`)

As above, but only for run entries.

9.177.2.18 void SnoopImpl::sync_with_server (bool *from_wsthread* = `false`)

Ensure that the local database is synchronised with the server (this sends multiple app or log entries in one websocket message).

Leave the bool argument at its default argument under all normal circumstances.

9.177.3 Member Data Documentation

9.177.3.1 std::mutex snoop::SnoopImpl::call_mutex `[private]`

9.177.3.2 WebsocketClient::connection_ptr snoop::SnoopImpl::connection

9.177.3.3 bool snoop::SnoopImpl::connection_attempt_failed

9.177.3.4 std::condition_variable snoop::SnoopImpl::connection_cv

9.177.3.5 bool snoop::SnoopImpl::connection_is_open

9.177.3.6 std::mutex snoop::SnoopImpl::connection_mutex

9.177.3.7 sqlite3* snoop::SnoopImpl::db

9.177.3.8 sqlite3_stmt * snoop::SnoopImpl::id_for_uuid_statement

9.177.3.9 sqlite3_stmt* snoop::SnoopImpl::insert_statement

Prepared statements (only need to prepare these once).

9.177.3.10 websocketpp::connection_hdl snoop::SnoopImpl::our_connection_hdl

9.177.3.11 std::string snoop::SnoopImpl::server_

9.177.3.12 Snoop* snoop::SnoopImpl::snoop_

9.177.3.13 std::mutex snoop::SnoopImpl::sqlite_mutex

9.177.3.14 Snoop::AppEntry snoop::SnoopImpl::this_app_

9.177.3.15 Snoop::LogEntry snoop::SnoopImpl::this_log_

9.177.3.16 WebsocketClient snoop::SnoopImpl::wsclient

Websocket client to talk to a remote logging server.

9.177.3.17 std::thread snoop::SnoopImpl::wsclient_thread

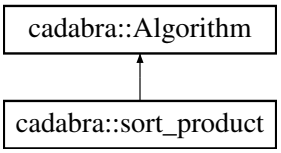
The documentation for this class was generated from the following files:

- client_server/SnoopPrivate.hh
- client_server/Snoop.cc

9.178 cadabra::sort_product Class Reference

`#include <sort_product.hh>`

Inheritance diagram for cadabra::sort_product:



Public Member Functions

- sort_product (const Kernel &, Ex &)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Private Attributes

- bool ignore_numbers_

Additional Inherited Members

9.178.1 Constructor & Destructor Documentation

9.178.1.1 sort_product::sort_product (const Kernel & *k*, Ex & *tr*)

9.178.2 Member Function Documentation

9.178.2.1 Algorithm::result_t sort_product::apply (iterator & *st*) [virtual]

Implements cadabra::Algorithm.

9.178.2.2 bool sort_product::can_apply (iterator *st*) [virtual]

Implements cadabra::Algorithm.

9.178.3 Member Data Documentation

9.178.3.1 bool cadabra::sort_product::ignore_numbers_ [private]

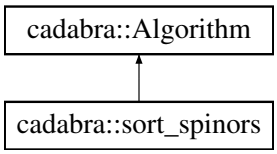
The documentation for this class was generated from the following files:

- core/algorithms/sort_product.hh
- core/algorithms/sort_product.cc

9.179 cadabra::sort_spinors Class Reference

`#include <sort_spinors.hh>`

Inheritance diagram for cadabra::sort_spinors:



Public Member Functions

- sort_spinors (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Public Attributes

- sibling_iterator one
- sibling_iterator gammamat
- sibling_iterator two

Additional Inherited Members

9.179.1 Constructor & Destructor Documentation

9.179.1.1 sort_spinors::sort_spinors (const Kernel & *k*, Ex & *e*)

9.179.2 Member Function Documentation

9.179.2.1 Algorithm::result_t sort_spinors::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.179.2.2 bool sort_spinors::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.179.3 Member Data Documentation

9.179.3.1 sibling_iterator cadabra::sort_spinors::gammamat

9.179.3.2 sibling_iterator cadabra::sort_spinors::one

9.179.3.3 sibling_iterator cadabra::sort_spinors::two

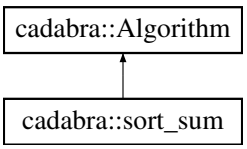
The documentation for this class was generated from the following files:

- core/algorithms/sort_spinors.hh
- core/algorithms/sort_spinors.cc

9.180 cadabra::sort_sum Class Reference

`#include <sort_sum.hh>`

Inheritance diagram for cadabra::sort_sum:



Public Member Functions

- sort_sum (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Private Member Functions

- bool should_swap (iterator obj, int subtree_comparison) const

Additional Inherited Members

9.180.1 Constructor & Destructor Documentation

9.180.1.1 sort_sum::sort_sum (const Kernel & *k*, Ex & *e*)

9.180.2 Member Function Documentation

9.180.2.1 Algorithm::result_t sort_sum::apply (iterator & *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.180.2.2 bool sort_sum::can_apply (iterator *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.180.2.3 bool sort_sum::should_swap (iterator *obj*, int *subtree_comparison*) const [private]

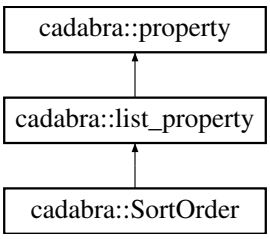
The documentation for this class was generated from the following files:

- core/algorithms/sort_sum.hh
- core/algorithms/sort_sum.cc

9.181 cadabra::SortOrder Class Reference

`#include <SortOrder.hh>`

Inheritance diagram for cadabra::SortOrder:



Public Member Functions

- virtual std::string name () const
- virtual match_t equals (const property *) const

Additional Inherited Members

9.181.1 Member Function Documentation

9.181.1.1 property::match_t SortOrder::equals (const property *) const [virtual]

Reimplemented from cadabra::property.

9.181.1.2 std::string SortOrder::name ( ) const [virtual]

Implements cadabra::property.

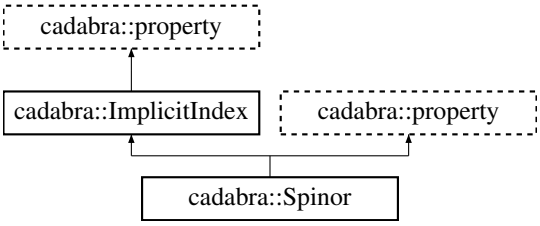
The documentation for this class was generated from the following files:

- core/properties/SortOrder.hh
- core/properties/SortOrder.cc

9.182 cadabra::Spinor Class Reference

`#include <Spinor.hh>`

Inheritance diagram for cadabra::Spinor:



Public Types

- enum { positive, negative }

Public Member Functions

- Spinor ()
- virtual ~Spinor ()
- virtual std::string name () const override
- virtual bool parse (const Kernel &, keyval_t &keyvals) override

Public Attributes

- int dimension
- bool weyl
- enum cadabra::Spinor:: { ... } chirality
- bool majorana

9.182.1 Member Enumeration Documentation

9.182.1.1 anonymous enum

Enumerator

positive

negative

9.182.2 Constructor & Destructor Documentation

9.182.2.1 Spinor::Spinor ( )

9.182.2.2 virtual cadabra::Spinor::~Spinor ( ) [inline], [virtual]

9.182.3 Member Function Documentation

9.182.3.1 std::string Spinor::name ( ) const [override], [virtual]

Implements cadabra::property.

9.182.3.2 bool Spinor::parse (const Kernel & *kernel,* keyval_t & *keyvals*) [override], [virtual]

Reimplemented from cadabra::property.

9.182.4 Member Data Documentation

9.182.4.1 enum { ... } cadabra::Spinor::chirality

9.182.4.2 int cadabra::Spinor::dimension

9.182.4.3 bool cadabra::Spinor::majorana

9.182.4.4 bool cadabra::Spinor::weyl

The documentation for this class was generated from the following files:

- core/properties/Spinor.hh
- core/properties/Spinor.cc

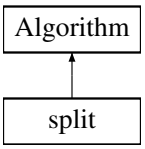
9.183 split Class Reference

9.183.1 Description

Split an expression into terms or factors.

`#include <split.hh>`

Inheritance diagram for split:



Public Member Functions

- split (const Kernel &, Ex &)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

9.183.2 Constructor & Destructor Documentation

9.183.2.1 split::split (const Kernel & , Ex &)

9.183.3 Member Function Documentation

9.183.3.1 Algorithm::result_t split::apply (iterator & *sum*) [virtual]

9.183.3.2 bool split::can_apply (iterator *st*) [virtual]

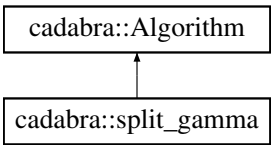
The documentation for this class was generated from the following files:

- core/algorithms/split.hh
- core/algorithms/split.cc

9.184 cadabra::split_gamma Class Reference

`#include <split_gamma.hh>`

Inheritance diagram for cadabra::split_gamma:



Public Member Functions

- split_gamma (const Kernel &, Ex &, bool on_back)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Public Attributes

- bool on_back

Additional Inherited Members

9.184.1 Constructor & Destructor Documentation

9.184.1.1 split_gamma::split_gamma (const Kernel & *k,* Ex & *e,* bool *on_back*)

9.184.2 Member Function Documentation

9.184.2.1 Algorithm::result_t split_gamma::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.184.2.2 bool split_gamma::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.184.3 Member Data Documentation

9.184.3.1 bool cadabra::split_gamma::on_back

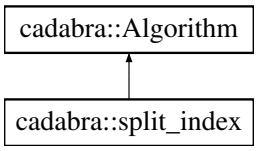
The documentation for this class was generated from the following files:

- core/algorithms/split_gamma.hh
- core/algorithms/split_gamma.cc

9.185 cadabra::split_index Class Reference

`#include <split_index.hh>`

Inheritance diagram for cadabra::split_index:



Public Member Functions

- split_index (const Kernel &, Ex &, Ex &)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Private Attributes

- const Indices * full_class
- const Indices * part1_class
- const Indices * part2_class
- const Coordinate * part1_coord
- const Coordinate * part2_coord
- bool part1_is_number
- bool part2_is_number
- long num1
- long num2
- iterator part1_coord_node
- iterator part2_coord_node

Additional Inherited Members

9.185.1 Constructor & Destructor Documentation

9.185.1.1 split_index::split_index (const Kernel & *k*, Ex & *tr*, Ex & *triple*)

9.185.2 Member Function Documentation

9.185.2.1 Algorithm::result_t split_index::apply (iterator & *it*) [virtual]

Implements cadabra::Algorithm.

9.185.2.2 bool split_index::can_apply (iterator *it*) [virtual]

Implements cadabra::Algorithm.

9.185.3 Member Data Documentation

9.185.3.1 const Indices* cadabra::split_index::full_class [private]

9.185.3.2 long cadabra::split_index::num1 [private]

9.185.3.3 long cadabra::split_index::num2 [private]

9.185.3.4 const Indices * cadabra::split_index::part1_class [private]

9.185.3.5 const Coordinate* cadabra::split_index::part1_coord [private]

9.185.3.6 iterator cadabra::split_index::part1_coord_node [private]

9.185.3.7 bool cadabra::split_index::part1_is_number [private]

9.185.3.8 const Indices * cadabra::split_index::part2_class [private]

9.185.3.9 const Coordinate * cadabra::split_index::part2_coord [private]

9.185.3.10 iterator cadabra::split_index::part2_coord_node [private]

9.185.3.11 bool cadabra::split_index::part2_is_number [private]

The documentation for this class was generated from the following files:

- core/algorithms/split_index.hh
- core/algorithms/split_index.cc

9.186 Stopwatch Class Reference

`#include <Stopwatch.hh>`

Public Member Functions

- Stopwatch ()
- void reset ()
- void start ()
- void stop ()
- long seconds () const
- long useconds () const
- bool stopped () const

Private Member Functions

- void checkpoint_ () const

Private Attributes

- struct timeval tv1 tv2
- struct timezone tz
- long diffsec
- long diffusec
- bool stopped_

Friends

- std::ostream & operator<< (std::ostream &, const Stopwatch &)

9.186.1 Constructor & Destructor Documentation

9.186.1.1 Stopwatch::Stopwatch ( )

9.186.2 Member Function Documentation

9.186.2.1 void Stopwatch::checkpoint_ ( ) const [private]

9.186.2.2 void Stopwatch::reset ( )

9.186.2.3 long Stopwatch::seconds ( ) const

9.186.2.4 void Stopwatch::start ( )

9.186.2.5 void Stopwatch::stop ( )

9.186.2.6 bool Stopwatch::stopped ( ) const

9.186.2.7 long Stopwatch::useconds ( ) const

9.186.3 Friends And Related Function Documentation

9.186.3.1 std::ostream& operator<< (std::ostream & , const Stopwatch &) [friend]

9.186.4 Member Data Documentation

9.186.4.1 long Stopwatch::diffsec [mutable], [private]

9.186.4.2 long Stopwatch::diffusec [mutable], [private]

9.186.4.3 bool Stopwatch::stopped_ [private]

9.186.4.4 struct timeval tv1 Stopwatch::tv2 [private]

9.186.4.5 struct timezone Stopwatch::tz [private]

The documentation for this class was generated from the following files:

- core/Stopwatch.hh
- core/Stopwatch.cc

9.187 cadabra::str_node Class Reference

9.187.1 Description

Elementary building block for a mathematical expression.

Contains information about the way in which the node is related to the parent node, and iterators into the global list of names and rationals.

`#include <Storage.hh>`

Classes

- struct flag_t

Public Types

- enum bracket_t {
  b_round =0, b_square =1, b_curly =2, b_pointy =3,
  b_none =4, b_no =5, b_invalid =6 }
- enum parent_rel_t {
  p_sub =0, p_super =1, p_none =2, p_property =3,
  p_exponent =4, p_components =5 }

  Child nodes are related to their parent node by a so-called parent relation, which can be one of these values.

Public Member Functions

- str_node (void)
- str_node (nset_t::iterator name, bracket_t btype=b_none, parent_rel_t ptype=p_none)
- str_node (const std::string &name, bracket_t btype=b_none, parent_rel_t ptype=p_none)
- bool operator== (const str_node &) const
- bool operator< (const str_node &) const
- void flip_parent_rel ()

  Change the parent relation from sub to super and vice versa (throws error when this is not an index).
- bool is_zero () const
- bool is_identity () const
- bool is_rational () const
- bool is_unsimplified_rational () const
- bool is_integer () const
- bool is_unsimplified_integer () const
- bool is_index () const
- bool is_quoted_string () const
- bool is_command () const
- bool is_inert_command () const
- bool is_name_wildcard () const
- bool is_object_wildcard () const
- bool is_range_wildcard () const
- bool is_siblings_wildcard () const
- bool is_autodeclare_wildcard () const
- bool is_indexstar_wildcard () const
- bool is_indexplus_wildcard () const
- bool is_numbered_symbol () const
- nset_t::iterator name_only ()

Static Public Member Functions

- static bool compare_names_only (const str_node &, const str_node &)
- static bool compare_name_brack_par (const str_node &, const str_node &)
- static bool compare_name_inverse_par (const str_node &, const str_node &)

Public Attributes

- nset_t::iterator name
- rset_t::iterator multiplier
- flag_t fl

9.187.2 Member Enumeration Documentation

9.187.2.1 enum cadabra::str_node::bracket_t

Enumerator

b_round

b_square

b_curly

b_pointy

b_none

b_no

b_invalid

9.187.2.2 enum cadabra::str_node::parent_rel_t

Child nodes are related to their parent node by a so-called parent relation, which can be one of these values.

Enumerator

p_sub

p_super

p_none

p_property

p_exponent

p_components

9.187.3 Constructor & Destructor Documentation

9.187.3.1 cadabra::str_node::str_node (void)

9.187.3.2 cadabra::str_node::str_node (nset_t::iterator *name,* bracket_t *btype* = b_none, parent_rel_t *ptype* = p_none)

9.187.3.3 cadabra::str_node::str_node (const std::string & *name,* bracket_t *btype* = b_none, parent_rel_t *ptype* = p_none)

9.187.4 Member Function Documentation

9.187.4.1 bool cadabra::str_node::compare_name_brack_par (const str_node & *one,* const str_node & *two*) [static]

9.187.4.2 bool cadabra::str_node::compare_name_inverse_par (const str_node & *one,* const str_node & *two*) [static]

9.187.4.3 bool cadabra::str_node::compare_names_only (const str_node & *one,* const str_node & *two*) [static]

9.187.4.4 void cadabra::str_node::flip_parent_rel ( )

Change the parent relation from sub to super and vice versa (throws error when this is not an index).

9.187.4.5 bool cadabra::str_node::is_autodeclare_wildcard ( ) const

9.187.4.6 bool cadabra::str_node::is_command ( ) const

9.187.4.7 bool cadabra::str_node::is_identity ( ) const

9.187.4.8 bool cadabra::str_node::is_index ( ) const

9.187.4.9 bool cadabra::str_node::is_indexplus_wildcard ( ) const

9.187.4.10 bool cadabra::str_node::is_indexstar_wildcard ( ) const

9.187.4.11 bool cadabra::str_node::is_inert_command ( ) const

9.187.4.12 bool cadabra::str_node::is_integer ( ) const

9.187.4.13 bool cadabra::str_node::is_name_wildcard ( ) const

9.187.4.14 bool cadabra::str_node::is_numbered_symbol ( ) const

9.187.4.15 bool cadabra::str_node::is_object_wildcard ( ) const

9.187.4.16 bool cadabra::str_node::is_quoted_string ( ) const

9.187.4.17 bool cadabra::str_node::is_range_wildcard ( ) const

9.187.4.18 bool cadabra::str_node::is_rational ( ) const

9.187.4.19 bool cadabra::str_node::is_siblings_wildcard ( ) const

9.187.4.20 bool cadabra::str_node::is_unsimplified_integer ( ) const

9.187.4.21 bool cadabra::str_node::is_unsimplified_rational ( ) const

9.187.4.22 bool cadabra::str_node::is_zero ( ) const

9.187.4.23 nset_t::iterator cadabra::str_node::name_only ( )

9.187.4.24 bool cadabra::str_node::operator< (const **str_node** & *other*) const

9.187.4.25 bool cadabra::str_node::operator== (const **str_node** & *other*) const

9.187.5 Member Data Documentation

9.187.5.1 flag_t cadabra::str_node::fl

9.187.5.2 rset_t::iterator cadabra::str_node::multiplier

9.187.5.3 nset_t::iterator cadabra::str_node::name

The documentation for this class was generated from the following files:

- core/Storage.hh
- core/Storage.cc

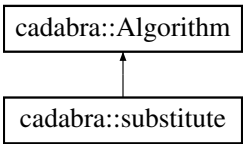
9.188 cadabra::substitute Class Reference

9.188.1 Description

Generic substitution algorithm.

`#include <substitute.hh>`

Inheritance diagram for cadabra::substitute:



Public Member Functions

- substitute (const Kernel &, Ex &tr, Ex &args)
- virtual bool can_apply (iterator st)

  Match the lhs of the replacement rule to the subtree 'st' under consideration.
- virtual result_t apply (iterator &)

Public Attributes

- Ex_comparator comparator

Private Attributes

- Ex & args
- iterator use_rule
- iterator conditions
- std::map< iterator, bool > lhs_contains_dummies
- std::map< iterator, bool > rhs_contains_dummies
- sort_product sort_product_

Additional Inherited Members

9.188.2 Constructor & Destructor Documentation

9.188.2.1 substitute::substitute (const Kernel & *k*, Ex & *tr*, Ex & *args*)

9.188.3 Member Function Documentation

9.188.3.1 Algorithm::result_t substitute::apply (iterator & *st*) [virtual]

Implements cadabra::Algorithm.

9.188.3.2 bool substitute::can_apply (iterator *st*) [virtual]

Match the lhs of the replacement rule to the subtree 'st' under consideration.

This will fill the replacement_map giving a map from objects appearing in the *rule* to what they matched to.

For F_{m n} -> G_{m n}, position-free indices and the expression F^{m n}, we would get a replacement map_m -> ^m _n -> ^n (Note how it is important that despite these indices being position-free, the rules in the replacement map do not ignore sub/superscript information). In the apply member, we then replace all of 'st' with the rhs of the rule, and scan through the rule (with a basic replacement_map.find based on simple tree comparison logic, not pattern matching) for replacements to be made.

Implements cadabra::Algorithm.

9.188.4 Member Data Documentation

9.188.4.1 Ex& cadabra::substitute::args [private]

9.188.4.2 Ex_comparator cadabra::substitute::comparator

9.188.4.3 iterator cadabra::substitute::conditions [private]

9.188.4.4 std::map<iterator, bool> cadabra::substitute::lhs_contains_dummies [private]

9.188.4.5 std::map<iterator, bool> cadabra::substitute::rhs_contains_dummies [private]

9.188.4.6 sort_product cadabra::substitute::sort_product_ [private]

9.188.4.7 iterator cadabra::substitute::use_rule [private]

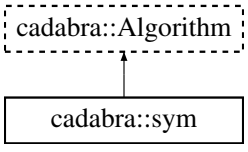
The documentation for this class was generated from the following files:

- core/algorithms/substitute.hh
- core/algorithms/substitute.cc

9.189 cadabra::sym Class Reference

```
#include <sym.hh>
```

Inheritance diagram for cadabra::sym:



Public Member Functions

- sym (const Kernel &, Ex &, Ex &, bool sign)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &it) override

Protected Member Functions

- result_t doit (iterator &, bool)

Protected Attributes

- Ex objects
- bool sign
- std::vector< unsigned int > argloc_2_treeloc
- combin::combinations< unsigned int > raw_ints

Additional Inherited Members

9.189.1 Constructor & Destructor Documentation

9.189.1.1 sym::sym (const Kernel & *k,* Ex & *tr,* Ex & *objs,* bool *sign*)

9.189.2 Member Function Documentation

9.189.2.1 Algorithm::result_t sym::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.189.2.2 bool sym::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.189.2.3 Algorithm::result_t sym::doit (iterator & *it,* bool *sign*) [protected]

9.189.3 Member Data Documentation

9.189.3.1 std::vector<unsigned int> cadabra::sym::argloc_2_treeloc [protected]

9.189.3.2 Ex cadabra::sym::objects [protected]

9.189.3.3 combin::combinations<unsigned int> cadabra::sym::raw_ints [protected]

9.189.3.4 bool cadabra::sym::sign [protected]

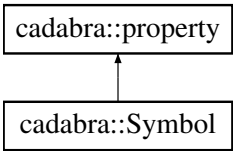
The documentation for this class was generated from the following files:

- core/algorithms/sym.hh
- core/algorithms/sym.cc

9.190 cadabra::Symbol Class Reference

`#include <Symbol.hh>`

Inheritance diagram for cadabra::Symbol:



Public Member Functions

- virtual std::string name () const

Static Public Member Functions

- static const Symbol * get (const Properties &, Ex::iterator, bool ignore_parent_rel=false)

Additional Inherited Members

9.190.1 Member Function Documentation

9.190.1.1 const Symbol * Symbol::get (const Properties & *properties*, Ex::iterator *it*, bool *ignore_parent_rel* = `false`) [static]

9.190.1.2 std::string Symbol::name ( ) const [virtual]

Implements cadabra::property.

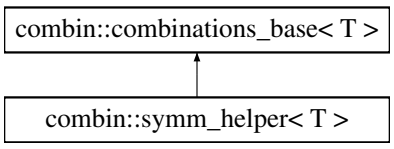
The documentation for this class was generated from the following files:

- core/properties/Symbol.hh
- core/properties/Symbol.cc

9.191 combin::symm_helper< T > Class Template Reference

`#include <Combinatorics.hh>`

Inheritance diagram for combin::symm_helper< T >:



Public Member Functions

- symm_helper (symmetriser< T > &)
- virtual void clear ()

Public Attributes

- int current_multiplicity

Protected Member Functions

- virtual void vector_generated (const std::vector< unsigned int > &)

Protected Attributes

- bool first_one
- symmetriser< T > & owner_

Additional Inherited Members

9.191.1 Constructor & Destructor Documentation

9.191.1.1 template<class T> combin::symm_helper< T >::symm_helper (symmetriser< T > & *tt*)

9.191.2 Member Function Documentation

9.191.2.1 template<class T > void combin::symm_helper< T >::clear ( ) [virtual]

Reimplemented from combin::combinations_base< T >.

9.191.2.2 template<class T > void combin::symm_helper< T >::vector_generated (const std::vector< unsigned int > & *vec*) [protected], [virtual]

Implements combin::combinations_base< T >.

9.191.3 Member Data Documentation

9.191.3.1 template<class T> int combin::symm_helper< T >::current_multiplicity

9.191.3.2 template<class T> bool combin::symm_helper< T >::first_one [protected]

9.191.3.3 template<class T> symmetriser<T>& combin::symm_helper< T >::owner_ [protected]

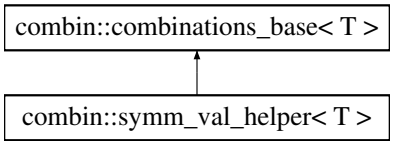
The documentation for this class was generated from the following file:

- core/Combinatorics.hh

9.192 combin::symm_val_helper< T > Class Template Reference

`#include <Combinatorics.hh>`

Inheritance diagram for combin::symm_val_helper< T >:



Public Member Functions

- symm_val_helper (symmetriser< T > &)
- virtual void clear ()

Public Attributes

- int current_multiplicity

Protected Member Functions

- virtual void vector_generated (const std::vector< unsigned int > &)

Protected Attributes

- bool first_one
- symmetriser< T > & owner_

Additional Inherited Members

9.192.1 Constructor & Destructor Documentation

9.192.1.1 template<class T> combin::symm_val_helper< T >::symm_val_helper (symmetriser< T > & *tt*)

9.192.2 Member Function Documentation

9.192.2.1 template<class T > void combin::symm_val_helper< T >::clear ( ) [virtual]

Reimplemented from combin::combinations_base< T >.

9.192.2.2 template<class T > void combin::symm_val_helper< T >::vector_generated (const std::vector< unsigned int > & *vec*) [protected], [virtual]

Implements combin::combinations_base< T >.

9.192.3 Member Data Documentation

9.192.3.1 template<class T> int combin::symm_val_helper< T >::current_multiplicity

9.192.3.2 template<class T> bool combin::symm_val_helper< T >::first_one [protected]

9.192.3.3 template<class T> symmetriser<T>& combin::symm_val_helper< T >::owner_ [protected]

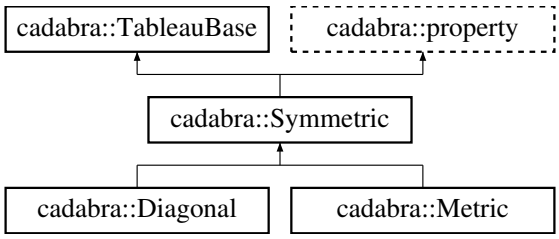
The documentation for this class was generated from the following file:

- core/Combinatorics.hh

9.193 cadabra::Symmetric Class Reference

`#include <Symmetric.hh>`

Inheritance diagram for cadabra::Symmetric:



Public Member Functions

- virtual std::string name () const override
- virtual unsigned int size (const Properties &, Ex &, Ex::iterator) const override
- virtual tab_t get_tab (const Properties &, Ex &, Ex::iterator, unsigned int) const override

Additional Inherited Members

9.193.1 Member Function Documentation

9.193.1.1 TableauBase::tab_t Symmetric::get_tab (const Properties & *pr,* Ex & *tr,* Ex::iterator *it,* unsigned int *num*) const [override], [virtual]

Implements cadabra::TableauBase.

9.193.1.2 std::string Symmetric::name ( ) const [override], [virtual]

Implements cadabra::property.

Reimplemented in cadabra::Metric, and cadabra::Diagonal.

9.193.1.3 unsigned int Symmetric::size (const Properties & , Ex & , Ex::iterator) const [override], [virtual]

Implements cadabra::TableauBase.

The documentation for this class was generated from the following files:

- core/properties/Symmetric.hh
- core/properties/Symmetric.cc

9.194 combin::symmetriser< T > Class Template Reference

`#include <Combinatorics.hh>`

Public Member Functions

- symmetriser ()
- void apply_symmetry (long start=-1, long end=-1)
- range_t values_to_locations (const std::vector< T > &values) const

  Convert vectors of values to vectors of locations in the original (mainly useful to create input_asym for permutation by value).
- const std::vector< T > & operator[ ] (unsigned int) const
- int signature (unsigned int) const
- void set_multiplicity (unsigned int pos, int val)
- unsigned int size () const
- void clear ()
- void collect ()

  Collect equal entries, and adjust the multiplier field accordingly.
- void remove_multiplicity_zero ()

Public Attributes

- std::vector< T > original
- unsigned int block_length
- std::vector< unsigned int > permute_blocks
- std::vector< T > value_permute
- int permutation_sign
- std::vector< unsigned int > sublengths
- range_vector_t input_asym
- range_vector_t sublengths_scattered

Private Attributes

- symm_helper< T > sh_
- symm_val_helper< T > svh_
- unsigned int current_
- std::vector< std::vector< T > > originals
- std::vector< int > multiplicity

Friends

- class symm_helper< T >
- class symm_val_helper< T >

9.194.1 Constructor & Destructor Documentation

9.194.1.1 template<class T > combin::symmetriser< T >::symmetriser ( )

9.194.2 Member Function Documentation

9.194.2.1 template<class T > void combin::symmetriser< T >::apply_symmetry (long *start* = −1, long *end* = −1)

9.194.2.2 template<class T > void combin::symmetriser< T >::clear ( )

9.194.2.3 template<class T > void combin::symmetriser< T >::collect ( )

Collect equal entries, and adjust the multiplier field accordingly.

9.194.2.4 template<class T > const std::vector< T > & combin::symmetriser< T >::operator[ ] (unsigned int *i*) const

9.194.2.5 template<class T > void combin::symmetriser< T >::remove_multiplicity_zero ( )

9.194.2.6 template<class T > void combin::symmetriser< T >::set_multiplicity (unsigned int *pos*, int *val*)

9.194.2.7 template<class T > int combin::symmetriser< T >::signature (unsigned int *i*) const

9.194.2.8 template<class T > unsigned int combin::symmetriser< T >::size ( ) const

9.194.2.9 template<class T> range_t combin::symmetriser< T >::values_to_locations (const std::vector< T > & *values*) const

Convert vectors of values to vectors of locations in the original (mainly useful to create input_asym for permutation by value).

9.194.3 Friends And Related Function Documentation

9.194.3.1 template<class T> friend class symm_helper< T > [friend]

9.194.3.2 template<class T> friend class symm_val_helper< T > [friend]

9.194.4 Member Data Documentation

9.194.4.1 template<class T> unsigned int combin::symmetriser< T >::block_length

9.194.4.2 template<class T> unsigned int combin::symmetriser< T >::current_ [private]

9.194.4.3 template<class T> range_vector_t combin::symmetriser< T >::input_asym

9.194.4.4 template<class T> std::vector<int> combin::symmetriser< T >::multiplicity [private]

9.194.4.5 template<class T> std::vector<T> combin::symmetriser< T >::original

9.194.4.6 template<class T> std::vector<std::vector<T> > combin::symmetriser< T >::originals [private]

9.194.4.7 template<class T> int combin::symmetriser< T >::permutation_sign

9.194.4.8 template<class T> std::vector<unsigned int> combin::symmetriser< T >::permute_blocks

9.194.4.9 template<class T> symm_helper<T> combin::symmetriser< T >::sh_ [private]

9.194.4.10 template<class T> std::vector<unsigned int> combin::symmetriser< T >::sublengths

9.194.4.11 template<class T> range_vector_t combin::symmetriser< T >::sublengths_scattered

9.194.4.12 template<class T> symm_val_helper<T> combin::symmetriser< T >::svh_ [private]

9.194.4.13 template<class T> std::vector<T> combin::symmetriser< T >::value_permute

The documentation for this class was generated from the following file:

- core/Combinatorics.hh

9.195 cadabra2_defaults.Sympy Class Reference

Static Private Attributes

- string __version__ = "unavailable"

9.195.1 Member Data Documentation

9.195.1.1 string cadabra2_defaults.Sympy.__version__ = "unavailable" [static], [private]

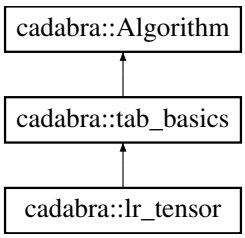
The documentation for this class was generated from the following file:

- core/cadabra2_defaults.py

9.196 cadabra::tab_basics Class Reference

`#include <tab_basics.hh>`

Inheritance diagram for cadabra::tab_basics:



Public Types

- typedef yngtab::filled_tableau< unsigned int > uinttab_t
- typedef yngtab::tableaux< uinttab_t > uinttabs_t

Public Member Functions

- tab_basics (const Kernel &, Ex &)
- void tree_to_numerical_tab (iterator, uinttab_t &)

  Convert an Ex to a numerical Young tableau, using num_to_it below.
- unsigned int find_obj (const Ex &other)
- void tabs_to_tree (uinttabs_t &, iterator, iterator, bool even_only)

  The inverse, converting tableaux to Ex objects attached as children of the iterator.
- void tabs_to_singlet_rules (uinttabs_t &, iterator)

Public Attributes

- std::vector< Ex::iterator > num_to_it

Additional Inherited Members

9.196.1 Member Typedef Documentation

9.196.1.1 typedef yngtab::filled_tableau<unsigned int> cadabra::tab_basics::uinttab_t

9.196.1.2 typedef yngtab::tableaux<uinttab_t> cadabra::tab_basics::uinttabs_t

9.196.2 Constructor & Destructor Documentation

9.196.2.1 tab_basics::tab_basics (const Kernel & *k,* Ex & *tr*)

9.196.3 Member Function Documentation

9.196.3.1 unsigned int tab_basics::find_obj (const Ex & *other*)

9.196.3.2 void tab_basics::tabs_to_singlet_rules (uinttabs_t & *tabs,* iterator *top*)

9.196.3.3 void tab_basics::tabs_to_tree (uinttabs_t & *tabs,* iterator *top,* iterator *tabpat,* bool *even_only*)

The inverse, converting tableaux to Ex objects attached as children of the iterator.

9.196.3.4 void tab_basics::tree_to_numerical_tab (iterator *tab1,* uinttab_t & *one*)

Convert an Ex to a numerical Young tableau, using num_to_it below.

9.196.4 Member Data Documentation

9.196.4.1 std::vector<Ex::iterator> cadabra::tab_basics::num_to_it

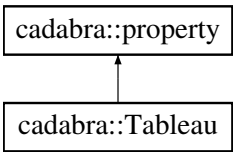
The documentation for this class was generated from the following files:

- core/algorithms/tab_basics.hh
- core/algorithms/tab_basics.cc

9.197 cadabra::Tableau Class Reference

`#include <Tableau.hh>`

Inheritance diagram for cadabra::Tableau:



Public Member Functions

- virtual ~Tableau ()
- virtual std::string name () const
- virtual bool parse (Ex &, Ex::iterator, Ex::iterator, keyval_t &)

Public Attributes

- int dimension

Additional Inherited Members

9.197.1 Constructor & Destructor Documentation

9.197.1.1 virtual cadabra::Tableau::~Tableau ( ) [inline], [virtual]

9.197.2 Member Function Documentation

9.197.2.1 std::string Tableau::name ( ) const [virtual]

Implements cadabra::property.

9.197.2.2 bool Tableau::parse (Ex & *tr,* Ex::iterator *pat,* Ex::iterator *prop,* keyval_t & *keyvals*) [virtual]

9.197.3 Member Data Documentation

9.197.3.1 int cadabra::Tableau::dimension

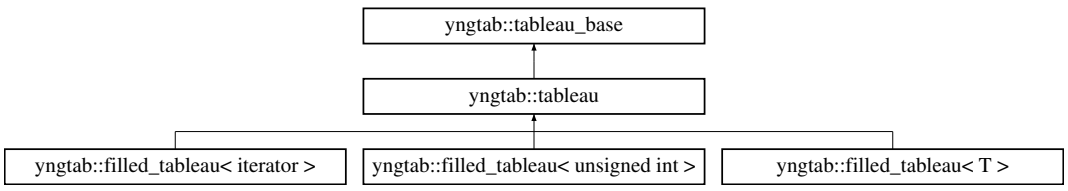
The documentation for this class was generated from the following files:

- core/properties/Tableau.hh
- core/properties/Tableau.cc

9.198 yngtab::tableau Class Reference

```
#include <YoungTab.hh>
```

Inheritance diagram for yngtab::tableau:



Public Member Functions

- virtual ~tableau ()
- virtual unsigned int number_of_rows () const
- virtual unsigned int row_size (unsigned int row) const
- virtual void add_box (unsigned int row)
- virtual void remove_box (unsigned int row)
- virtual void clear ()
- tableau & operator= (const tableau &)

Private Attributes

- std::vector< int > rows

Additional Inherited Members

9.198.1 Constructor & Destructor Documentation

9.198.1.1 yngtab::tableau::~tableau ( ) [virtual]

9.198.2 Member Function Documentation

9.198.2.1 void yngtab::tableau::add_box (unsigned int *row*) [virtual]

Implements yngtab::tableau_base.

Reimplemented in yngtab::filled_tableau< T >, yngtab::filled_tableau< unsigned int >, and yngtab::filled_tableau< iterator >.

9.198.2.2 void yngtab::tableau::clear ( ) [virtual]

Implements yngtab::tableau_base.

Reimplemented in yngtab::filled_tableau< T >, yngtab::filled_tableau< unsigned int >, and yngtab::filled_tableau< iterator >.

9.198.2.3 unsigned int yngtab::tableau::number_of_rows ( ) const [virtual]

Implements yngtab::tableau_base.

Reimplemented in yngtab::filled_tableau< T >, yngtab::filled_tableau< unsigned int >, and yngtab::filled_tableau< iterator >.

9.198.2.4 tableau & yngtab::tableau::operator= (const tableau & *other*)

9.198.2.5 void yngtab::tableau::remove_box (unsigned int *row*) [virtual]

Implements yngtab::tableau_base.

Reimplemented in yngtab::filled_tableau< T >, yngtab::filled_tableau< unsigned int >, and yngtab::filled_tableau< iterator >.

9.198.2.6 unsigned int yngtab::tableau::row_size (unsigned int *row*) const [virtual]

Implements yngtab::tableau_base.

Reimplemented in yngtab::filled_tableau< T >, yngtab::filled_tableau< unsigned int >, and yngtab::filled_tableau< iterator >.

9.198.3 Member Data Documentation

9.198.3.1 std::vector<int> yngtab::tableau::rows [private]

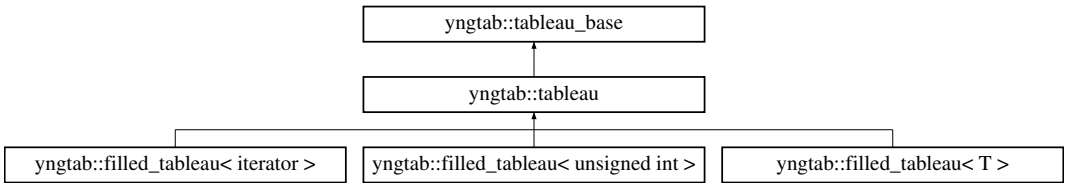
The documentation for this class was generated from the following files:

- core/YoungTab.hh
- core/YoungTab.cc

9.199 yngtab::tableau_base Class Reference

`#include <YoungTab.hh>`

Inheritance diagram for yngtab::tableau_base:



Public Member Functions

- tableau_base ()
- virtual ~tableau_base ()
- virtual unsigned int number_of_rows () const =0
- virtual unsigned int row_size (unsigned int row) const =0
- virtual unsigned int column_size (unsigned int col) const
- virtual void add_box (unsigned int row)=0
- virtual void remove_box (unsigned int row)=0
- virtual void add_row (unsigned int row_size)
- virtual void clear ()=0
- yngint_t dimension (unsigned int) const
- unsigned long hook_length (unsigned int row, unsigned int col) const
- yngint_t hook_length_prod () const

Public Attributes

- yngrat_t multiplicity
- int selfdual_column

9.199.1 Constructor & Destructor Documentation

9.199.1.1 yngtab::tableau_base::tableau_base ( )

9.199.1.2 yngtab::tableau_base::~tableau_base ( ) [virtual]

9.199.2 Member Function Documentation

9.199.2.1 virtual void yngtab::tableau_base::add_box (unsigned int *row*) [pure virtual]

Implemented in yngtab::filled_tableau< T >, yngtab::filled_tableau< unsigned int >, yngtab::filled_tableau< iterator >, and yngtab::tableau.

9.199.2.2 void yngtab::tableau_base::add_row (unsigned int *row_size*) [virtual]

9.199.2.3 virtual void yngtab::tableau_base::clear ( ) [pure virtual]

Implemented in yngtab::filled_tableau< T >, yngtab::filled_tableau< unsigned int >, yngtab::filled_tableau< iterator >, and yngtab::tableau.

9.199.2.4 unsigned int yngtab::tableau_base::column_size (unsigned int *col*) const [virtual]

9.199.2.5 yngint_t yngtab::tableau_base::dimension (unsigned int *dim*) const

9.199.2.6 unsigned long yngtab::tableau_base::hook_length (unsigned int *row,* unsigned int *col*) const

9.199.2.7 yngint_t yngtab::tableau_base::hook_length_prod ( ) const

9.199.2.8 virtual unsigned int yngtab::tableau_base::number_of_rows ( ) const [pure virtual]

Implemented in yngtab::filled_tableau< T >, yngtab::filled_tableau< unsigned int >, yngtab::filled_tableau< iterator >, and yngtab::tableau.

9.199.2.9 virtual void yngtab::tableau_base::remove_box (unsigned int *row*) [pure virtual]

Implemented in yngtab::filled_tableau< T >, yngtab::filled_tableau< unsigned int >, yngtab::filled_tableau< iterator >, and yngtab::tableau.

9.199.2.10 virtual unsigned int yngtab::tableau_base::row_size (unsigned int *row*) const [pure virtual]

Implemented in yngtab::filled_tableau< T >, yngtab::filled_tableau< unsigned int >, yngtab::filled_tableau< iterator >, and yngtab::tableau.

9.199.3 Member Data Documentation

9.199.3.1 yngrat_t yngtab::tableau_base::multiplicity

9.199.3.2 int yngtab::tableau_base::selfdual_column

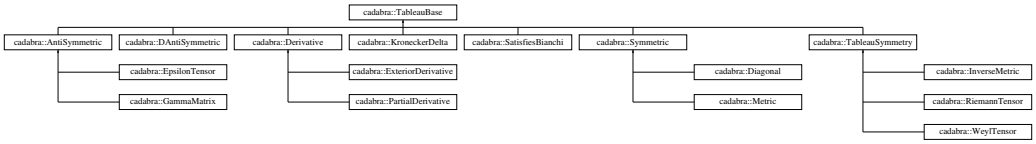
The documentation for this class was generated from the following files:

- core/YoungTab.hh
- core/YoungTab.cc

9.200 cadabra::TableauBase Class Reference

`#include <TableauBase.hh>`

Inheritance diagram for cadabra::TableauBase:



Public Types

- typedef yngtab::filled_tableau< unsigned int > tab_t

Public Member Functions

- virtual ~TableauBase ()
- virtual unsigned int size (const Properties &, Ex &, Ex::iterator) const =0
- virtual tab_t get_tab (const Properties &, Ex &, Ex::iterator, unsigned int) const =0
- virtual bool only_column_exchange () const
- int get_indexgroup (const Properties &, Ex &, Ex::iterator, int) const
- bool is_simple_symmetry (const Properties &, Ex &, Ex::iterator) const

9.200.1 Member Typedef Documentation

9.200.1.1 typedef yngtab::filled_tableau<unsigned int> cadabra::TableauBase::tab_t

9.200.2 Constructor & Destructor Documentation

9.200.2.1 virtual cadabra::TableauBase::~TableauBase ( ) [inline], [virtual]

9.200.3 Member Function Documentation

9.200.3.1 int TableauBase::get_indexgroup (const Properties & *pr,* Ex & *tr,* Ex::iterator *it,* int *indexnum*) const

9.200.3.2 virtual tab_t cadabra::TableauBase::get_tab (const Properties & , Ex & , Ex::iterator , unsigned *int*) const [pure virtual]

Implemented in cadabra::Derivative, cadabra::TableauSymmetry, cadabra::AntiSymmetric, cadabra::DAnti↩Symmetric, cadabra::KroneckerDelta, cadabra::PartialDerivative, cadabra::SatisfiesBianchi, and cadabra::↩Symmetric.

9.200.3.3 bool TableauBase::is_simple_symmetry (const Properties & *pr,* Ex & *tr,* Ex::iterator *it*) const

9.200.3.4 virtual bool cadabra::TableauBase::only_column_exchange ( ) const [inline], [virtual]

Reimplemented in cadabra::TableauSymmetry.

9.200.3.5 virtual unsigned int cadabra::TableauBase::size (const Properties & , Ex & , Ex::iterator) const [pure virtual]

Implemented in cadabra::Derivative, cadabra::TableauSymmetry, cadabra::AntiSymmetric, cadabra::DAnti↩Symmetric, cadabra::KroneckerDelta, cadabra::PartialDerivative, cadabra::SatisfiesBianchi, and cadabra::↩Symmetric.

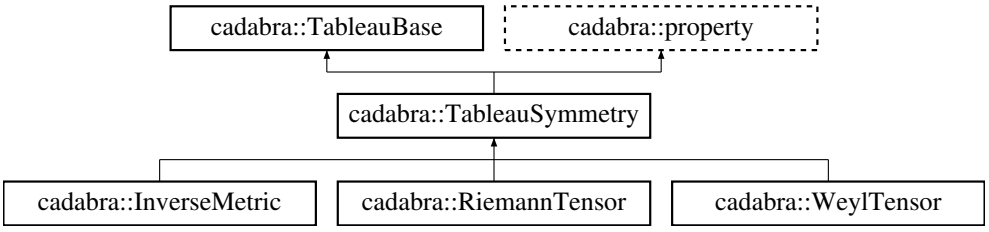
The documentation for this class was generated from the following files:

- core/properties/TableauBase.hh
- core/properties/TableauBase.cc

9.201 cadabra::TableauSymmetry Class Reference

`#include <TableauSymmetry.hh>`

Inheritance diagram for cadabra::TableauSymmetry:



Public Member Functions

- virtual ~TableauSymmetry ()
- virtual bool parse (const Kernel &, keyval_t &) override
- virtual std::string name () const override
- virtual void latex (std::ostream &) const override

  Display the property on the stream.
- virtual unsigned int size (const Properties &, Ex &, Ex::iterator) const override
- virtual tab_t get_tab (const Properties &, Ex &, Ex::iterator, unsigned int) const override
- virtual bool only_column_exchange () const override

Public Attributes

- std::vector< tab_t > tabs

Private Attributes

- bool only_col_

Additional Inherited Members

9.201.1 Constructor & Destructor Documentation

9.201.1.1 TableauSymmetry::~TableauSymmetry ( ) [virtual]

9.201.2 Member Function Documentation

9.201.2.1 TableauBase::tab_t TableauSymmetry::get_tab (const Properties & , Ex & , Ex::iterator , unsigned int *num*) const [override], [virtual]

Implements cadabra::TableauBase.

9.201.2.2 void TableauSymmetry::latex (std::ostream & *str*) const [override], [virtual]

Display the property on the stream.

Generate a LaTeX representation of the property, assuming LaTeX is in text mode (so it needs dollar symbols to switch to maths).

Reimplemented from cadabra::property.

Reimplemented in cadabra::WeylTensor.

9.201.2.3 std::string TableauSymmetry::name ( ) const [override], [virtual]

Implements cadabra::property.

Reimplemented in cadabra::InverseMetric, cadabra::WeylTensor, and cadabra::RiemannTensor.

9.201.2.4 bool TableauSymmetry::only_column_exchange ( ) const [override], [virtual]

Reimplemented from cadabra::TableauBase.

9.201.2.5 bool TableauSymmetry::parse (const Kernel & *kernel*, keyval_t & *keyvals*) [override], [virtual]

Reimplemented from cadabra::property.

Reimplemented in cadabra::InverseMetric.

9.201.2.6 unsigned int TableauSymmetry::size (const Properties & , Ex & , Ex::iterator) const [override], [virtual]

Implements cadabra::TableauBase.

9.201.3 Member Data Documentation

9.201.3.1 bool cadabra::TableauSymmetry::only_col_ [private]

9.201.3.2 std::vector<tab_t> cadabra::TableauSymmetry::tabs

The documentation for this class was generated from the following files:

- core/properties/TableauSymmetry.hh
- core/properties/TableauSymmetry.cc

9.202 yngtab::tableaux< T > Class Template Reference

`#include <YoungTab.hh>`

Public Types

- typedef std::list< T > tableau_container_t
- typedef std::back_insert_iterator< tableau_container_t > back_insert_iterator

Public Member Functions

- yngint_t total_dimension (unsigned int dim)
- void remove_nullifying_traces ()
- bool standard_form ()

  Put the set of tableaux into standard form by using Garnir symmetries.
- void add_tableau (const T &)
- void symmetrise (const T &tabsym)
- back_insert_iterator get_back_insert_iterator ()

Public Attributes

- tableau_container_t storage

9.202.1 Member Typedef Documentation

9.202.1.1 template<class T> typedef std::back_insert_iterator<tableau_container_t> yngtab::tableaux< T >::back_insert_iterator

9.202.1.2 template<class T> typedef std::list<T> yngtab::tableaux< T >::tableau_container_t

9.202.2 Member Function Documentation

9.202.2.1 template<class T> void yngtab::tableaux< T >::add_tableau (const T & *ntab*)

9.202.2.2 template<class T > tableaux< T >::back_insert_iterator yngtab::tableaux< T >::get_back_insert_iterator ( )

9.202.2.3 template<class T > void yngtab::tableaux< T >::remove_nullifying_traces ( )

9.202.2.4 template<class T > bool yngtab::tableaux< T >::standard_form ( )

Put the set of tableaux into standard form by using Garnir symmetries.

Return value indicates whether the tableaux were already all in standard form.

9.202.2.5 template<class T> void yngtab::tableaux< T >::symmetrise (const T & *tabsym*)

9.202.2.6 template<class T > yngint_t yngtab::tableaux< T >::total_dimension (unsigned int *dim*)

9.202.3 Member Data Documentation

9.202.3.1 template<class T> tableau_container_t yngtab::tableaux< T >::storage

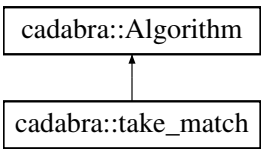
The documentation for this class was generated from the following file:

- core/YoungTab.hh

9.203 cadabra::take_match Class Reference

`#include <take_match.hh>`

Inheritance diagram for cadabra::take_match:



Public Member Functions

- take_match (const Kernel &k, Ex &e, Ex &r)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Private Attributes

- Ex & rules

Additional Inherited Members

9.203.1 Constructor & Destructor Documentation

9.203.1.1 take_match::take_match (const Kernel & *k,* Ex & *e,* Ex & *r*)

9.203.2 Member Function Documentation

9.203.2.1 Algorithm::result_t take_match::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.203.2.2 bool take_match::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.203.3 Member Data Documentation

9.203.3.1 Ex& cadabra::take_match::rules [private]

The documentation for this class was generated from the following files:

- core/algorithms/take_match.hh
- core/algorithms/take_match.cc

9.204 cadabra::exchange::tensor_type_t Struct Reference

`#include <Exchange.hh>`

Public Attributes

- nset_t::iterator name
- unsigned int number_of_indices

9.204.1 Member Data Documentation

9.204.1.1 nset_t::iterator cadabra::exchange::tensor_type_t::name

9.204.1.2 unsigned int cadabra::exchange::tensor_type_t::number_of_indices

The documentation for this struct was generated from the following file:

- core/Exchange.hh

9.205 cadabra::TerminalStream Class Reference

`#include <TerminalStream.hh>`

Public Member Functions

- TerminalStream (const Kernel &, std::ostream &)
- TerminalStream & operator<< (const Ex &)
- TerminalStream & operator<< (std::shared_ptr< Ex >)
- template<class T >
  TerminalStream & operator<< (const T &obj)
- TerminalStream & operator<< (std::ostream &(*os)(std::ostream &))

Private Attributes

- const Kernel & kernel
- std::ostream & out_

9.205.1 Constructor & Destructor Documentation

9.205.1.1 TerminalStream::TerminalStream (const Kernel & *k*, std::ostream & *s*)

9.205.2 Member Function Documentation

9.205.2.1 TerminalStream & TerminalStream::operator<< (const Ex & *ex*)

9.205.2.2 TerminalStream & TerminalStream::operator<< (std::shared_ptr< Ex > *ex*)

9.205.2.3 template<class T > TerminalStream& cadabra::TerminalStream::operator<< (const T & *obj*) [inline]

9.205.2.4 TerminalStream& cadabra::TerminalStream::operator<< (std::ostream &(*)(std::ostream &) *os*) [inline]

9.205.3 Member Data Documentation

9.205.3.1 const Kernel& cadabra::TerminalStream::kernel [private]

9.205.3.2 std::ostream& cadabra::TerminalStream::out_ [private]

The documentation for this class was generated from the following files:

- core/TerminalStream.hh
- core/TerminalStream.cc

9.206 cadabra::TeXEngine Class Reference

9.206.1 Description

TeXEngine is used to convert LaTeX strings into PNG images.

This is a two-stage process: you first 'check in' a string into the system, in exchange for a pointer to a TeXRequest object. When you are ready to retrieve the image, call 'get_pixbuf'.

If you need to generate images for more than one string, simply check them all in and then call 'convert_all' before retrieving the pixbufs. This requires only one round-trip through latex/dvipng.

```
#include <TeXEngine.hh>
```

Classes

- class TeXException
- class TeXRequest

Public Member Functions

- TeXEngine ()
- ~TeXEngine ()
- void set_geometry (int horizontal_pixels)
- void set_scale (double)
- void set_font_size (int font_size)
- std::shared_ptr< TeXRequest > checkin (const std::string &, const std::string &startwrap, const std::string &endwrap)
- std::shared_ptr< TeXRequest > modify (std::shared_ptr< TeXRequest >, const std::string &)
- void convert_all ()

  Generate images for all TeXRequests which are labelled as needing conversion.
- void invalidate_all ()

  Mark all TeXRequests as needing re-generating.
- void checkout (std::shared_ptr< TeXRequest >)

  Mark a TeXRequest as no longer being needed.
- void checkout_all ()

Public Attributes

- std::vector< std::string > latex_packages

Private Member Functions

- void erase_file (const std::string &) const
- void convert_one (std::shared_ptr< TeXRequest >)
- void convert_set (std::set< std::shared_ptr< TeXRequest > > &)
- std::string handle_latex_errors (const std::string &, int exit_code) const

Private Attributes

- std::set< std::shared_ptr< TeXRequest > > requests
- std::string preamble_string
- int horizontal_pixels_
- int font_size_
- double scale_

Static Private Attributes

- static double millimeter_per_inch = 25.4

9.206.2 Constructor & Destructor Documentation

9.206.2.1 TeXEngine::TeXEngine ( )

9.206.2.2 TeXEngine::~TeXEngine ( )

9.206.3 Member Function Documentation

9.206.3.1 std::shared_ptr< TeXEngine::TeXRequest > TeXEngine::checkin (const std::string & *txt,* const std::string & *startwrap,* const std::string & *endwrap*)

9.206.3.2 void TeXEngine::checkout (std::shared_ptr< TeXRequest > *req*)

Mark a TeXRequest as no longer being needed.

9.206.3.3 void TeXEngine::checkout_all ( )

9.206.3.4 void TeXEngine::convert_all ( )

Generate images for all TeXRequests which are labelled as needing conversion.

9.206.3.5 void TeXEngine::convert_one (std::shared_ptr< TeXRequest > *req*) [private]

9.206.3.6 void TeXEngine::convert_set (std::set< std::shared_ptr< TeXRequest > > & *reqs*) [private]

9.206.3.7 void TeXEngine::erase_file (const std::string & *nm*) const [private]

9.206.3.8 std::string TeXEngine::handle_latex_errors (const std::string & *result,* int *exit_code*) const [private]

9.206.3.9 void TeXEngine::invalidate_all ( )

Mark all TeXRequests as needing re-generating.

Use this e.g. when changing font size for the entire notebook: first invalidate_all, then convert_all.

9.206.3.10 std::shared_ptr< TeXEngine::TeXRequest > TeXEngine::modify (std::shared_ptr< TeXRequest > *req*, const std::string & *txt*)

9.206.3.11 void TeXEngine::set_font_size (int *font_size*)

9.206.3.12 void TeXEngine::set_geometry (int *horizontal_pixels*)

9.206.3.13 void TeXEngine::set_scale (double *scale*)

9.206.4 Member Data Documentation

9.206.4.1 int cadabra::TeXEngine::font_size_ [private]

9.206.4.2 int cadabra::TeXEngine::horizontal_pixels_ [private]

9.206.4.3 std::vector<std::string> cadabra::TeXEngine::latex_packages

9.206.4.4 double TeXEngine::millimeter_per_inch = 25.4 [static], [private]

9.206.4.5 std::string cadabra::TeXEngine::preamble_string [private]

9.206.4.6 std::set<std::shared_ptr<TeXRequest> > cadabra::TeXEngine::requests [private]

9.206.4.7 double cadabra::TeXEngine::scale_ [private]

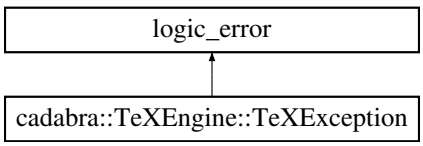
The documentation for this class was generated from the following files:

- frontend/common/TeXEngine.hh
- frontend/common/TeXEngine.cc

9.207 cadabra::TeXEngine::TeXException Class Reference

`#include <TeXEngine.hh>`

Inheritance diagram for cadabra::TeXEngine::TeXException:



Public Member Functions

- TeXException (const std::string &)

9.207.1 Constructor & Destructor Documentation

9.207.1.1 TeXEngine::TeXException::TeXException (const std::string & *str*)

The documentation for this class was generated from the following files:

- frontend/common/TeXEngine.hh
- frontend/common/TeXEngine.cc

9.208 cadabra::TeXEngine::TeXRequest Class Reference

`#include <TeXEngine.hh>`

Public Member Functions

- TeXRequest ()
- unsigned width () const
- unsigned height () const
- const std::vector< unsigned char > & image () const

Private Attributes

- std::string latex_string
- std::string start_wrap
- std::string end_wrap
- bool needs_generating
- std::vector< unsigned char > image_
- unsigned width_
- unsigned height_

Friends

- class TeXEngine

9.208.1 Constructor & Destructor Documentation

9.208.1.1 TeXEngine::TeXRequest::TeXRequest ( )

9.208.2 Member Function Documentation

9.208.2.1 unsigned TeXEngine::TeXRequest::height ( ) const

9.208.2.2 const std::vector< unsigned char > & TeXEngine::TeXRequest::image ( ) const

9.208.2.3 unsigned TeXEngine::TeXRequest::width ( ) const

9.208.3 Friends And Related Function Documentation

9.208.3.1 friend class TeXEngine [friend]

9.208.4 Member Data Documentation

9.208.4.1 std::string cadabra::TeXEngine::TeXRequest::end_wrap [private]

9.208.4.2 unsigned cadabra::TeXEngine::TeXRequest::height_ [private]

9.208.4.3 std::vector<unsigned char> cadabra::TeXEngine::TeXRequest::image_ [private]

9.208.4.4 std::string cadabra::TeXEngine::TeXRequest::latex_string [private]

9.208.4.5 bool cadabra::TeXEngine::TeXRequest::needs_generating [private]

9.208.4.6 std::string cadabra::TeXEngine::TeXRequest::start_wrap [private]

9.208.4.7 unsigned cadabra::TeXEngine::TeXRequest::width_ [private]

The documentation for this class was generated from the following files:

- frontend/common/TeXEngine.hh
- frontend/common/TeXEngine.cc

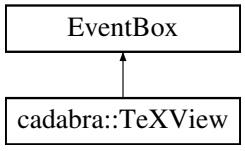
9.209 cadabra::TeXView Class Reference

9.209.1 Description

TeXView is a widget which knows how to turn a string into a LaTeX-rendered image and display that.

```
#include <TeXView.hh>
```

Inheritance diagram for cadabra::TeXView:



Public Member Functions

- TeXView (TeXEngine &, DTree::iterator, int hmargin=25)
- virtual ~TeXView ()
- void update_image ()

  Update the visible image from the pixbuf.
- void dim (bool)

  Dim the output to indicate that the result is no longer guaranteed to be correlated with the input cell from which it was derived.

Public Attributes

- std::shared_ptr< TeXEngine::TeXRequest > content
- sigc::signal1< bool, DTree::iterator > show_hide_requested
- DTree::iterator datacell
- Gtk::VBox vbox
- Gtk::HBox hbox
- Gtk::Image image
- Glib::RefPtr< Gdk::Pixbuf > pixbuf

  The actual image is stored in the image referenced by pixbuf.
- sigc::signal1< bool, std::string > tex_error

Protected Member Functions

- virtual bool on_button_release_event (GdkEventButton *) override
- virtual void on_show () override
- void convert ()

Private Attributes

- TeXEngine & engine

9.209.2 Constructor & Destructor Documentation

9.209.2.1 TeXView::TeXView (TeXEngine & *eng*, DTree::iterator *it*, int *hmargin* = 25)

9.209.2.2 TeXView::~TeXView ( ) [virtual]

9.209.3 Member Function Documentation

9.209.3.1 void TeXView::convert ( ) [protected]

9.209.3.2 void TeXView::dim (bool *d*)

Dim the output to indicate that the result is no longer guaranteed to be correlated with the input cell from which it was derived.

9.209.3.3 bool TeXView::on_button_release_event (GdkEventButton * *ev*) [override], [protected], [virtual]

9.209.3.4 void TeXView::on_show ( ) [override], [protected], [virtual]

9.209.3.5 void TeXView::update_image ( )

Update the visible image from the pixbuf.

Call this in order to propagate changes to the pixbuf (e.g. from re-running the TeXRequest) to the visible widget itself.

9.209.4 Member Data Documentation

9.209.4.1 std::shared_ptr<TeXEngine::TeXRequest> cadabra::TeXView::content

9.209.4.2 DTree::iterator cadabra::TeXView::datacell

9.209.4.3 TeXEngine& cadabra::TeXView::engine [private]

9.209.4.4 Gtk::HBox cadabra::TeXView::hbox

9.209.4.5 Gtk::Image cadabra::TeXView::image

9.209.4.6 Glib::RefPtr<Gdk::Pixbuf> cadabra::TeXView::pixbuf

The actual image is stored in the image referenced by pixbuf.

FIXME: This pointer is not yet shared among instances which show the same content.

9.209.4.7 sigc::signal1<bool, DTree::iterator> cadabra::TeXView::show_hide_requested

9.209.4.8 sigc::signal1<bool, std::string> cadabra::TeXView::tex_error

9.209.4.9 Gtk::VBox cadabra::TeXView::vbox

The documentation for this class was generated from the following files:

- frontend/gtkmm/TeXView.hh
- frontend/gtkmm/TeXView.cc

9.210 ProgressMonitor::Total Class Reference

`#include <ProgressMonitor.hh>`

Public Member Functions

- Total ()
- long time_spent_as_long () const
- bool operator== (const Total &other) const
- std::string str () const

Public Attributes

- std::string name
- size_t call_count
- std::chrono::milliseconds time_spent
- int total_steps

9.210.1 Constructor & Destructor Documentation

9.210.1.1 ProgressMonitor::Total::Total ( )

9.210.2 Member Function Documentation

9.210.2.1 bool ProgressMonitor::Total::operator== (const Total & *other*) const

9.210.2.2 std::string ProgressMonitor::Total::str ( ) const

9.210.2.3 long ProgressMonitor::Total::time_spent_as_long ( ) const

9.210.3 Member Data Documentation

9.210.3.1 size_t ProgressMonitor::Total::call_count

9.210.3.2 std::string ProgressMonitor::Total::name

9.210.3.3 std::chrono::milliseconds ProgressMonitor::Total::time_spent

9.210.3.4 int ProgressMonitor::Total::total_steps

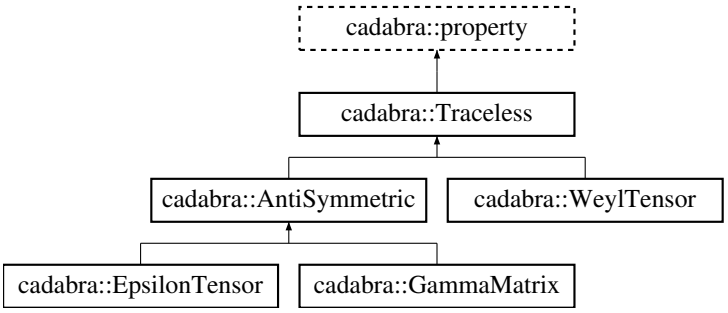
The documentation for this class was generated from the following files:

- core/ProgressMonitor.hh
- core/ProgressMonitor.cc

9.211 cadabra::Traceless Class Reference

`#include <Traceless.hh>`

Inheritance diagram for cadabra::Traceless:



Public Member Functions

- virtual ~Traceless ()
- virtual std::string name () const

Additional Inherited Members

9.211.1 Constructor & Destructor Documentation

9.211.1.1 virtual cadabra::Traceless::~Traceless ( ) [inline], [virtual]

9.211.2 Member Function Documentation

9.211.2.1 std::string Traceless::name ( ) const [virtual]

Implements cadabra::property.

Reimplemented in cadabra::EpsilonTensor, cadabra::AntiSymmetric, cadabra::WeylTensor, and cadabra::GammaMatrix.

The documentation for this class was generated from the following files:

- core/properties/Traceless.hh
- core/properties/Traceless.cc

9.212 cadabra::tree_equal_obj Class Reference

`#include <Compare.hh>`

Public Member Functions

- tree_equal_obj (const Properties ∗)
- bool operator() (const Ex &first, const Ex &second) const

Private Attributes

- const Properties ∗ properties

9.212.1 Constructor & Destructor Documentation

9.212.1.1 cadabra::tree_equal_obj::tree_equal_obj (const Properties ∗ *k*)

9.212.2 Member Function Documentation

9.212.2.1 bool cadabra::tree_equal_obj::operator() (const Ex & *first,* const Ex & *second*) const

9.212.3 Member Data Documentation

9.212.3.1 const Properties∗ cadabra::tree_equal_obj::properties [private]

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.213 cadabra::tree_exact_equal_mod_prel_obj Class Reference

`#include <Compare.hh>`

Public Member Functions

- tree_exact_equal_mod_prel_obj (const Properties ∗)
- bool operator() (const Ex &first, const Ex &second) const

Private Attributes

- const Properties ∗ properties

9.213.1 Constructor & Destructor Documentation

9.213.1.1 cadabra::tree_exact_equal_mod_prel_obj::tree_exact_equal_mod_prel_obj (const Properties *)

9.213.2 Member Function Documentation

9.213.2.1 bool cadabra::tree_exact_equal_mod_prel_obj::operator() (const Ex & *first,* const Ex & *second*) const

9.213.3 Member Data Documentation

9.213.3.1 const Properties* cadabra::tree_exact_equal_mod_prel_obj::properties [private]

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.214 cadabra::tree_exact_equal_obj Class Reference

`#include <Compare.hh>`

Public Member Functions

- tree_exact_equal_obj (const Properties *)
- bool operator() (const Ex &first, const Ex &second) const

Private Attributes

- const Properties * properties

9.214.1 Constructor & Destructor Documentation

9.214.1.1 cadabra::tree_exact_equal_obj::tree_exact_equal_obj (const Properties *)

9.214.2 Member Function Documentation

9.214.2.1 bool cadabra::tree_exact_equal_obj::operator() (const Ex & *first,* const Ex & *second*) const

9.214.3 Member Data Documentation

9.214.3.1 const Properties* cadabra::tree_exact_equal_obj::properties [private]

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.215 cadabra::tree_exact_less_for_indexmap_obj Class Reference

9.215.1 Description

Compare for indexmap_t.

The only comparator object that does not use properties info to lookup properties. This one compares exactly (it cannot do any matching which requires knowledge about index sets because it does not know about properties). It requires parent relations to match including at top level. It requires multipliers to match including at top level. Names with '?' or '??' suffixes are matched literally, not as patterns.

`#include <Compare.hh>`

Public Member Functions

- bool operator() (const Ex &first, const Ex &second) const

9.215.2 Member Function Documentation

9.215.2.1 bool cadabra::tree_exact_less_for_indexmap_obj::operator() (const Ex & *first,* const Ex & *second*) const

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.216 cadabra::tree_exact_less_mod_prel_obj Class Reference

`#include <Compare.hh>`

Public Member Functions

- tree_exact_less_mod_prel_obj (const Properties *)
- bool operator() (const Ex &first, const Ex &second) const

Private Attributes

- const Properties * properties

9.216.1 Constructor & Destructor Documentation

9.216.1.1 cadabra::tree_exact_less_mod_prel_obj::tree_exact_less_mod_prel_obj (const Properties * *p*)

9.216.2 Member Function Documentation

9.216.2.1 bool cadabra::tree_exact_less_mod_prel_obj::operator() (const Ex & *first,* const Ex & *second*) const

9.216.3 Member Data Documentation

9.216.3.1 const Properties* cadabra::tree_exact_less_mod_prel_obj::properties [private]

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.217 cadabra::tree_exact_less_no_wildcards_mod_prel_obj Class Reference

`#include <Compare.hh>`

Public Member Functions

- tree_exact_less_no_wildcards_mod_prel_obj (const Properties *)
- bool operator() (const Ex &first, const Ex &second) const

Private Attributes

- const Properties * properties

9.217.1 Constructor & Destructor Documentation

9.217.1.1 cadabra::tree_exact_less_no_wildcards_mod_prel_obj::tree_exact_less_no_wildcards_mod_prel_obj (const Properties *)

9.217.2 Member Function Documentation

9.217.2.1 bool cadabra::tree_exact_less_no_wildcards_mod_prel_obj::operator() (const Ex & *first,* const Ex & *second*) const

9.217.3 Member Data Documentation

9.217.3.1 const Properties* cadabra::tree_exact_less_no_wildcards_mod_prel_obj::properties [private]

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.218 cadabra::tree_exact_less_no_wildcards_obj Class Reference

9.218.1 Description

Compare two trees exactly, treat wildcard names as ordinary names.

`#include <Compare.hh>`

Public Member Functions

- tree_exact_less_no_wildcards_obj ()
- tree_exact_less_no_wildcards_obj (const Properties *)
- bool operator() (const Ex &first, const Ex &second) const

Private Attributes

- const Properties * properties

9.218.2 Constructor & Destructor Documentation

9.218.2.1 cadabra::tree_exact_less_no_wildcards_obj::tree_exact_less_no_wildcards_obj ( )

9.218.2.2 cadabra::tree_exact_less_no_wildcards_obj::tree_exact_less_no_wildcards_obj (const Properties *)

9.218.3 Member Function Documentation

9.218.3.1 bool cadabra::tree_exact_less_no_wildcards_obj::operator() (const Ex & *first,* const Ex & *second*) const

9.218.4 Member Data Documentation

9.218.4.1 const Properties* cadabra::tree_exact_less_no_wildcards_obj::properties [private]

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.219 cadabra::tree_exact_less_obj Class Reference

9.219.1 Description

Compare two trees exactly, i.e. including exact index names.

`#include <Compare.hh>`

Public Member Functions

- tree_exact_less_obj (const Properties ∗)
- bool operator() (const Ex &first, const Ex &second) const

Private Attributes

- const Properties ∗ properties

9.219.2 Constructor & Destructor Documentation

9.219.2.1 cadabra::tree_exact_less_obj::tree_exact_less_obj (const Properties ∗ *p*)

9.219.3 Member Function Documentation

9.219.3.1 bool cadabra::tree_exact_less_obj::operator() (const Ex & *first,* const Ex & *second*) const

9.219.4 Member Data Documentation

9.219.4.1 const Properties∗ cadabra::tree_exact_less_obj::properties [private]

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.220 cadabra::tree_less_modprel_obj Class Reference

`#include <Compare.hh>`

Public Member Functions

- tree_less_modprel_obj (const Properties ∗)
- bool operator() (const Ex &first, const Ex &second) const

Private Attributes

- const Properties ∗ properties

9.220.1 Constructor & Destructor Documentation

9.220.1.1 cadabra::tree_less_modprel_obj::tree_less_modprel_obj (const Properties * *k*)

9.220.2 Member Function Documentation

9.220.2.1 bool cadabra::tree_less_modprel_obj::operator() (const Ex & *first,* const Ex & *second*) const

9.220.3 Member Data Documentation

9.220.3.1 const Properties* cadabra::tree_less_modprel_obj::properties [private]

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.221 cadabra::tree_less_obj Class Reference

9.221.1 Description

Compare two trees by pattern logic, i.e. modulo index names.

`#include <Compare.hh>`

Public Member Functions

- tree_less_obj (const Properties *)
- bool operator() (const Ex &first, const Ex &second) const

Private Attributes

- const Properties * properties

9.221.2 Constructor & Destructor Documentation

9.221.2.1 cadabra::tree_less_obj::tree_less_obj (const Properties * *k*)

9.221.3 Member Function Documentation

9.221.3.1 bool cadabra::tree_less_obj::operator() (const Ex & *first,* const Ex & *second*) const

9.221.4 Member Data Documentation

9.221.4.1 const Properties* cadabra::tree_less_obj::properties [private]

The documentation for this class was generated from the following files:

- core/Compare.hh
- core/Compare.cc

9.222 UI Class Reference

Public Member Functions

- void run ()

9.222.1 Member Function Documentation

9.222.1.1 void UI::run ( )

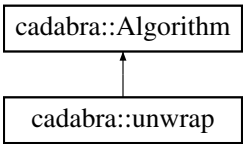
The documentation for this class was generated from the following file:

- client_server/test_client.cc

9.223 cadabra::unwrap Class Reference

`#include <unwrap.hh>`

Inheritance diagram for cadabra::unwrap:



Public Member Functions

- unwrap (const Kernel &, Ex &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Public Attributes

- std::vector< Ex > wrappers

Additional Inherited Members

9.223.1 Constructor & Destructor Documentation

9.223.1.1 unwrap::unwrap (const Kernel & *k,* Ex & *tr,* Ex & *w*)

9.223.2 Member Function Documentation

9.223.2.1 Algorithm::result_t unwrap::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.223.2.2 bool unwrap::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.223.3 Member Data Documentation

9.223.3.1 std::vector<Ex> cadabra::unwrap::wrappers

The documentation for this class was generated from the following files:

- core/algorithms/unwrap.hh
- core/algorithms/unwrap.cc

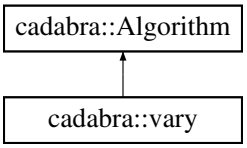
9.224 cadabra::vary Class Reference

9.224.1 Description

Generic variational derivative algorithm.

`#include <vary.hh>`

Inheritance diagram for cadabra::vary:



Public Member Functions

- vary (const Kernel &, Ex &tr, Ex &args)
- virtual bool can_apply (iterator st) override
- virtual result_t apply (iterator &) override

Private Attributes

- Ex & args

Additional Inherited Members

9.224.2 Constructor & Destructor Documentation

9.224.2.1 vary::vary (const Kernel & *k*, Ex & *tr*, Ex & *args*)

9.224.3 Member Function Documentation

9.224.3.1 Algorithm::result_t vary::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.224.3.2 bool vary::can_apply (iterator *st*) [override], [virtual]

Implements cadabra::Algorithm.

9.224.4 Member Data Documentation

9.224.4.1 Ex& cadabra::vary::args [private]

The documentation for this class was generated from the following files:

- core/algorithms/vary.hh
- core/algorithms/vary.cc

9.225 cadabra::VisualCell Class Reference

9.225.1 Description

Structure holding a pointer to one of the possible GUI widgets that can appear in a document.

`#include <VisualCell.hh>`

Public Attributes

- union {
  Gtk::VBox * document
  CodeInput * inbox
  TeXView * outbox
  ImageView * imagebox
  };

  Union of pointers to one of the possible GUI realisations of the cell types declared in DataCell::CellType.

9.225.2 Member Data Documentation

9.225.2.1 union { ... }

Union of pointers to one of the possible GUI realisations of the cell types declared in DataCell::CellType.

All of these cells below should derive from Gtk::VBox.

9.225.2.2 Gtk::VBox* cadabra::VisualCell::document

9.225.2.3 ImageView* cadabra::VisualCell::imagebox

9.225.2.4 CodeInput* cadabra::VisualCell::inbox

9.225.2.5 TeXView* cadabra::VisualCell::outbox

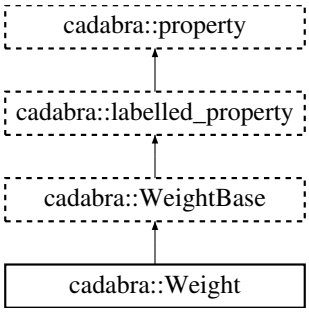
The documentation for this class was generated from the following file:

- frontend/gtkmm/VisualCell.hh

9.226 cadabra::Weight Class Reference

`#include <Weight.hh>`

Inheritance diagram for cadabra::Weight:



Public Member Functions

- virtual multiplier_t value (const Kernel &, Ex::iterator, const std::string &forcedlabel) const override
- virtual bool parse (const Kernel &, keyval_t &) override
- virtual std::string unnamed_argument () const override
- virtual std::string name () const override

Private Attributes

- multiplier_t value_

Additional Inherited Members

9.226.1 Member Function Documentation

9.226.1.1 std::string Weight::name ( ) const [override], [virtual]

Implements cadabra::property.

9.226.1.2 bool Weight::parse (const Kernel & *k,* keyval_t & *kv*) [override], [virtual]

Reimplemented from cadabra::labelled_property.

9.226.1.3 virtual std::string cadabra::Weight::unnamed_argument ( ) const [inline], [override], [virtual]

Reimplemented from cadabra::property.

9.226.1.4 multiplier_t Weight::value (const Kernel & *pr,* Ex::iterator , const std::string & *forcedlabel*) const [override], [virtual]

Implements cadabra::WeightBase.

9.226.2 Member Data Documentation

9.226.2.1 multiplier_t cadabra::Weight::value_ [private]

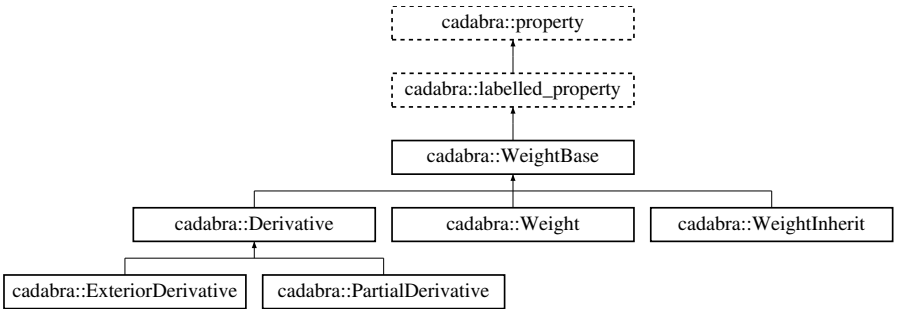
The documentation for this class was generated from the following files:

- core/properties/Weight.hh
- core/properties/Weight.cc

9.227 cadabra::WeightBase Class Reference

`#include <WeightBase.hh>`

Inheritance diagram for cadabra::WeightBase:



Public Member Functions

- virtual multiplier_t value (const Kernel &, Ex::iterator, const std::string &forcedlabel) const =0

Additional Inherited Members

9.227.1 Member Function Documentation

9.227.1.1 virtual multiplier_t cadabra::WeightBase::value (const Kernel & , Ex::iterator , const std::string & *forcedlabel*) const [pure virtual]

Implemented in cadabra::Derivative, cadabra::WeightInherit, and cadabra::Weight.

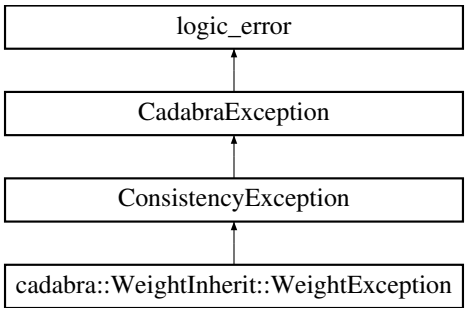
The documentation for this class was generated from the following file:

- core/properties/WeightBase.hh

9.228 cadabra::WeightInherit::WeightException Class Reference

`#include <WeightInherit.hh>`

Inheritance diagram for cadabra::WeightInherit::WeightException:



Public Member Functions

- WeightException (const std::string &)

9.228.1 Constructor & Destructor Documentation

9.228.1.1 WeightInherit::WeightException::WeightException (const std::string & *str*)

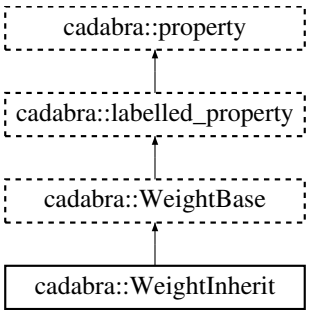
The documentation for this class was generated from the following files:

- core/properties/WeightInherit.hh
- core/properties/WeightInherit.cc

9.229 cadabra::WeightInherit Class Reference

`#include <WeightInherit.hh>`

Inheritance diagram for cadabra::WeightInherit:



Classes

- class WeightException

Public Types

- enum { multiplicative, additive, power }

Public Member Functions

- virtual bool parse (const Kernel &, keyval_t &) override
- virtual multiplier_t value (const Kernel &, Ex::iterator, const std::string &forcedlabel) const override
- virtual std::string unnamed_argument () const override
- virtual std::string name () const override

Public Attributes

- enum cadabra::WeightInherit:: { ... } combination_type
- multiplier_t value_self

9.229.1 Member Enumeration Documentation

9.229.1.1 anonymous enum

Enumerator

multiplicative

additive

power

9.229.2 Member Function Documentation

9.229.2.1 std::string WeightInherit::name ( ) const [override], [virtual]

Implements cadabra::property.

9.229.2.2 bool WeightInherit::parse (const Kernel & *k,* keyval_t & *kv*) [override], [virtual]

Reimplemented from cadabra::labelled_property.

9.229.2.3 virtual std::string cadabra::WeightInherit::unnamed_argument ( ) const [inline], [override], [virtual]

Reimplemented from cadabra::property.

9.229.2.4 multiplier_t WeightInherit::value (const Kernel & *kernel,* Ex::iterator *it,* const std::string & *forcedlabel*) const [override], [virtual]

Implements cadabra::WeightBase.

9.229.3 Member Data Documentation

9.229.3.1 enum { ... } cadabra::WeightInherit::combination_type

9.229.3.2 multiplier_t cadabra::WeightInherit::value_self

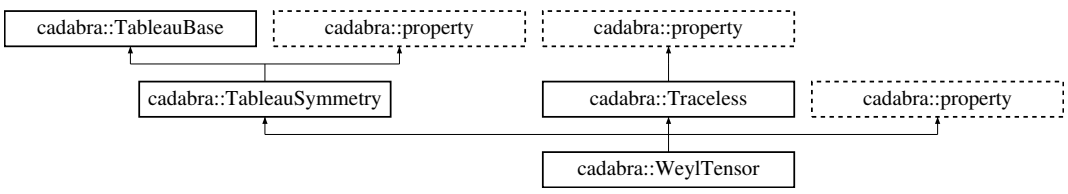
The documentation for this class was generated from the following files:

- core/properties/WeightInherit.hh
- core/properties/WeightInherit.cc

9.230 cadabra::WeylTensor Class Reference

`#include <WeylTensor.hh>`

Inheritance diagram for cadabra::WeylTensor:



Public Member Functions

- WeylTensor ()
- virtual std::string name () const override
- virtual void validate (const Kernel &, const Ex &) const override
- virtual void latex (std::ostream &) const override

  Display the property on the stream.

Additional Inherited Members

9.230.1 Constructor & Destructor Documentation

9.230.1.1 WeylTensor::WeylTensor ( )

9.230.2 Member Function Documentation

9.230.2.1 void WeylTensor::latex (std::ostream & *str*) const [override], [virtual]

Display the property on the stream.

Generate a LaTeX representation of the property, assuming LaTeX is in text mode (so it needs dollar symbols to switch to maths).

Reimplemented from cadabra::property.

9.230.2.2 std::string WeylTensor::name ( ) const [override], [virtual]

Implements cadabra::property.

9.230.2.3 void WeylTensor::validate (const Kernel & *kernel,* const Ex & *pat*) const [override], [virtual]

Reimplemented from cadabra::property.

The documentation for this class was generated from the following files:

- core/properties/WeylTensor.hh
- core/properties/WeylTensor.cc

9.231 X Struct Reference

9.231.1 Description

Mockup types.

The documentation for this struct was generated from the following file:

- core/ptest.cc

9.232 Y Struct Reference

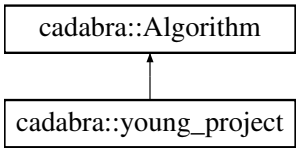
The documentation for this struct was generated from the following file:

- core/ptest.cc

9.233 cadabra::young_project Class Reference

`#include <young_project.hh>`

Inheritance diagram for cadabra::young_project:



Public Types

- typedef yngtab::filled_tableau< unsigned int > pos_tab_t
- typedef yngtab::filled_tableau< iterator > name_tab_t

Public Member Functions

- young_project (const Kernel &, Ex &)
- young_project (const Kernel &, Ex &, const std::vector< int > &shape, const std::vector< int > &indices)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Public Attributes

- pos_tab_t tab
- name_tab_t nametab
- combin::symmetriser< unsigned int > sym
- combin::combinations< unsigned int >::permuted_sets_t asym_ranges
- bool remove_traces

Private Member Functions

- iterator nth_index_node (iterator, unsigned int)

Additional Inherited Members

9.233.1 Member Typedef Documentation

9.233.1.1 typedef yngtab::filled_tableau<iterator> cadabra::young_project::name_tab_t

9.233.1.2 typedef yngtab::filled_tableau<unsigned int> cadabra::young_project::pos_tab_t

9.233.2 Constructor & Destructor Documentation

9.233.2.1 young_project::young_project (const Kernel & *k*, Ex & *tr*)

9.233.2.2 young_project::young_project (const Kernel & *k*, Ex & *tr*, const std::vector< int > & *shape*, const std::vector< int > & *indices*)

9.233.3 Member Function Documentation

9.233.3.1 Algorithm::result_t young_project::apply (iterator & *it*) [virtual]

Implements cadabra::Algorithm.

9.233.3.2 bool young_project::can_apply (iterator *it*) [virtual]

Implements cadabra::Algorithm.

9.233.3.3 Ex::iterator young_project::nth_index_node (iterator *it*, unsigned int *num*) [private]

9.233.4 Member Data Documentation

9.233.4.1 combin::combinations<unsigned int>::permuted_sets_t cadabra::young_project::asym_ranges

9.233.4.2 name_tab_t cadabra::young_project::nametab

9.233.4.3 bool cadabra::young_project::remove_traces

9.233.4.4 combin::symmetriser<unsigned int> cadabra::young_project::sym

9.233.4.5 pos_tab_t cadabra::young_project::tab

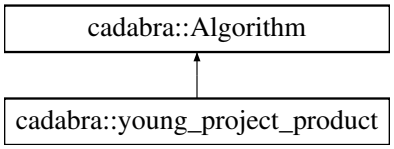
The documentation for this class was generated from the following files:

- core/algorithms/young_project.hh
- core/algorithms/young_project.cc

9.234 cadabra::young_project_product Class Reference

`#include <young_project_product.hh>`

Inheritance diagram for cadabra::young_project_product:



Public Member Functions

- young_project_product (const Kernel &, Ex &)
- virtual bool can_apply (iterator) override
- virtual result_t apply (iterator &) override

Additional Inherited Members

9.234.1 Constructor & Destructor Documentation

9.234.1.1 young_project_product::young_project_product (const Kernel & *k*, Ex & *tr*)

9.234.2 Member Function Documentation

9.234.2.1 Algorithm::result_t young_project_product::apply (iterator & *it*) [override], [virtual]

Implements cadabra::Algorithm.

9.234.2.2 bool young_project_product::can_apply (iterator *it*) [override], [virtual]

Implements cadabra::Algorithm.

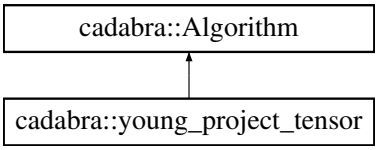
The documentation for this class was generated from the following files:

- core/algorithms/young_project_product.hh
- core/algorithms/young_project_product.cc

9.235 cadabra::young_project_tensor Class Reference

`#include <young_project_tensor.hh>`

Inheritance diagram for cadabra::young_project_tensor:



Public Member Functions

- young_project_tensor (const Kernel &, Ex &, bool)
- virtual bool can_apply (iterator)
- virtual result_t apply (iterator &)

Public Attributes

- bool modulo_monoterm
- combin::symmetriser< unsigned int > sym

Private Attributes

- const TableauBase * tb

Additional Inherited Members

9.235.1 Constructor & Destructor Documentation

9.235.1.1 young_project_tensor::young_project_tensor (const Kernel & *k,* Ex & *tr,* bool *modmono*)

9.235.2 Member Function Documentation

9.235.2.1 Algorithm::result_t young_project_tensor::apply (iterator & *it*) [virtual]

Implements cadabra::Algorithm.

9.235.2.2 bool young_project_tensor::can_apply (iterator *it*) [virtual]

Implements cadabra::Algorithm.

9.235.3 Member Data Documentation

9.235.3.1 bool cadabra::young_project_tensor::modulo_monoterm

9.235.3.2 combin::symmetriser<unsigned int> cadabra::young_project_tensor::sym

9.235.3.3 const TableauBase* cadabra::young_project_tensor::tb [private]

The documentation for this class was generated from the following files:

- core/algorithms/young_project_tensor.hh
- core/algorithms/young_project_tensor.cc

9.236 Z Struct Reference

Public Member Functions

- Z ()

9.236.1 Constructor & Destructor Documentation

9.236.1.1 Z::Z ( )

The documentation for this struct was generated from the following file:

- core/ptest.cc

Chapter 10

File Documentation

10.1 client_server/Actions.cc File Reference

```
#include "Actions.hh"
#include "DataCell.hh"
#include "DocumentThread.hh"
#include "GUIBase.hh"
#include <iostream>
```

10.2 client_server/Actions.hh File Reference

```
#include "DataCell.hh"
#include "DocumentThread.hh"
#include <memory>
```

Classes

- class cadabra::ActionBase

  All actions derive from the ActionBase object, which defines the interface they need to implement.
- class cadabra::ActionAddCell

  Add a cell to the notebook.
- class cadabra::ActionPositionCursor

  Position the cursor relative to the indicated cell.
- class cadabra::ActionSetRunStatus

  Update the running status of the indicated cell.
- class cadabra::ActionRemoveCell

  Remove a cell and all its child cells from the document.
- class cadabra::ActionSplitCell

  Split a cell into two separate cells, at the point of the cursor.
- class cadabra::ActionInsertText

  Add a text string (can be just a single character) at the point of the cursor.
- class cadabra::ActionEraseText

  Remove a text string starting at the indicated position, and with the indicated length, from the indicated cell.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.3 client_server/cadabra-server.cc File Reference

```
#include "Snoop.hh"
#include "Server.hh"
```

Functions

- int main ()

10.3.1 Function Documentation

10.3.1.1 int main ( )

10.4 client_server/cadabra2cadabra.cc File Reference

```
#include <fstream>
#include <iostream>
#include "DataCell.hh"
```

Functions

- int main (int argc, char **argv)

10.4.1 Function Documentation

10.4.1.1 int main (int *argc*, char ** *argv*)

10.5 client_server/cadabra2html.cc File Reference

```
#include <fstream>
#include <iostream>
#include "DataCell.hh"
```

Functions

- int main (int argc, char **argv)

10.5.1 Function Documentation

10.5.1.1 int main (int *argc*, char ** *argv*)

10.6 client_server/ComputeThread.cc File Reference

```
#include <string>
#include <iostream>
#include <sstream>
#include "ComputeThread.hh"
#include "DocumentThread.hh"
#include "GUIBase.hh"
#include "Actions.hh"
#include "popen2.hh"
#include <sys/types.h>
#include <signal.h>
#include <glibmm/spawn.h>
```

Typedefs

- typedef websocketpp::client< websocketpp::config::asio_client > client
- using SlotSpawnChildSetup = sigc::slot< void()>

10.6.1 Typedef Documentation

10.6.1.1 typedef websocketpp::client<websocketpp::config::asio_client> client

10.6.1.2 using SlotSpawnChildSetup = sigc::slot<void()>

10.7 client_server/ComputeThread.hh File Reference

```
#include <websocketpp/config/asio_no_tls_client.hpp>
#include <websocketpp/client.hpp>
#include <websocketpp/common/thread.hpp>
#include <websocketpp/common/functional.hpp>
#include <thread>
#include <glibmm/spawn.h>
#include "DataCell.hh"
```

Classes

- class cadabra::ComputeThread

  Base class which talks to the server and sends Action objects back to the DocumentThread.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Typedefs

- typedef websocketpp::client< websocketpp::config::asio_client > WSClient
- typedef websocketpp::config::asio_client::message_type::ptr message_ptr
- typedef websocketpp::lib::lock_guard< websocketpp::lib::mutex > scoped_lock

10.7.1 Typedef Documentation

10.7.1.1 typedef websocketpp::config::asio_client::message_type::ptr message_ptr

10.7.1.2 typedef websocketpp::lib::lock_guard<websocketpp::lib::mutex> scoped_lock

10.7.1.3 typedef websocketpp::client<websocketpp::config::asio_client> WSClient

10.8 client_server/DataCell.cc File Reference

```
#include "Config.hh"
#include "DataCell.hh"
#include <sstream>
#include <fstream>
#include <boost/regex.hpp>
#include <boost/filesystem.hpp>
#include <boost/algorithm/string.hpp>
#include <iostream>
```

10.9 client_server/DataCell.hh File Reference

```
#include <string>
#include <mutex>
#include "tree.hh"
#include "json/json.h"
```

Classes

- class cadabra::DataCell

  DataCells are the basic building blocks for a document.
- class cadabra::DataCell::id_t

  Each cell is identified by a serial number 'id' which is used to keep track of it across network calls, and a bool indicating whether the client or the server has created this cell.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Typedefs

- typedef tree< DataCell > cadabra::DTree

Functions

- std::string cadabra::JSON_serialise (const DTree &)

  Serialise a document into .cj format, which is a JSON version of the document tree.
- void cadabra::JSON_recurse (const DTree &, DTree::iterator, Json::Value &)
- void cadabra::JSON_deserialise (const std::string &, DTree &)

  Load a document from .cj format, i.e. the inverse of the above.
- void cadabra::JSON_in_recurse (DTree &doc, DTree::iterator loc, const Json::Value &cells)
- std::string cadabra::export_as_HTML (const DTree &doc, bool for_embedding=false, std::string title="")

  Export a document to a single self-contained HTML file containing inline CSS.
- void cadabra::HTML_recurse (const DTree &doc, DTree::iterator it, std::ostringstream &str, const std::string &preamble_string, bool for_embedding=false, std::string title="")
- std::string cadabra::latex_to_html (const std::string &)

  Convert various LaTeX constructions to HTML-with-Mathjax, e.g.
- std::string cadabra::export_as_LaTeX (const DTree &doc)

  Export a document to a single self-contained LaTeX file.
- void cadabra::LaTeX_recurse (const DTree &doc, DTree::iterator it, std::ostringstream &str, const std::string &preamble_string)
- std::string cadabra::export_as_python (const DTree &doc)

  Export a document to a python-like file (converting text cells to comments and python cells to python code, dropping output cells).
- void cadabra::python_recurse (const DTree &doc, DTree::iterator it, std::ostringstream &str)

10.10 client_server/DocumentThread.cc File Reference

```
#include "Actions.hh"
#include "DocumentThread.hh"
#include "GUIBase.hh"
#include <typeinfo>
#include <iostream>
#include <set>
#include <string>
#include <fstream>
#include <boost/config.hpp>
#include <boost/program_options/detail/config_file.hpp>
#include <boost/program_options/parsers.hpp>
#include <unistd.h>
#include <sys/types.h>
#include <glibmm/miscutils.h>
#include "Snoop.hh"
#include "Config.hh"
```

10.11 client_server/DocumentThread.hh File Reference

```
#include <queue>
#include <mutex>
#include <stack>
#include "DataCell.hh"
#include "tree.hh"
```

Classes

- class cadabra::DocumentThread

  A base class with all the logic to manipulate a Cadabra notebook document.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.12 client_server/GUIBase.hh File Reference

```
#include <deque>
#include "DataCell.hh"
```

Classes

- class cadabra::GUIBase

  Abstract base class with methods that need to be implemented by any GUI.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.13 client_server/popen2.cc File Reference

```
#include "popen2.hh"
#include <sys/wait.h>
#include <stdexcept>
```

Macros

- #define READ 0
- #define WRITE 1

Functions

- FILE * popen2 (std::string command, std::string type, int &pid)
- int pclose2 (FILE *fp, pid_t pid)

10.13.1 Macro Definition Documentation

10.13.1.1 #define READ 0

10.13.1.2 #define WRITE 1

10.13.2 Function Documentation

10.13.2.1 int pclose2 (FILE * *fp*, pid_t *pid*)

10.13.2.2 FILE* popen2 (std::string *command*, std::string *type*, int & *pid*)

10.14 client_server/popen2.hh File Reference

```
#include <unistd.h>
#include <errno.h>
#include <stdio.h>
#include <stdlib.h>
#include <sys/types.h>
#include <string>
```

Functions

- FILE * popen2 (std::string command, std::string type, int &pid)
- int pclose2 (FILE *fp, pid_t pid)

10.14.1 Function Documentation

10.14.1.1 int pclose2 (FILE * *fp*, pid_t *pid*)

10.14.1.2 FILE* popen2 (std::string *command*, std::string *type*, int & *pid*)

10.15 client_server/regexp_tester.cc File Reference

```
#include <iostream>
#include <string>
#include <regex>
```

Functions

- int main (int argc, char **argv)

10.15.1 Function Documentation

10.15.1.1 int main (int *argc,* char ** *argv*)

10.16 client_server/Server.cc File Reference

```
#include <iostream>
#include <fstream>
#include <sstream>
#include <thread>
#include <boost/regex.hpp>
#include <boost/uuid/uuid_generators.hpp>
#include <boost/uuid/uuid_io.hpp>
#include <boost/algorithm/string/replace.hpp>
#include <json/json.h>
#include "Snoop.hh"
#include "CdbPython.hh"
#include "Server.hh"
#include "SympyCdb.hh"
```

Functions

- boost::python::list ProgressMonitor_totals_helper (ProgressMonitor &self)
- int quit (void *)

10.16.1 Function Documentation

10.16.1.1 boost::python::list ProgressMonitor_totals_helper (ProgressMonitor & *self*)

10.16.1.2 int quit (void *)

10.17 client_server/Server.hh File Reference

```
#include <string>
#include <boost/uuid/uuid.hpp>
#include <websocketpp/server.hpp>
#include <websocketpp/config/asio_no_tls.hpp>
#include <websocketpp/common/functional.hpp>
#include <future>
#include <boost/python.hpp>
#include "Stopwatch.hh"
#include "ProgressMonitor.hh"
```

Classes

- class Server

  Object representing a Cadabra server, capable of receiving messages on a websocket, running Python code, and sending output back to the client.
- class Server::CatchOutput

  Python output catching.
- class Server::Connection
- class Server::Block

10.18 client_server/Snoop.cc File Reference

```
#include "Snoop.hh"
#include "SnoopPrivate.hh"
#include <iostream>
#include <string.h>
#include <regex>
#include <chrono>
#include <ctime>
#include <sys/utsname.h>
#include <stdint.h>
#include <json/json.h>
#include <set>
#include <unistd.h>
#include <sys/types.h>
#include <pwd.h>
#include <glibmm/miscutils.h>
#include <boost/property_tree/ptree.hpp>
#include <boost/property_tree/json_parser.hpp>
#include <boost/config.hpp>
#include <boost/program_options/detail/config_file.hpp>
#include <boost/program_options/parsers.hpp>
#include <boost/uuid/uuid.hpp>
#include <boost/uuid/uuid_generators.hpp>
#include <boost/uuid/uuid_io.hpp>
```

Macros

- #define BOOST_SPIRIT_THREADSAFE

Typedefs

- using u64_millis = std::chrono::duration< uint64_t, std::milli >

Functions

- std::string safestring (const unsigned char *c)

10.18.1 Macro Definition Documentation

10.18.1.1 #define BOOST_SPIRIT_THREADSAFE

10.18.2 Typedef Documentation

10.18.2.1 using u64_millis = std::chrono::duration<uint64_t, std::milli>

10.18.3 Function Documentation

10.18.3.1 std::string safestring (const unsigned char * c)

10.19 client_server/Snoop.hh File Reference

```
#include <string>
#include <sstream>
#include <sqlite3.h>
#include <stdint.h>
#include <mutex>
#include <json/json.h>
#include <thread>
```

Classes

- class snoop::Flush
- class snoop::Snoop

  Logging class with functionality to send log information to a remote server using a websocket connection.
- class snoop::Snoop::AppEntry

  C++ representation of an run entry.
- class snoop::Snoop::LogEntry

  C++ representation of a log entry.

Namespaces

- snoop

Macros

- #define LOC __FILE__, __LINE__, __func__

Variables

- Flush snoop::flush
- Snoop snoop::log
- const char snoop::info [ ] ="info"
- const char snoop::warn [ ] ="warning"
- const char snoop::error [ ] ="error"
- const char snoop::fatal [ ] ="fatal"
- const char snoop::email [ ] ="email"

10.19.1 Macro Definition Documentation

10.19.1.1 #define LOC __FILE__, __LINE__, __func__

10.20 client_server/SnoopPrivate.hh File Reference

```
#include <websocketpp/config/asio_no_tls_client.hpp>
#include <websocketpp/client.hpp>
#include <websocketpp/common/thread.hpp>
#include <websocketpp/common/functional.hpp>
#include <mutex>
#include <condition_variable>
#include <thread>
```

Classes

- class snoop::SnoopImpl

Namespaces

- snoop

Typedefs

- typedef websocketpp::client< websocketpp::config::asio_client > WebsocketClient
- typedef websocketpp::config::asio_client::message_type::ptr message_ptr

10.20.1 Typedef Documentation

10.20.1.1 typedef websocketpp::config::asio_client::message_type::ptr message_ptr

10.20.1.2 typedef websocketpp::client<websocketpp::config::asio_client> WebsocketClient

10.21 client_server/test_client.cc File Reference

```
#include "Client.hh"
#include <thread>
#include <system_error>
```

Classes

- class MyClient
- class UI

Functions

- int main (int, char **)

Variables

- MyClient client
- UI ui

10.21.1 Function Documentation

10.21.1.1 int main (int , char **)

10.21.2 Variable Documentation

10.21.2.1 MyClient client

10.21.2.2 UI ui

10.22 client_server/test_talk_to_server.cc File Reference

```
#include <websocketpp/client.hpp>
#include <websocketpp/config/asio_no_tls_client.hpp>
#include <websocketpp/common/functional.hpp>
```

Typedefs

- typedef websocketpp::client< websocketpp::config::asio_client > client
- typedef websocketpp::config::asio_client::message_type::ptr message_ptr

Functions

- void on_open (client *c, websocketpp::connection_hdl hdl)
- void on_message (client *c, websocketpp::connection_hdl hdl, message_ptr msg)
- int main (int argc, char **argv)

Variables

- bool stopit =false

10.22.1 Typedef Documentation

10.22.1.1 typedef websocketpp::client<websocketpp::config::asio_client> client

10.22.1.2 typedef websocketpp::config::asio_client::message_type::ptr message_ptr

10.22.2 Function Documentation

10.22.2.1 int main (int *argc,* char ** *argv*)

10.22.2.2 void on_message (client * *c,* websocketpp::connection_hdl *hdl,* message_ptr *msg*)

10.22.2.3 void on_open (client * *c,* websocketpp::connection_hdl *hdl*)

10.22.3 Variable Documentation

10.22.3.1 bool stopit =false

10.23 core/Algorithm.cc File Reference

```
#include <stddef.h>
#include "Algorithm.hh"
#include "Storage.hh"
#include "Props.hh"
#include "Cleanup.hh"
#include <typeinfo>
#include <cxxabi.h>
#include "properties/Derivative.hh"
#include "properties/Indices.hh"
#include "properties/Coordinate.hh"
#include "properties/Symbol.hh"
#include "properties/DependsBase.hh"
#include <sstream>
```

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.24 core/Algorithm.hh File Reference

```
#include "Stopwatch.hh"
#include "Storage.hh"
#include "Compare.hh"
#include "Props.hh"
#include "Exceptions.hh"
#include "Kernel.hh"
#include "IndexIterator.hh"
#include "ProgressMonitor.hh"
#include <map>
#include <fstream>
#include <cstddef>
```

Classes

- class cadabra::Algorithm

  Base class for all algorithms, containing generic routines and in particular the logic for index classification.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.25 core/algorithms/canonicalise.cc File Reference

```
#include "Cleanup.hh"
#include "Exchange.hh"
#include "Functional.hh"
#include "algorithms/canonicalise.hh"
#include "modules/xperm_new.h"
#include "properties/Traceless.hh"
#include "properties/Diagonal.hh"
#include "properties/Derivative.hh"
#include "properties/AntiCommuting.hh"
```

10.26 core/algorithms/canonicalise.hh File Reference

```
#include "Algorithm.hh"
#include "properties/Indices.hh"
#include <vector>
```

Classes

- class cadabra::canonicalise

  Canonicalise the index structure of a tensorial expression.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.27 core/algorithms/collect_components.cc File Reference

```
#include "algorithms/collect_components.hh"
#include "algorithms/evaluate.hh"
```

10.28 core/algorithms/collect_components.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::collect_components

  Collect terms inside a sum, merging their substitution rules.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.29 core/algorithms/collect_factors.cc File Reference

```
#include "Props.hh"
#include "Compare.hh"
#include "Cleanup.hh"
#include "algorithms/collect_factors.hh"
#include "algorithms/collect_terms.hh"
#include "properties/Symbol.hh"
```

10.30 core/algorithms/collect_factors.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::collect_factors

  Collect symbolically equal factors in a product.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.31 core/algorithms/collect_terms.cc File Reference

```
#include "algorithms/collect_terms.hh"
```

10.32 core/algorithms/collect_terms.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::collect_terms

  Collect symbolically equal terms in a sum.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.33 core/algorithms/combine.cc File Reference

```
#include "Cleanup.hh"
#include "algorithms/combine.hh"
#include "properties/Matrix.hh"
```

10.34 core/algorithms/combine.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::combine

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.35 core/algorithms/complete.cc File Reference

```
#include "algorithms/complete.hh"
#include "Functional.hh"
#include "properties/Metric.hh"
#include "properties/InverseMetric.hh"
#include "SympyCdb.hh"
```

10.36 core/algorithms/complete.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::complete

  Complete a set of coordinate rules so that they also cover related tensors.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.37 core/algorithms/component.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class component

10.38 core/algorithms/decompose_product.cc File Reference

```
#include "Cleanup.hh"
#include "IndexIterator.hh"
#include "Exceptions.hh"
#include "algorithms/decompose_product.hh"
#include "properties/Integer.hh"
```

10.39 core/algorithms/decompose_product.hh File Reference

```
#include "algorithms/young_project.hh"
#include "properties/TableauBase.hh"
#include "properties/Indices.hh"
```

Classes

- class cadabra::decompose_product

  Decompose a product of tensors by applying Young projectors.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.40 core/algorithms/distribute.cc File Reference

```
#include "distribute.hh"
#include "Cleanup.hh"
#include "properties/Distributable.hh"
#include "algorithms/flatten_product.hh"
```

10.41 core/algorithms/distribute.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::distribute

  Distribute factors over a sum, that is, $(A+B)C \to AC+BC$.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.42 core/algorithms/drop_weight.cc File Reference

```
#include "algorithms/drop_weight.hh"
#include "Cleanup.hh"
#include "Props.hh"
#include "properties/Weight.hh"
#include "properties/WeightInherit.hh"
```

10.43 core/algorithms/drop_weight.hh File Reference

```
#include "Algorithm.hh"
#include "properties/WeightInherit.hh"
#include "properties/Weight.hh"
#include <string>
```

Classes

- class cadabra::drop_keep_weight
- class cadabra::drop_weight
- class cadabra::keep_weight

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.44 core/algorithms/einsteinify.cc File Reference

```
#include "algorithms/einsteinify.hh"
```

10.45 core/algorithms/einsteinify.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::einsteinify

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.46 core/algorithms/eliminate_kronecker.cc File Reference

```
#include "Cleanup.hh"
#include "algorithms/eliminate_kronecker.hh"
#include "properties/KroneckerDelta.hh"
#include "properties/Integer.hh"
```

10.47 core/algorithms/eliminate_kronecker.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::eliminate_kronecker

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.48 core/algorithms/eliminate_metric.cc File Reference

```
#include "Cleanup.hh"
#include "algorithms/eliminate_metric.hh"
#include "properties/Metric.hh"
#include "properties/InverseMetric.hh"
```

10.49 core/algorithms/eliminate_metric.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::eliminate_converter
- class cadabra::eliminate_metric

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.50 core/algorithms/epsilon_to_delta.cc File Reference

```
#include "algorithms/epsilon_to_delta.hh"
#include "algorithms/reduce_delta.hh"
#include "properties/EpsilonTensor.hh"
#include "properties/Metric.hh"
```

10.51 core/algorithms/epsilon_to_delta.hh File Reference

```
#include "Algorithm.hh"
#include <vector>
```

Classes

- class cadabra::epsilon_to_delta

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.52 core/algorithms/evaluate.cc File Reference

```
#include "Functional.hh"
#include "Cleanup.hh"
#include "Permutations.hh"
#include "SympyCdb.hh"
#include "algorithms/evaluate.hh"
#include "algorithms/substitute.hh"
#include "properties/EpsilonTensor.hh"
#include "properties/PartialDerivative.hh"
#include "properties/Coordinate.hh"
#include "properties/Depends.hh"
#include "properties/Accent.hh"
#include <functional>
```

10.53 core/algorithms/evaluate.hh File Reference

```
#include "Compare.hh"
#include "Algorithm.hh"
#include "properties/Indices.hh"
```

Classes

- class cadabra::evaluate

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.54 core/algorithms/expand.cc File Reference

```
#include "Cleanup.hh"
#include "Exceptions.hh"
#include "algorithms/expand.hh"
#include "properties/Matrix.hh"
```

10.55 core/algorithms/expand.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::expand

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.56 core/algorithms/expand_delta.cc File Reference

```
#include "algorithms/expand_delta.hh"
#include "properties/KroneckerDelta.hh"
#include "properties/TableauBase.hh"
#include "Cleanup.hh"
```

10.57 core/algorithms/expand_delta.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::expand_delta

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.58 core/algorithms/expand_diracbar.cc File Reference

```
#include "Cleanup.hh"
#include "algorithms/expand_diracbar.hh"
#include "properties/DiracBar.hh"
#include "properties/Spinor.hh"
#include "properties/GammaMatrix.hh"
```

10.59 core/algorithms/expand_diracbar.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::expand_diracbar

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.60 core/algorithms/expand_power.cc File Reference

```
#include "Cleanup.hh"
#include "algorithms/expand_power.hh"
```

10.61 core/algorithms/expand_power.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::expand_power

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.62 core/algorithms/factor_in.cc File Reference

```
#include "Functional.hh"
#include "algorithms/factor_in.hh"
```

10.63 core/algorithms/factor_in.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::factor_in

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.64 core/algorithms/factor_out.cc File Reference

```
#include "Cleanup.hh"
#include "Functional.hh"
#include "algorithms/factor_out.hh"
#include "algorithms/sort_product.hh"
#include <map>
```

10.65 core/algorithms/factor_out.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::factor_out

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.66 core/algorithms/fierz.cc File Reference

```
#include "Cleanup.hh"
#include "Exceptions.hh"
#include "algorithms/fierz.hh"
#include "properties/GammaMatrix.hh"
#include "properties/Integer.hh"
#include "properties/DiracBar.hh"
```

10.67 core/algorithms/fierz.hh File Reference

```
#include "Algorithm.hh"
#include "properties/Indices.hh"
#include "properties/Spinor.hh"
```

Classes

- class cadabra::fierz

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.68 core/algorithms/flatten_product.cc File Reference

```
#include "algorithms/flatten_product.hh"
#include "properties/PartialDerivative.hh"
```

10.69 core/algorithms/flatten_product.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::flatten_product

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.70 core/algorithms/flatten_sum.cc File Reference

```
#include "algorithms/flatten_sum.hh"
```

10.71 core/algorithms/flatten_sum.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::flatten_sum

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.72 core/algorithms/indexsort.cc File Reference

```
#include "IndexIterator.hh"
#include "properties/TableauSymmetry.hh"
#include "algorithms/indexsort.hh"
```

10.73 core/algorithms/indexsort.hh File Reference

```
#include "Algorithm.hh"
#include "properties/TableauBase.hh"
```

Classes

- class cadabra::indexsort
- class cadabra::indexsort::less_indexed_treenode

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.74 core/algorithms/integrate_by_parts.cc File Reference

```
#include <iterator>
#include "algorithms/integrate_by_parts.hh"
#include "properties/Derivative.hh"
#include "Cleanup.hh"
```

10.75 core/algorithms/integrate_by_parts.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::integrate_by_parts

  Integrate by parts away from the indicated derivative object.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.76 core/algorithms/join_gamma.cc File Reference

```
#include "Storage.hh"
#include "algorithms/join_gamma.hh"
#include "Exceptions.hh"
#include "Cleanup.hh"
#include "properties/Integer.hh"
```

10.77 core/algorithms/join_gamma.hh File Reference

```
#include "Algorithm.hh"
#include "properties/GammaMatrix.hh"
```

Classes

- class cadabra::join_gamma

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.78 core/algorithms/keep_terms.cc File Reference

```
#include "Cleanup.hh"
#include "algorithms/keep_terms.hh"
```

10.79 core/algorithms/keep_terms.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::keep_terms

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.80 core/algorithms/lr_tensor.cc File Reference

```
#include "Cleanup.hh"
#include "algorithms/lr_tensor.hh"
#include "properties/Tableau.hh"
#include "properties/FilledTableau.hh"
```

10.81 core/algorithms/lr_tensor.hh File Reference

```
#include "Algorithm.hh"
#include "algorithms/tab_basics.hh"
```

Classes

- class cadabra::lr_tensor

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.82 core/algorithms/map_sympy.cc File Reference

```
#include "algorithms/map_sympy.hh"
#include "properties/Coordinate.hh"
#include "properties/Symbol.hh"
#include "SympyCdb.hh"
```

Macros

- #define DEBUG 1

10.82.1 Macro Definition Documentation

10.82.1.1 #define DEBUG 1

10.83 core/algorithms/map_sympy.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::map_sympy

  Functionality to act with Sympy on all scalar parts of an expression, and keep the result in-place.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.84 core/algorithms/order.cc File Reference

```
#include "algorithms/order.hh"
#include "Combinatorics.hh"
```

10.85 core/algorithms/order.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::order

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.86 core/algorithms/product_rule.cc File Reference

```
#include "Compare.hh"
#include "Cleanup.hh"
#include "algorithms/product_rule.hh"
#include "properties/Derivative.hh"
#include "properties/DifferentialForm.hh"
```

10.87 core/algorithms/product_rule.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::product_rule

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.88 core/algorithms/reduce_delta.cc File Reference

```
#include "Exceptions.hh"
#include "algorithms/reduce_delta.hh"
#include "properties/Integer.hh"
#include "properties/KroneckerDelta.hh"
```

10.89 core/algorithms/reduce_delta.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::reduce_delta

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.90 core/algorithms/rename_dummies.cc File Reference

```
#include "algorithms/rename_dummies.hh"
#include "properties/Indices.hh"
#include "Exceptions.hh"
```

10.91 core/algorithms/rename_dummies.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::rename_dummies

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.92 core/algorithms/replace_match.cc File Reference

```
#include "Cleanup.hh"
#include "algorithms/replace_match.hh"
#include "algorithms/substitute.hh"
```

10.93 core/algorithms/replace_match.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::replace_match

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.94 core/algorithms/rewrite_indices.cc File Reference

```
#include "Cleanup.hh"
#include "algorithms/rewrite_indices.hh"
#include "properties/Derivative.hh"
#include "properties/Indices.hh"
```

10.95 core/algorithms/rewrite_indices.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::rewrite_indices

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.96 core/algorithms/sort_product.cc File Reference

```
#include "algorithms/sort_product.hh"
```

10.97 core/algorithms/sort_product.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::sort_product

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.98 core/algorithms/sort_spinors.cc File Reference

```
#include "algorithms/sort_spinors.hh"
#include "properties/GammaMatrix.hh"
#include "properties/Spinor.hh"
#include "properties/DiracBar.hh"
#include "properties/SortOrder.hh"
```

10.99 core/algorithms/sort_spinors.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::sort_spinors

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.100 core/algorithms/sort_sum.cc File Reference

```
#include "properties/SortOrder.hh"
#include "algorithms/sort_sum.hh"
```

10.101 core/algorithms/sort_sum.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::sort_sum

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.102 core/algorithms/split.cc File Reference

```
#include "split.hh"
```

10.103 core/algorithms/split.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class split

  Split an expression into terms or factors.

10.104 core/algorithms/split_gamma.cc File Reference

```
#include "Cleanup.hh"
#include "algorithms/split_gamma.hh"
#include "algorithms/join_gamma.hh"
```

10.105 core/algorithms/split_gamma.hh File Reference

```
#include "Algorithm.hh"
#include "properties/GammaMatrix.hh"
```

Classes

- class cadabra::split_gamma

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.106 core/algorithms/split_index.cc File Reference

```
#include "algorithms/split_index.hh"
```

10.107 core/algorithms/split_index.hh File Reference

```
#include "Algorithm.hh"
#include "properties/Indices.hh"
#include "properties/Coordinate.hh"
```

Classes

- class cadabra::split_index

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.108 core/algorithms/substitute.cc File Reference

```
#include <sstream>
#include "Cleanup.hh"
#include "Functional.hh"
#include "algorithms/substitute.hh"
#include "properties/Indices.hh"
```

10.109 core/algorithms/substitute.hh File Reference

```
#include "Algorithm.hh"
#include "algorithms/sort_product.hh"
```

Classes

- class cadabra::substitute

  Generic substitution algorithm.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.110 core/algorithms/sym.cc File Reference

```
#include "algorithms/sym.hh"
```

10.111 core/algorithms/sym.hh File Reference

```
#include "Algorithm.hh"
#include <vector>
#include "Combinatorics.hh"
```

Classes

- class cadabra::sym

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.112 core/algorithms/tab_basics.cc File Reference

```
#include "algorithms/tab_basics.hh"
```

10.113 core/algorithms/tab_basics.hh File Reference

```
#include "Algorithm.hh"
#include "YoungTab.hh"
```

Classes

- class cadabra::tab_basics

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.114 core/algorithms/take_match.cc File Reference

```
#include "algorithms/take_match.hh"
#include "algorithms/substitute.hh"
#include "Cleanup.hh"
```

10.115 core/algorithms/take_match.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::take_match

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.116 core/algorithms/unwrap.cc File Reference

```
#include "Compare.hh"
#include "Cleanup.hh"
#include "algorithms/unwrap.hh"
#include "properties/Derivative.hh"
#include "properties/Accent.hh"
#include "properties/DiracBar.hh"
#include "properties/Spinor.hh"
#include "properties/GammaMatrix.hh"
#include "properties/DependsBase.hh"
```

10.117 core/algorithms/unwrap.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::unwrap

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.118 core/algorithms/vary.cc File Reference

```
#include "Cleanup.hh"
#include "Exceptions.hh"
#include "algorithms/vary.hh"
#include "algorithms/substitute.hh"
#include "algorithms/product_rule.hh"
#include "properties/Derivative.hh"
#include "properties/Accent.hh"
```

10.119 core/algorithms/vary.hh File Reference

```
#include "Algorithm.hh"
#include "algorithms/sort_product.hh"
```

Classes

- class cadabra::vary

  Generic variational derivative algorithm.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.120 core/algorithms/young_project.cc File Reference

```
#include "IndexIterator.hh"
#include "algorithms/young_project.hh"
```

10.121 core/algorithms/young_project.hh File Reference

```
#include "Algorithm.hh"
#include "YoungTab.hh"
```

Classes

- class cadabra::young_project

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.122 core/algorithms/young_project_product.cc File Reference

```
#include "Cleanup.hh"
#include "algorithms/young_project_product.hh"
#include "algorithms/young_project_tensor.hh"
#include "algorithms/distribute.hh"
#include "algorithms/collect_terms.hh"
#include "algorithms/canonicalise.hh"
```

10.123 core/algorithms/young_project_product.hh File Reference

```
#include "Algorithm.hh"
```

Classes

- class cadabra::young_project_product

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.124 core/algorithms/young_project_tensor.cc File Reference

```
#include "IndexIterator.hh"
#include "Exceptions.hh"
#include "Cleanup.hh"
#include "properties/Indices.hh"
#include "properties/Integer.hh"
#include "algorithms/young_project_tensor.hh"
#include "algorithms/collect_terms.hh"
#include "algorithms/indexsort.hh"
```

10.125 core/algorithms/young_project_tensor.hh File Reference

```
#include "Algorithm.hh"
#include "properties/TableauBase.hh"
```

Classes

- class cadabra::young_project_tensor

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.126 core/Bridge.cc File Reference

```
#include "PythonCdb.hh"
#include "Bridge.hh"
#include "algorithms/collect_terms.hh"
```

Functions

- void pull_in (std::shared_ptr< Ex > ex)

  Replace any objects of the form '@(...)' in the expression tree by the python expression '...' if it exists.

10.127 core/Bridge.hh File Reference

```
#include "Storage.hh"
```

Functions

- void pull_in (std::shared_ptr< cadabra::Ex > ex)

  Replace any objects of the form '@(...)' in the expression tree by the python expression '...' if it exists.

10.128 core/cadabra2 File Reference

10.129 core/cadabra2_defaults.py File Reference

Classes

- class cadabra2_defaults.Sympy
- class cadabra2_defaults.Server

Namespaces

- cadabra2_defaults

Functions

- def cadabra2_defaults.display (obj, delay_send=False)
- def cadabra2_defaults._displayhook (arg)
- def cadabra2_defaults.post_process (__cdbkernel__, ex)

Variables

- cadabra2_defaults.__cdbkernel__ = cadabra2.__cdbkernel__
- cadabra2_defaults.sympy
- string cadabra2_defaults.mopen = "\\begin{dmath*}{}"
- string cadabra2_defaults.mclose = "\\end{dmath*}"
- cadabra2_defaults.server
- bool cadabra2_defaults.have_matplotlib = True
- cadabra2_defaults.remember_display_hook = sys.displayhook
- cadabra2_defaults.displayhook

10.130 core/cadabra2python.cc File Reference

```
#include <iostream>
#include <CdbPython.hh>
#include <fstream>
```

Functions

- int main (int argc, char **argv)

10.130.1 Function Documentation

10.130.1.1 int main (int *argc*, char ** *argv*)

10.131 core/CdbPython.cc File Reference

```
#include "CdbPython.hh"
#include <boost/regex.hpp>
#include <boost/algorithm/string/replace.hpp>
```

10.132 core/CdbPython.hh File Reference

```
#include <string>
```

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Functions

- std::string cadabra::escape_quotes (const std::string &)
- std::string cadabra::cdb2python (const std::string &)
- std::string cadabra::convert_line (const std::string &, std::string &lhs, std::string &rhs, std::string &indent)

10.133 core/Cleanup.cc File Reference

```
#include "Cleanup.hh"
#include "Functional.hh"
#include "Algorithm.hh"
#include "algorithms/collect_terms.hh"
#include "properties/Diagonal.hh"
#include "properties/ExteriorDerivative.hh"
#include "properties/KroneckerDelta.hh"
#include "properties/NumericalFlat.hh"
#include "properties/PartialDerivative.hh"
#include "properties/ImaginaryI.hh"
```

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Functions

- void cadabra::cleanup_dispatch (const Kernel &k, Ex &, Ex::iterator &it)

  Central cleanup dispatch routine, which calls the other cleanup functions defined later.
- void cadabra::check_index_consistency (const Kernel &k, Ex &tr, Ex::iterator it)

  Generic tool to check for index inconsistencies independent of running any algorithm.
- bool cadabra::cleanup_productlike (const Kernel &k, Ex &, Ex::iterator &it)

  Individual node cleanup routines.
- bool cadabra::cleanup_sumlike (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::push_down_multiplier (const Kernel &k, Ex &tr, Ex::iterator it)

  Given a node with a non-unit multiplier, push this multiplier down the tree if the node is not allowed to have a non-unit multiplier.
- bool cadabra::cleanup_components (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_partialderivative (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_derivative (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_numericalflat (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_diagonal (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_kronecker (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_exterior_derivative (const Kernel &k, Ex &tr, Ex::iterator &it)
- void cadabra::cleanup_dispatch_deep (const Kernel &k, Ex &, dispatcher_t disp=&cleanup_dispatch)

  More general cleanup of an entire tree.
- void cadabra::cleanup_dispatch_deep (const Kernel &k, Ex &tr, Ex::iterator &top, dispatcher_t dispatch)

10.134 core/Cleanup.hh File Reference

```
#include "Storage.hh"
#include "Kernel.hh"
```

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Typedefs

- typedef void(∗ cadabra::dispatcher_t) (const Kernel &k, Ex &, Ex::iterator &it)

Functions

- void cadabra::cleanup_dispatch (const Kernel &k, Ex &, Ex::iterator &it)

  Central cleanup dispatch routine, which calls the other cleanup functions defined later.
- void cadabra::cleanup_dispatch_deep (const Kernel &k, Ex &, dispatcher_t disp=&cleanup_dispatch)

  More general cleanup of an entire tree.
- void cadabra::cleanup_dispatch_deep (const Kernel &k, Ex &tr, Ex::iterator &top, dispatcher_t dispatch)
- bool cadabra::cleanup_productlike (const Kernel &k, Ex &, Ex::iterator &it)

  Individual node cleanup routines.
- bool cadabra::cleanup_sumlike (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_derivative (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_partialderivative (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_components (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_numericalflat (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_diagonal (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_kronecker (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::cleanup_exterior_derivative (const Kernel &k, Ex &tr, Ex::iterator &it)
- bool cadabra::push_down_multiplier (const Kernel &k, Ex &tr, Ex::iterator it)

  Given a node with a non-unit multiplier, push this multiplier down the tree if the node is not allowed to have a non-unit multiplier.
- void cadabra::check_index_consistency (const Kernel &k, Ex &tr, Ex::iterator it)

  Generic tool to check for index inconsistencies independent of running any algorithm.

10.135 core/CMakeLists.txt File Reference

Functions

- cmake_minimum_required (VERSION 2.8) project(Cadabra) set(CMAKE_MODULE_PATH $
- print (site.getsitepackages()[0])
- OUTPUT_VARIABLE PYTHON_SITE_PATH OUTPUT_STRIP_TRAILING_WHITESPACE endif () message("-- Python site path at $
- install (FILES"${PROJECT_BINARY_DIR}/cadabra2.so""${PROJECT_SOURCE_DIR}/cadabra2_↩ defaults.py"DESTINATION"${PYTHON_SITE_PATH}") configure_file("$

10.135.1 Function Documentation

10.135.1.1 cmake_minimum_required (VERSION 2. *8*)

10.135.1.2 OUTPUT_VARIABLE PYTHON_SITE_PATH OUTPUT_STRIP_TRAILING_WHITESPACE endif ( )

10.135.1.3 install (FILES"${PROJECT_BINARY_DIR}/cadabra2.so""${PROJECT_SOURCE_DIR}/cadabra2_defaults.py"DESTI↩ NATION"${PYTHON_SITE_PATH}")

10.135.1.4 print (site. *getsitepackages()[0]*)

10.136 client_server/CMakeLists.txt File Reference

Functions

- cmake_minimum_required (VERSION 2.8) project(CadabraServer) if(POLICY CMP0042) cmake_policy(SET CMP0042 NEW) endif(POLICY CMP0042)() set(CMAKE_MODULE_PATH $

10.136.1 Function Documentation

10.136.1.1 cmake_minimum_required (VERSION 2. *8*)

10.137 frontend/common/CMakeLists.txt File Reference

Functions

- cmake_minimum_required (VERSION 2.8) project(TeXEngine) if(POLICY CMP0042) cmake_policy(SET C↩ MP0042 NEW) endif(POLICY CMP0042) if(CMAKE_COMPILER_IS_GNUCC OR CMAKE_COMPILER_I↩ S_GNUCXX) set(CMAKE_CXX_FLAGS"$

10.137.1 Function Documentation

10.137.1.1 cmake_minimum_required (VERSION 2. *8*)

10.138 frontend/gtkmm/CMakeLists.txt File Reference

10.139 core/Combinatorics.cc File Reference

```
#include "Combinatorics.hh"
```

10.140 core/Combinatorics.hh File Reference

```
#include <vector>
#include <cassert>
#include <algorithm>
#include <iomanip>
#include <iostream>
#include <map>
```

Classes

- class combin::combinations_base< T >
- class combin::combinations< T >
- class combin::symmetriser< T >
- class combin::symm_helper< T >
- class combin::symm_val_helper< T >
- class combin::symmetriser< T >

Namespaces

- combin

Typedefs

- typedef std::vector< unsigned int > combin::range_t
- typedef std::vector< range_t > combin::range_vector_t
- typedef std::vector< int > combin::weights_t

Functions

- unsigned long combin::factorial (unsigned int x)
- long combin::vector_sum (const std::vector< int > &)

  sum of elements
- unsigned long combin::vector_prod (const std::vector< unsigned int > &)

  product of elements
- unsigned long combin::vector_prod_fact (const std::vector< unsigned int > &)

  product of factorials of elements
- bool combin::operator== (const std::vector< unsigned int > &, const std::vector< unsigned int > &)
- long combin::hash (const std::vector< unsigned int > &)

  compute a hash value for a vector of unsigned ints
- int combin::determine_intersection_ranges (const range_vector_t &prod, const range_vector_t &indv, range_vector_t &target)
- template<class iterator1 , class iterator2 >
  int combin::ordersign (iterator1 b1, iterator1 e1, iterator2 b2, iterator2 e2, int stepsize=1)
- template<class iterator1 >
  int combin::ordersign (iterator1 b1, iterator1 e1)
- template<class T >
  T combin::fact (T x)
- template<class T >
  std::ostream & combin::operator<< (std::ostream &str, const symmetriser< T > &sym)

10.141 core/Compare.cc File Reference

```
#include <typeinfo>
#include "Compare.hh"
#include "Algorithm.hh"
#include <sstream>
#include "pcrecpp.h"
#include "properties/Indices.hh"
#include "properties/Coordinate.hh"
#include "properties/ImplicitIndex.hh"
#include "properties/SelfCommutingBehaviour.hh"
#include "properties/CommutingAsSum.hh"
#include "properties/CommutingAsProduct.hh"
#include "properties/CommutingBehaviour.hh"
#include "properties/DifferentialForm.hh"
#include "properties/DiracBar.hh"
#include "properties/Integer.hh"
#include "properties/SortOrder.hh"
```

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Macros

- #define DEBUG(ln)

Functions

- int cadabra::subtree_compare (const Properties ∗, Ex::iterator one, Ex::iterator two, int mod_prel=-2, bool checksets=true, int compare_multiplier=-2, bool literal_wildcards=false)

  Basic building block subtree comparison function for tensors without dummy indices, which determines whether two tensor subtrees are equal up to the names of indices.
- bool cadabra::tree_less (const Properties ∗, const Ex &one, const Ex &two, int mod_prel=-2, bool checksets=true, int compare_multiplier=-2)

  Various comparison functions, some exact, some with pattern logic.
- bool cadabra::tree_equal (const Properties ∗properties, const Ex &one, const Ex &two, int mod_prel, bool checksets, int compare_multiplier)
- bool cadabra::tree_exact_less (const Properties ∗properties, const Ex &one, const Ex &two, int mod_prel, bool checksets, int compare_multiplier, bool literal_wildcards)
- bool cadabra::tree_exact_equal (const Properties ∗properties, const Ex &one, const Ex &two, int mod_prel, bool checksets, int compare_multiplier, bool literal_wildcards)
- bool cadabra::subtree_less (const Properties ∗properties, Ex::iterator one, Ex::iterator two, int mod_prel, bool checksets, int compare_multiplier)
- bool cadabra::subtree_equal (const Properties ∗properties, Ex::iterator one, Ex::iterator two, int mod_prel, bool checksets, int compare_multiplier)
- bool cadabra::subtree_exact_less (const Properties ∗properties, Ex::iterator one, Ex::iterator two, int mod_↩ prel, bool checksets, int compare_multiplier, bool literal_wildcards)
- bool cadabra::subtree_exact_equal (const Properties ∗properties, Ex::iterator one, Ex::iterator two, int mod↩ _prel, bool checksets, int compare_multiplier, bool literal_wildcards)
- bool operator< (const cadabra::Ex::iterator &i1, const cadabra::Ex::iterator &i2)
- bool operator< (const cadabra::Ex &e1, const cadabra::Ex &e2)
- std::ostream & operator<< (std::ostream &s, cadabra::Ex_comparator::useprops_t up)

10.141.1 Macro Definition Documentation

10.141.1.1 #define DEBUG(*ln*)

10.141.2 Function Documentation

10.141.2.1 bool operator< (const cadabra::Ex::iterator & *i1*, const cadabra::Ex::iterator & *i2*)

10.141.2.2 bool operator< (const **cadabra::Ex** & *e1*, const **cadabra::Ex** & *e2*)

10.141.2.3 std::ostream& operator<< (std::ostream & *s*, **cadabra::Ex_comparator::useprops_t** *up*)

10.142 core/Compare.hh File Reference

```
#include "Storage.hh"
#include "Props.hh"
#include "properties/Indices.hh"
```

Classes

- class cadabra::tree_less_obj

  Compare two trees by pattern logic, i.e. modulo index names.
- class cadabra::tree_less_modprel_obj
- class cadabra::tree_equal_obj
- class cadabra::tree_exact_less_obj

  Compare two trees exactly, i.e. including exact index names.
- class cadabra::tree_exact_less_mod_prel_obj
- class cadabra::tree_exact_equal_obj
- class cadabra::tree_exact_equal_mod_prel_obj
- class cadabra::tree_exact_less_for_indexmap_obj

  Compare for indexmap_t.
- class cadabra::tree_exact_less_no_wildcards_obj

  Compare two trees exactly, treat wildcard names as ordinary names.
- class cadabra::tree_exact_less_no_wildcards_mod_prel_obj
- class cadabra::Ex_comparator

  A generic tree comparison class which will take into account index contractions and will also keep track of a replacement list for all types of cadabra wildcards.
- class cadabra::Ex_is_equivalent

  Basic comparison operator for tree iterators, so we can use them as keys in maps.
- class cadabra::Ex_is_less

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Functions

- int cadabra::subtree_compare (const Properties ∗, Ex::iterator one, Ex::iterator two, int mod_prel=-2, bool checksets=true, int compare_multiplier=-2, bool literal_wildcards=false)

  Basic building block subtree comparison function for tensors without dummy indices, which determines whether two tensor subtrees are equal up to the names of indices.
- bool cadabra::tree_less (const Properties ∗, const Ex &one, const Ex &two, int mod_prel=-2, bool checksets=true, int compare_multiplier=-2)

  Various comparison functions, some exact, some with pattern logic.
- bool cadabra::tree_equal (const Properties ∗properties, const Ex &one, const Ex &two, int mod_prel, bool checksets, int compare_multiplier)
- bool cadabra::tree_exact_less (const Properties ∗properties, const Ex &one, const Ex &two, int mod_prel, bool checksets, int compare_multiplier, bool literal_wildcards)
- bool cadabra::tree_exact_equal (const Properties ∗properties, const Ex &one, const Ex &two, int mod_prel, bool checksets, int compare_multiplier, bool literal_wildcards)
- bool cadabra::subtree_less (const Properties ∗properties, Ex::iterator one, Ex::iterator two, int mod_prel, bool checksets, int compare_multiplier)
- bool cadabra::subtree_equal (const Properties ∗properties, Ex::iterator one, Ex::iterator two, int mod_prel, bool checksets, int compare_multiplier)
- bool cadabra::subtree_exact_less (const Properties ∗properties, Ex::iterator one, Ex::iterator two, int mod_↩ prel, bool checksets, int compare_multiplier, bool literal_wildcards)
- bool cadabra::subtree_exact_equal (const Properties ∗properties, Ex::iterator one, Ex::iterator two, int mod↩ _prel, bool checksets, int compare_multiplier, bool literal_wildcards)
- bool operator< (const cadabra::Ex::iterator &, const cadabra::Ex::iterator &)
- bool operator< (const cadabra::Ex &, const cadabra::Ex &)
- std::ostream & operator<< (std::ostream &, cadabra::Ex_comparator::useprops_t up)

10.142.1 Function Documentation

10.142.1.1 bool operator< (const cadabra::Ex::iterator & , const cadabra::Ex::iterator &)

10.142.1.2 bool operator< (const cadabra::Ex & , const cadabra::Ex &)

10.142.1.3 std::ostream& operator<< (std::ostream & , cadabra::Ex_comparator::useprops_t *up*)

10.143 core/DisplayBase.cc File Reference

```
#include "DisplayBase.hh"
```

10.144 core/DisplayBase.hh File Reference

```
#include "Props.hh"
#include "Storage.hh"
```

Classes

- class cadabra::DisplayBase

  Base class for all display classes.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.145 core/DisplaySympy.cc File Reference

```
#include "Algorithm.hh"
#include "Functional.hh"
#include "DisplaySympy.hh"
#include "properties/Depends.hh"
#include "properties/Accent.hh"
```

10.146 core/DisplaySympy.hh File Reference

```
#include "DisplayBase.hh"
#include <ostream>
#include <map>
#include <set>
```

Classes

- class cadabra::DisplaySympy

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Typedefs

- typedef uint32_t kunichar

Functions

- const char * cadabra::unichar (kunichar c)

10.146.1 Typedef Documentation

10.146.1.1 typedef uint32_t kunichar

10.147 core/DisplayTerminal.cc File Reference

```
#include "Algorithm.hh"
#include "DisplayTerminal.hh"
#include "properties/Accent.hh"
```

10.148 core/DisplayTerminal.hh File Reference

```
#include "Props.hh"
#include "Storage.hh"
#include "DisplayBase.hh"
#include <ostream>
#include <map>
```

Classes

- class cadabra::DisplayTerminal

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Typedefs

- typedef uint32_t kunichar

Functions

- const char * cadabra::unichar (kunichar c)

10.148.1 Typedef Documentation

10.148.1.1 typedef uint32_t kunichar

10.149 core/DisplayTeX.cc File Reference

```
#include "Symbols.hh"
#include "DisplayTeX.hh"
#include "Algorithm.hh"
#include "properties/LaTeXForm.hh"
#include "properties/Derivative.hh"
#include "properties/Accent.hh"
```

Macros

- #define nbsp " "
- #define zwnbsp ""

Functions

- int k_unichar_to_utf8 (kunichar c, char *buf)
- const char * unichar (kunichar c)

10.149.1 Macro Definition Documentation

10.149.1.1 #define nbsp " "

10.149.1.2 #define zwnbsp ""

10.149.2 Function Documentation

10.149.2.1 int k_unichar_to_utf8 (kunichar *c*, char * *buf*)

10.149.2.2 const char* unichar (kunichar *c*)

10.150 core/DisplayTeX.hh File Reference

```
#include "Props.hh"
#include "Storage.hh"
#include "DisplayBase.hh"
#include <ostream>
```

Classes

- class cadabra::DisplayTeX

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Typedefs

- typedef uint32_t kunichar

Functions

- const char * cadabra::unichar (kunichar c)

10.150.1 Typedef Documentation

10.150.1.1 typedef uint32_t kunichar

10.151 core/Dummies.hh File Reference

```
#include "algorithm.hh"
#include "props.hh"
```

Classes

- class rename_dummies

10.152 core/echokernel.py File Reference

Classes

- class echokernel.EchoKernel

Namespaces

- echokernel

Variables

- echokernel.kernel_class

10.153 core/Exceptions.cc File Reference

```
#include "Exceptions.hh"
#include <iostream>
```

10.154 core/Exceptions.hh File Reference

```
#include <stdexcept>
#include <string>
```

Classes

- class CadabraException
- class ConsistencyException
- class ParseException
- class InterruptionException
- class ArgumentException

  Exception thrown when arguments to an algorithm or property are not correct.
- class NonScalarException

  Exception thrown when something requires that an expression is a pure scalar (i.e.
- class RuntimeException

  Exception thrown when an algorithm cannot complete, e.g.
- class InternalError

  Exception thrown when there the Cadabra code detects an internal inconsistency; this should never happen, but is better than bailing out with an assert.
- class NotYetImplemented

  Exception thrown when there the Cadabra code detects an internal inconsistency; this should never happen, but is better than bailing out with an assert.

10.155 core/Exchange.cc File Reference

```
#include <map>
#include "Exchange.hh"
#include "Compare.hh"
#include "Algorithm.hh"
#include "properties/DiracBar.hh"
```

Functions

- bool operator< (const exchange::tensor_type_t &one, const exchange::tensor_type_t &two)

10.155.1 Function Documentation

10.155.1.1 bool operator< (const exchange::tensor_type_t & *one*, const exchange::tensor_type_t & *two*)

10.156 core/Exchange.hh File Reference

```
#include <vector>
#include "Storage.hh"
#include "properties/GammaMatrix.hh"
#include "properties/Spinor.hh"
#include "properties/Traceless.hh"
#include "properties/GammaTraceless.hh"
#include "properties/SelfCommutingBehaviour.hh"
#include "properties/CommutingBehaviour.hh"
```

Classes

- class cadabra::exchange
- struct cadabra::exchange::identical_tensors_t
- struct cadabra::exchange::tensor_type_t

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Functions

- bool cadabra::operator< (const exchange::tensor_type_t &one, const exchange::tensor_type_t &two)

10.157 core/Functional.cc File Reference

```
#include "Functional.hh"
```

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Functions

- void cadabra::do_list (const Ex &tr, Ex::iterator it, std::function< bool(Ex::iterator)> f)

  Apply a function on every element of a list, or if the iterator 'it' does not point to a list, only on that single element.
- int cadabra::list_size (const Ex &tr, Ex::iterator it)

  For lists as defined above for 'do_list', return their size (in case you really need to know the size before iterating over the elements).
- Ex::iterator cadabra::do_subtree (const Ex &tr, Ex::iterator it, std::function< Ex::iterator(Ex::iterator)> f)

  Apply a function on every node in the tree at and below the given node, depth-first.
- Ex::iterator cadabra::find_in_subtree (const Ex &tr, Ex::iterator it, std::function< bool(Ex::iterator)> f, bool including_head=true)

  Returns an iterator to the first element for which 'f' returns 'true', or 'tr.end()'.
- Ex::iterator cadabra::find_in_list (const Ex &tr, Ex::iterator it, std::function< Ex::iterator(Ex::iterator)> f)

  Returns an iterator to the first element for which 'f' does not return tr.end().
- Ex cadabra::make_list (Ex el)

  Ensure that the tree is a list, even if it contains only a single element.

10.158 core/Functional.hh File Reference

```
#include <functional>
#include "Storage.hh"
```

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Functions

- void cadabra::do_list (const Ex &tr, Ex::iterator it, std::function< bool(Ex::iterator)> f)

  Apply a function on every element of a list, or if the iterator 'it' does not point to a list, only on that single element.
- int cadabra::list_size (const Ex &tr, Ex::iterator it)

  For lists as defined above for 'do_list', return their size (in case you really need to know the size before iterating over the elements).
- Ex::iterator cadabra::do_subtree (const Ex &tr, Ex::iterator it, std::function< Ex::iterator(Ex::iterator)> f)

  Apply a function on every node in the tree at and below the given node, depth-first.
- Ex::iterator cadabra::find_in_list (const Ex &tr, Ex::iterator it, std::function< Ex::iterator(Ex::iterator)> f)

  Returns an iterator to the first element for which 'f' does not return tr.end().
- Ex::iterator cadabra::find_in_subtree (const Ex &tr, Ex::iterator it, std::function< bool(Ex::iterator)> f, bool including_head=true)

  Returns an iterator to the first element for which 'f' returns 'true', or 'tr.end()'.
- Ex cadabra::make_list (Ex el)

  Ensure that the tree is a list, even if it contains only a single element.

10.159 core/IndexIterator.cc File Reference

```
#include "IndexIterator.hh"
#include "properties/IndexInherit.hh"
```

10.160 core/IndexIterator.hh File Reference

```
#include "Storage.hh"
#include "Props.hh"
```

Classes

- class cadabra::index_iterator

  An iterator which iterates over indices even if they are at lower levels, i.e.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.161 core/Kernel.cc File Reference

```
#include "Kernel.hh"
#include "PreClean.hh"
#include "Cleanup.hh"
#include "Parser.hh"
```

10.162 core/Kernel.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::Kernel

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.163 core/Parser.cc File Reference

```
#include "Parser.hh"
#include "PreProcessor.hh"
#include <sstream>
```

Functions

- std::istream & operator>> (std::istream &str, cadabra::Parser &pa)

10.163.1 Function Documentation

10.163.1.1 std::istream& operator>> (std::istream & *str,* cadabra::Parser & *pa*)

10.164 core/Parser.hh File Reference

```
#include <string>
#include <vector>
#include <iostream>
#include "Storage.hh"
```

Classes

- class cadabra::Parser

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Functions

- std::istream & operator>> (std::istream &, cadabra::Parser &)

10.164.1 Function Documentation

10.164.1.1 std::istream& operator>> (std::istream & , cadabra::Parser &)

10.165 core/passing.cc File Reference

```
#include <iostream>
```

Functions

- void fun (int *&p)
- int main ()

Variables

- int k =5

10.165.1 Function Documentation

10.165.1.1 void fun (int *& *p*)

10.165.1.2 int main ( )

10.165.2 Variable Documentation

10.165.2.1 int k =5

10.166 core/Permutations.hh File Reference

```
#include <stdexcept>
#include <vector>
```

Classes

- class PermutationException

  Generic permutation group material.
- class Perm
- class Images

10.167 core/PreClean.cc File Reference

```
#include "PreClean.hh"
#include "Cleanup.hh"
```

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Functions

- void cadabra::pre_clean_dispatch (const Kernel &kernel, Ex &ex, Ex::iterator &it)
- void cadabra::pre_clean_dispatch_deep (const Kernel &k, Ex &tr)
- void cadabra::cleanup_updown (const Kernel &k, Ex &, Ex::iterator &it)

  Cleanup for individual node types.
- void cadabra::cleanup_rational (const Kernel &k, Ex &tr, Ex::iterator &st)
- void cadabra::cleanup_frac (const Kernel &k, Ex &tr, Ex::iterator &st)
- void cadabra::cleanup_sub (const Kernel &k, Ex &tr, Ex::iterator &it)
- void cadabra::cleanup_indexbracket (const Kernel &k, Ex &, Ex::iterator &it)

  Convert parser output which indicates an indexbracket to an actual indexbracket node.

10.168 core/PreClean.hh File Reference

```
#include "Algorithm.hh"
```

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Functions

- void cadabra::pre_clean_dispatch (const Kernel &kernel, Ex &ex, Ex::iterator &it)
- void cadabra::pre_clean_dispatch_deep (const Kernel &k, Ex &tr)
- void cadabra::cleanup_updown (const Kernel &k, Ex &, Ex::iterator &it)

  Cleanup for individual node types.
- void cadabra::cleanup_rational (const Kernel &k, Ex &tr, Ex::iterator &st)
- void cadabra::cleanup_frac (const Kernel &k, Ex &tr, Ex::iterator &st)
- void cadabra::cleanup_sub (const Kernel &k, Ex &tr, Ex::iterator &it)
- void cadabra::cleanup_indexbracket (const Kernel &k, Ex &, Ex::iterator &it)

  Convert parser output which indicates an indexbracket to an actual indexbracket node.

10.169 core/PreProcessor.cc File Reference

```
#include <ctype.h>
#include <stdexcept>
#include <sstream>
#include "PreProcessor.hh"
```

Functions

- std::istream & operator>> (std::istream &s, preprocessor &p)
- std::ostream & operator<< (std::ostream &s, const preprocessor &p)

10.169.1 Function Documentation

10.169.1.1 std::ostream& operator<< (std::ostream & *s*, const preprocessor & *p*)

10.169.1.2 std::istream& operator>> (std::istream & *s*, preprocessor & *p*)

10.170 core/PreProcessor.hh File Reference

```
#include <iostream>
#include <string>
#include <vector>
```

Classes

- class preprocessor

  Preprocessing class which takes infix mathematical notation with all sorts of maths shortcuts and transforms it into a string which is properly formatted in prefix notation.
- class preprocessor::accu_t

Enumerations

- enum {
  tok_arrow =0xac, tok_unequals =0xad, tok_wedge =0xae, tok_pow =0xaf,
  tok_set_option =0xb0, tok_declare =0xb1, tok_sequence =0xb2, tok_siblings =0xb3 }

Functions

- std::ostream & operator<< (std::ostream &, const preprocessor &)
- std::istream & operator>> (std::istream &, preprocessor &)

10.170.1 Enumeration Type Documentation

10.170.1.1 anonymous enum

Enumerator

tok_arrow

tok_unequals

tok_wedge

tok_pow

tok_set_option

tok_declare

tok_sequence

tok_siblings

10.170.2 Function Documentation

10.170.2.1 std::ostream& operator<< (std::ostream & , const preprocessor &)

10.170.2.2 std::istream& operator>> (std::istream & , preprocessor &)

10.171 core/ProgressMonitor.cc File Reference

```
#include "ProgressMonitor.hh"
#include <iostream>
#include <sstream>
```

10.172 core/ProgressMonitor.hh File Reference

```
#include <string>
#include <chrono>
#include <stack>
#include <map>
#include <vector>
```

Classes

- class ProgressMonitor
- class ProgressMonitor::Total
- class ProgressMonitor::Block

10.173 core/properties/Accent.cc File Reference

```
#include "properties/Accent.hh"
```

10.174 core/properties/Accent.hh File Reference

```
#include "properties/IndexInherit.hh"
#include "properties/NumericalFlat.hh"
```

Classes

- class cadabra::Accent

  Turns a symbol into an accent.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.175 core/properties/AntiCommuting.cc File Reference

```
#include "properties/AntiCommuting.hh"
```

10.176 core/properties/AntiCommuting.hh File Reference

```
#include "properties/CommutingBehaviour.hh"
```

Classes

- class cadabra::AntiCommuting

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.177 core/properties/AntiSymmetric.cc File Reference

```
#include "Algorithm.hh"
#include "properties/AntiSymmetric.hh"
```

10.178 core/properties/AntiSymmetric.hh File Reference

```
#include "properties/TableauBase.hh"
#include "properties/Traceless.hh"
```

Classes

- class cadabra::AntiSymmetric

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.179 core/properties/Commuting.cc File Reference

```
#include "properties/Commuting.hh"
```

10.180 core/properties/Commuting.hh File Reference

```
#include "properties/CommutingBehaviour.hh"
```

Classes

- class cadabra::Commuting

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.181 core/properties/CommutingAsProduct.cc File Reference

```
#include "properties/CommutingAsProduct.hh"
```

10.182 core/properties/CommutingAsProduct.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::CommutingAsProduct

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.183 core/properties/CommutingAsSum.cc File Reference

```
#include "properties/CommutingAsSum.hh"
```

10.184 core/properties/CommutingAsSum.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::CommutingAsSum

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.185 core/properties/CommutingBehaviour.cc File Reference

```
#include "properties/CommutingBehaviour.hh"
```

10.186 core/properties/CommutingBehaviour.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::CommutingBehaviour

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.187 core/properties/Coordinate.cc File Reference

```
#include "properties/Coordinate.hh"
```

10.188 core/properties/Coordinate.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::Coordinate

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.189 core/properties/DAntiSymmetric.cc File Reference

```
#include "properties/DAntiSymmetric.hh"
```

10.190 core/properties/DAntiSymmetric.hh File Reference

```
#include "properties/TableauBase.hh"
```

Classes

- class cadabra::DAntiSymmetric

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.191 core/properties/Depends.cc File Reference

```
#include "properties/Depends.hh"
#include "properties/Indices.hh"
#include "properties/Coordinate.hh"
#include "properties/Derivative.hh"
#include "properties/Accent.hh"
#include "Exceptions.hh"
#include "Kernel.hh"
```

10.192 core/properties/Depends.hh File Reference

```
#include "properties/DependsBase.hh"
```

Classes

- class cadabra::Depends

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.193 core/properties/DependsBase.hh File Reference

```
#include "Props.hh"
#include "Kernel.hh"
```

Classes

- class cadabra::DependsBase

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.194 core/properties/DependsInherit.cc File Reference

```
#include "properties/DependsInherit.hh"
```

10.195 core/properties/DependsInherit.hh File Reference

```
#include "properties/DependsBase.hh"
```

Classes

- class cadabra::DependsInherit

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.196 core/properties/Derivative.cc File Reference

```
#include "properties/Derivative.hh"
#include "Props.hh"
#include "Kernel.hh"
```

10.197 core/properties/Derivative.hh File Reference

```
#include "properties/CommutingAsProduct.hh"
#include "properties/NumericalFlat.hh"
#include "properties/WeightBase.hh"
#include "properties/TableauBase.hh"
#include "properties/Distributable.hh"
#include "properties/DependsInherit.hh"
#include "properties/IndexInherit.hh"
#include "properties/SortOrder.hh"
```

Classes

- class cadabra::Derivative

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.198 core/properties/Diagonal.cc File Reference

```
#include "properties/Diagonal.hh"
```

10.199 core/properties/Diagonal.hh File Reference

```
#include "Props.hh"
#include "properties/Symmetric.hh"
```

Classes

- class cadabra::Diagonal

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.200 core/properties/DifferentialForm.cc File Reference

```
#include "DifferentialForm.hh"
```

10.201 core/properties/DifferentialForm.hh File Reference

```
#include "Props.hh"
#include "properties/ImplicitIndex.hh"
#include "properties/IndexInherit.hh"
#include "properties/DifferentialFormBase.hh"
```

Classes

- class cadabra::DifferentialForm

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.202 core/properties/DifferentialFormBase.hh File Reference

```
#include "Props.hh"
#include "properties/ImplicitIndex.hh"
#include "properties/IndexInherit.hh"
```

Classes

- class cadabra::DifferentialFormBase

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.203 core/properties/DiracBar.cc File Reference

```
#include "DiracBar.hh"
```

10.204 core/properties/DiracBar.hh File Reference

```
#include "properties/Accent.hh"
#include "properties/Distributable.hh"
```

Classes

- class cadabra::DiracBar

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.205 core/properties/Distributable.cc File Reference

```
#include "Distributable.hh"
```

10.206 core/properties/Distributable.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::Distributable

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.207 core/properties/EpsilonTensor.cc File Reference

```
#include "properties/EpsilonTensor.hh"
```

10.208 core/properties/EpsilonTensor.hh File Reference

```
#include "properties/AntiSymmetric.hh"
```

Classes

- class cadabra::EpsilonTensor

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.209 core/properties/ExteriorDerivative.cc File Reference

```
#include "Exceptions.hh"
#include "ExteriorDerivative.hh"
```

10.210 core/properties/ExteriorDerivative.hh File Reference

```
#include "Props.hh"
#include "properties/Derivative.hh"
#include "properties/DifferentialFormBase.hh"
```

Classes

- class cadabra::ExteriorDerivative

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.211 core/properties/FilledTableau.cc File Reference

```
#include "properties/FilledTableau.hh"
```

10.212 core/properties/FilledTableau.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::FilledTableau

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.213 core/properties/GammaMatrix.cc File Reference

```
#include "GammaMatrix.hh"
#include "Kernel.hh"
```

10.214 core/properties/GammaMatrix.hh File Reference

```
#include "properties/Matrix.hh"
#include "properties/AntiSymmetric.hh"
```

Classes

- class cadabra::GammaMatrix

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.215 core/properties/GammaTraceless.cc File Reference

```
#include "GammaTraceless.hh"
```

10.216 core/properties/GammaTraceless.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::GammaTraceless

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.217 core/properties/ImaginaryI.cc File Reference

```
#include "properties/ImaginaryI.hh"
```

10.218 core/properties/ImaginaryI.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::ImaginaryI

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.219 core/properties/ImplicitIndex.cc File Reference

```
#include "properties/ImplicitIndex.hh"
#include "Exceptions.hh"
```

10.220 core/properties/ImplicitIndex.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::ImplicitIndex

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.221 core/properties/IndexInherit.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::IndexInherit

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.222 core/properties/Indices.cc File Reference

```
#include "properties/Indices.hh"
#include "Exceptions.hh"
#include "Functional.hh"
```

10.223 core/properties/Indices.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::Indices

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.224 core/properties/Integer.cc File Reference

```
#include "properties/Integer.hh"
#include "Cleanup.hh"
#include "Kernel.hh"
#include "algorithms/collect_terms.hh"
```

10.225 core/properties/Integer.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::Integer

  Property indicating that a symbolic object always takes integer values.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.226 core/properties/Integral.hh File Reference

```
#include "Props.hh"
```

Classes

- class Integral

10.227 core/properties/InverseMetric.cc File Reference

```
#include "Exceptions.hh"
#include "properties/InverseMetric.hh"
```

10.228 core/properties/InverseMetric.hh File Reference

```
#include "Props.hh"
#include "properties/TableauSymmetry.hh"
```

Classes

- class cadabra::InverseMetric

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.229 core/properties/KroneckerDelta.cc File Reference

```
#include "properties/KroneckerDelta.hh"
#include "Exceptions.hh"
```

10.230 core/properties/KroneckerDelta.hh File Reference

```
#include "properties/TableauBase.hh"
```

Classes

- class cadabra::KroneckerDelta

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.231 core/properties/LaTeXForm.cc File Reference

```
#include "properties/LaTeXForm.hh"
```

10.232 core/properties/LaTeXForm.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::LaTeXForm

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.233 core/properties/Matrix.cc File Reference

```
#include "Matrix.hh"
```

10.234 core/properties/Matrix.hh File Reference

```
#include "properties/ImplicitIndex.hh"
```

Classes

- class cadabra::Matrix

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.235 core/properties/Metric.cc File Reference

```
#include "Exceptions.hh"
#include "properties/Metric.hh"
```

10.236 core/properties/Metric.hh File Reference

```
#include "Props.hh"
#include "properties/Symmetric.hh"
```

Classes

- class cadabra::Metric

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.237 core/properties/NonCommuting.cc File Reference

```
#include "properties/NonCommuting.hh"
```

10.238 core/properties/NonCommuting.hh File Reference

```
#include "properties/CommutingBehaviour.hh"
```

Classes

- class cadabra::NonCommuting

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.239 core/properties/NumericalFlat.cc File Reference

```
#include "properties/NumericalFlat.hh"
```

10.240 core/properties/NumericalFlat.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::NumericalFlat

  Property indicating that an operator is numerically flat, so that numerical factors in the argument can be taken outside.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.241 core/properties/PartialDerivative.cc File Reference

```
#include "Algorithm.hh"
#include "properties/PartialDerivative.hh"
```

10.242 core/properties/PartialDerivative.hh File Reference

```
#include "properties/Derivative.hh"
```

Classes

- class cadabra::PartialDerivative

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.243 core/properties/RiemannTensor.cc File Reference

```
#include "IndexIterator.hh"
#include "Exceptions.hh"
#include "Kernel.hh"
#include "Algorithm.hh"
#include "properties/RiemannTensor.hh"
```

10.244 core/properties/RiemannTensor.hh File Reference

```
#include "properties/TableauSymmetry.hh"
```

Classes

- class cadabra::RiemannTensor

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.245 core/properties/SatisfiesBianchi.cc File Reference

```
#include "properties/SatisfiesBianchi.hh"
#include "IndexIterator.hh"
```

10.246 core/properties/SatisfiesBianchi.hh File Reference

```
#include "properties/TableauBase.hh"
```

Classes

- class cadabra::SatisfiesBianchi

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.247 core/properties/SelfAntiCommuting.cc File Reference

```
#include "properties/SelfAntiCommuting.hh"
```

10.248 core/properties/SelfAntiCommuting.hh File Reference

```
#include "properties/SelfCommutingBehaviour.hh"
```

Classes

- class cadabra::SelfAntiCommuting

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.249 core/properties/SelfCommuting.cc File Reference

```
#include "properties/SelfCommuting.hh"
```

10.250 core/properties/SelfCommuting.hh File Reference

```
#include "properties/SelfCommutingBehaviour.hh"
```

Classes

- class cadabra::SelfCommuting

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.251 core/properties/SelfCommutingBehaviour.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::SelfCommutingBehaviour

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.252 core/properties/SelfNonCommuting.cc File Reference

```
#include "properties/SelfNonCommuting.hh"
```

10.253 core/properties/SelfNonCommuting.hh File Reference

```
#include "properties/SelfCommutingBehaviour.hh"
```

Classes

- class cadabra::SelfNonCommuting

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.254 core/properties/SortOrder.cc File Reference

```
#include "properties/SortOrder.hh"
```

10.255 core/properties/SortOrder.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::SortOrder

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.256 core/properties/Spinor.cc File Reference

```
#include "Spinor.hh"
#include "Exceptions.hh"
#include "Kernel.hh"
```

10.257 core/properties/Spinor.hh File Reference

```
#include "properties/ImplicitIndex.hh"
```

Classes

- class cadabra::Spinor

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.258 core/properties/Symbol.cc File Reference

```
#include "properties/Symbol.hh"
```

10.259 core/properties/Symbol.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::Symbol

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.260 core/properties/Symmetric.cc File Reference

```
#include "properties/Symmetric.hh"
```

10.261 core/properties/Symmetric.hh File Reference

```
#include "properties/TableauBase.hh"
```

Classes

- class cadabra::Symmetric

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.262 core/properties/Tableau.cc File Reference

```
#include "properties/Tableau.hh"
```

10.263 core/properties/Tableau.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::Tableau

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.264 core/properties/TableauBase.cc File Reference

```
#include "properties/TableauBase.hh"
```

10.265 core/properties/TableauBase.hh File Reference

```
#include "Props.hh"
#include "YoungTab.hh"
```

Classes

- class cadabra::TableauBase

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.266 core/properties/TableauSymmetry.cc File Reference

```
#include "properties/TableauSymmetry.hh"
#include "IndexIterator.hh"
#include "Kernel.hh"
```

10.267 core/properties/TableauSymmetry.hh File Reference

```
#include "properties/TableauBase.hh"
#include <vector>
```

Classes

- class cadabra::TableauSymmetry

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.268 core/properties/Traceless.cc File Reference

```
#include "Traceless.hh"
```

10.269 core/properties/Traceless.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::Traceless

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.270 core/properties/Weight.cc File Reference

```
#include "Weight.hh"
```

10.271 core/properties/Weight.hh File Reference

```
#include "properties/WeightBase.hh"
```

Classes

- class cadabra::Weight

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.272 core/properties/WeightBase.hh File Reference

```
#include "Props.hh"
```

Classes

- class cadabra::WeightBase

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.273 core/properties/WeightInherit.cc File Reference

```
#include "WeightInherit.hh"
#include "Kernel.hh"
```

10.274 core/properties/WeightInherit.hh File Reference

```
#include "Exceptions.hh"
#include "properties/WeightBase.hh"
```

Classes

- class cadabra::WeightInherit
- class cadabra::WeightInherit::WeightException

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.275 core/properties/WeylTensor.cc File Reference

```
#include "IndexIterator.hh"
#include "Exceptions.hh"
#include "Kernel.hh"
#include "Algorithm.hh"
#include "properties/WeylTensor.hh"
```

10.276 core/properties/WeylTensor.hh File Reference

```
#include "properties/TableauSymmetry.hh"
#include "properties/Traceless.hh"
```

Classes

- class cadabra::WeylTensor

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.277 core/Props.cc File Reference

```
#include "Props.hh"
#include "Exceptions.hh"
#include "Compare.hh"
#include <stdlib.h>
#include <typeinfo>
#include <iostream>
#include <sstream>
#include "properties/Indices.hh"
```

10.278 core/Props.hh File Reference

```
#include <map>
#include <list>
#include "Storage.hh"
```

Classes

- class cadabra::pattern
- class cadabra::keyval_t

  Arguments to properties get parsed into a keyval_t structure.
- class cadabra::property

  Base class for all properties, handling argument parsing and defining the interface.
- class cadabra::labelled_property
- class cadabra::list_property

  Something cannot be both a list property and a normal property at the same time, so we can safely inherit without virtual.
- class cadabra::Inherit< T >

  If a property X derives from Inherit<Y>, and get<Y> is called on an object which has an X property (but no Y property), then the get<Y> will look at the non-index child of the object to see if that has a Y property.
- class cadabra::PropertyInherit

  PropertyInherit is like Inherit<T> for all properties.
- class cadabra::Properties

  Class holding a collection of properties attached to expressions.
- class cadabra::Properties::registered_property_map_t

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.279 core/ptest.cc File Reference

```
#include <boost/python.hpp>
```

Classes

- struct X

  Mockup types.
- struct Y
- struct Z

Functions

- X * make_x_and_inject_y ()

  Auxiliary function that will create X and inject an Y object as 'y' into the caller's frame.
- void fun ()
- BOOST_PYTHON_MODULE (example)

10.279.1 Function Documentation

10.279.1.1 BOOST_PYTHON_MODULE (example)

10.279.1.2 void fun ( )

10.279.1.3 X* make_x_and_inject_y ( )

Auxiliary function that will create X and inject an Y object as 'y' into the caller's frame.

10.280 core/PythonCdb.cc File Reference

```
#include <memory>
#include "PythonCdb.hh"
#include "SympyCdb.hh"
#include "Parser.hh"
#include "Bridge.hh"
#include "Exceptions.hh"
#include "DisplayTeX.hh"
#include "DisplaySympy.hh"
#include "DisplayTerminal.hh"
#include "Cleanup.hh"
#include "PreClean.hh"
#include "PythonException.hh"
#include "ProgressMonitor.hh"
#include <boost/python/implicit.hpp>
#include <boost/parameter/preprocessor.hpp>
#include <boost/mpl/vector.hpp>
#include <boost/python/enum.hpp>
#include <boost/python/def.hpp>
#include <boost/python/module.hpp>
#include <boost/python/stl_iterator.hpp>
#include <boost/python/slice.hpp>
#include <boost/python/suite/indexing/vector_indexing_suite.hpp>
#include <boost/algorithm/string/replace.hpp>
#include <sstream>
#include "properties/Accent.hh"
#include "properties/AntiCommuting.hh"
#include "properties/AntiSymmetric.hh"
#include "properties/Commuting.hh"
#include "properties/Coordinate.hh"
#include "properties/Depends.hh"
#include "properties/DependsInherit.hh"
#include "properties/Derivative.hh"
#include "properties/DifferentialForm.hh"
#include "properties/DiracBar.hh"
#include "properties/GammaMatrix.hh"
#include "properties/CommutingAsProduct.hh"
#include "properties/CommutingAsSum.hh"
#include "properties/DAntiSymmetric.hh"
#include "properties/Diagonal.hh"
#include "properties/Distributable.hh"
#include "properties/EpsilonTensor.hh"
#include "properties/ExteriorDerivative.hh"
#include "properties/FilledTableau.hh"
#include "properties/ImaginaryI.hh"
#include "properties/ImplicitIndex.hh"
#include "properties/Indices.hh"
#include "properties/IndexInherit.hh"
#include "properties/Integer.hh"
#include "properties/InverseMetric.hh"
#include "properties/KroneckerDelta.hh"
#include "properties/LaTeXForm.hh"
#include "properties/Matrix.hh"
#include "properties/Metric.hh"
#include "properties/NonCommuting.hh"
#include "properties/NumericalFlat.hh"
#include "properties/PartialDerivative.hh"
#include "properties/RiemannTensor.hh"
#include "properties/SatisfiesBianchi.hh"
#include "properties/SelfAntiCommuting.hh"
#include "properties/SelfCommuting.hh"
#include "properties/SelfNonCommuting.hh"
#include "properties/SortOrder.hh"
```

Classes

- class iterable_converter

Functions

- template<typename T >
  std::vector< T > to_std_vector (const boost::python::list &iterable)
- boost::python::list ProgressMonitor_totals_helper (ProgressMonitor &self)
- boost::python::list terms (const Ex &ex)
- Ex lhs (const Ex &ex)
- Ex rhs (const Ex &ex)
- Ex Ex_getslice (Ex &ex, boost::python::slice slice)
- Ex Ex_getitem (Ex &ex, int index)
- void Ex_setitem (Ex &ex, int index, Ex val)
- size_t Ex_len (Ex &ex)
- std::string Ex_str_ (const Ex &ex)

  Generate the Python str() and repr() representation of the Ex object.
- std::string Ex_latex_ (const Ex &ex)

  The Python 'print' function always calls the 'str' member on objects to be printed.
- std::string Ex_repr_ (const Ex &ex)
- boost::python::object Ex_to_Sympy (const Ex &ex)

  Convert a Cadabra 'Ex' to a Sympy expression.
- std::shared_ptr< Ex > fetch_from_python (const std::string &nm)

  Fetch an Ex object from the Python side using its Python identifier.
- bool __eq__Ex_Ex (const Ex &one, const Ex &other)

  Comparison operator for Ex objects in Python.
- bool __eq__Ex_int (const Ex &one, int other)

  Comparison operator for Ex objects in Python.
- std::shared_ptr< Ex > make_Ex_from_string (const std::string &ex_, bool make_ref=true)
- std::shared_ptr< Ex > construct_Ex_from_string (const std::string &ex_)
- std::shared_ptr< Ex > construct_Ex_from_string_2 (const std::string &ex_, bool add_ref)
- std::shared_ptr< Ex > make_Ex_from_int (int num, bool make_ref=true)
- std::shared_ptr< Ex > construct_Ex_from_int (int num)
- std::shared_ptr< Ex > construct_Ex_from_int_2 (int num, bool add_ref)
- Ex operator+ (const Ex &ex1, const Ex &ex2)

  Add two expressions, adding a top-level node if required.
- Ex operator- (const Ex &ex1, const Ex &ex2)

  Subtract two expressions, adding a top-level node if required.
- std::string init_ipython ()
- boost::python::list list_properties ()
- std::string print_tree (Ex *ex)
- PyObject * createExceptionClass (const char *name, PyObject *baseTypeObj=PyExc_Exception)
- void translate_ArgumentException (const ArgumentException &x)
- void translate_ConsistencyException (const ConsistencyException &x)
- void translate_ParseException (const ParseException &e)
- void translate_RuntimeException (const RuntimeException &e)
- void translate_NonScalarException (const NonScalarException &e)
- void translate_InternalError (const InternalError &e)

- void translate_NotYetImplemented (const NotYetImplemented &e)
- Kernel * get_kernel_from_scope ()

  Get a pointer to the currently visible kernel.
- Kernel * create_scope ()

  Setup of kernels in current scope, callable from Python.
- Kernel * create_scope_from_global ()
- Kernel * create_empty_scope ()
- void inject_defaults (Kernel *k)

  *Inject properties directly into the Kernel, even if the kernel is not yet on the Python stack (needed when we create a new local scope: in this case we create the kernel and pass it back to be turned into local **cdbkernel** by Python, but we want to populate the kernel with defaults before we hand it back).*
- template<class F >
  Ex * dispatch_base (Ex &ex, F &algo, bool deep, bool repeat, unsigned int depth, bool pre_order)
- Ex * map_sympy_wrapper (Ex &ex, std::string head)
- void call_post_process (Kernel &kernel, Ex &ex)

  Run the post-process Python function (if defined) on the given expression.
- template<class F >
  Ex * dispatch_ex (Ex &ex, bool deep, bool repeat, unsigned int depth)
- template<class F , typename Arg1 >
  Ex * dispatch_ex (Ex &ex, Arg1 arg, bool deep, bool repeat, unsigned int depth)
- template<class F , typename Arg1 , typename Arg2 >
  Ex * dispatch_ex (Ex &ex, Arg1 arg1, Arg2 arg2, bool deep, bool repeat, unsigned int depth)
- template<class F , typename... Args>
  Ex * dispatch_string (const std::string &ex, Args...args, bool deep, bool repeat, unsigned int depth)
- template<class F >
  void def_algo_1 (const std::string &name)
- template<class P >
  void def_prop ()
- BOOST_PYTHON_MODULE (cadabra2)

Variables

- bool output_ipython =false
- bool post_process_enabled =true
- PyObject * ParseExceptionType = NULL
- PyObject * ArgumentExceptionType = 0
- PyObject * ConsistencyExceptionType = 0
- PyObject * RuntimeExceptionType = 0
- PyObject * NonScalarExceptionType = NULL
- PyObject * InternalErrorType = NULL
- PyObject * NotYetImplementedType = NULL
- ProgressMonitor * pm =0

10.280.1 Function Documentation

10.280.1.1 BOOST_PYTHON_MODULE (cadabra2)

10.280.1.2 std::shared_ptr<Ex> construct_Ex_from_int (int *num*)

10.280.1.3 std::shared_ptr<Ex> construct_Ex_from_int_2 (int *num*, bool *add_ref*)

10.280.1.4 std::shared_ptr<Ex> construct_Ex_from_string (const std::string & *ex_*)

10.280.1.5 std::shared_ptr<Ex> construct_Ex_from_string_2 (const std::string & *ex_*, bool *add_ref*)

10.280.1.6 Kernel* create_empty_scope ( )

10.280.1.7 Kernel* create_scope_from_global ( )

10.280.1.8 PyObject* createExceptionClass (const char * *name*, PyObject * *baseTypeObj* = `PyExc_Exception`)

10.280.1.9 template<class F > void def_algo_1 (const std::string & *name*)

10.280.1.10 template<class P > void def_prop ( )

10.280.1.11 template<class F > Ex* dispatch_base (Ex & *ex*, F & *algo*, bool *deep*, bool *repeat*, unsigned int *depth*, bool *pre_order*)

10.280.1.12 template<class F > Ex* dispatch_ex (Ex & *ex*, bool *deep*, bool *repeat*, unsigned int *depth*)

10.280.1.13 template<class F , typename Arg1 > Ex* dispatch_ex (Ex & *ex*, Arg1 *arg*, bool *deep*, bool *repeat*, unsigned int *depth*)

10.280.1.14 template<class F , typename Arg1 , typename Arg2 > Ex* dispatch_ex (Ex & *ex*, Arg1 *arg1*, Arg2 *arg2*, bool *deep*, bool *repeat*, unsigned int *depth*)

10.280.1.15 template<class F , typename... Args> Ex* dispatch_string (const std::string & *ex*, Args... *args*, bool *deep*, bool *repeat*, unsigned int *depth*)

10.280.1.16 Ex Ex_getitem (Ex & *ex*, int *index*)

10.280.1.17 Ex Ex_getslice (Ex & *ex*, boost::python::slice *slice*)

10.280.1.18 size_t Ex_len (Ex & *ex*)

10.280.1.19 std::string Ex_repr_ (const Ex & *ex*)

10.280.1.20 void Ex_setitem (Ex & *ex*, int *index*, Ex *val*)

10.280.1.21 std::shared_ptr<Ex> fetch_from_python (const std::string & *nm*)

Fetch an Ex object from the Python side using its Python identifier.

10.280.1.22 std::string init_ipython ( )

10.280.1.23 Ex lhs (const Ex & *ex*)

10.280.1.24 boost::python::list list_properties ( )

10.280.1.25 std::shared_ptr<Ex> make_Ex_from_int (int *num,* bool *make_ref* = `true`)

10.280.1.26 std::shared_ptr<Ex> make_Ex_from_string (const std::string & *ex_,* bool *make_ref* = `true`)

10.280.1.27 Ex* map_sympy_wrapper (Ex & *ex,* std::string *head*)

10.280.1.28 std::string print_tree (Ex * *ex*)

10.280.1.29 boost::python::list ProgressMonitor_totals_helper (ProgressMonitor & *self*)

10.280.1.30 Ex rhs (const Ex & *ex*)

10.280.1.31 boost::python::list terms (const Ex & *ex*)

10.280.1.32 template<typename T > std::vector<T> to_std_vector (const boost::python::list & *iterable*)

10.280.1.33 void translate_ArgumentException (const ArgumentException & *x*)

10.280.1.34 void translate_ConsistencyException (const ConsistencyException & *x*)

10.280.1.35 void translate_InternalError (const InternalError & *e*)

10.280.1.36 void translate_NonScalarException (const NonScalarException & *e*)

10.280.1.37 void translate_NotYetImplemented (const NotYetImplemented & *e*)

10.280.1.38 void translate_ParseException (const ParseException & *e*)

10.280.1.39 void translate_RuntimeException (const RuntimeException & *e*)

10.280.2 Variable Documentation

10.280.2.1 PyObject* ArgumentExceptionType = 0

10.280.2.2 PyObject* ConsistencyExceptionType = 0

10.280.2.3 PyObject* InternalErrorType = NULL

10.280.2.4 PyObject* NonScalarExceptionType = NULL

10.280.2.5 PyObject* NotYetImplementedType = NULL

10.280.2.6 bool output_ipython =false

10.280.2.7 PyObject* ParseExceptionType = NULL

10.280.2.8 ProgressMonitor* pm =0

10.280.2.9 bool post_process_enabled =true

10.280.2.10 PyObject* RuntimeExceptionType = 0

10.281 core/PythonCdb.hh File Reference

```
#include <boost/python.hpp>
#include <stdexcept>
#include "Storage.hh"
#include "Kernel.hh"
#include "Algorithm.hh"
```

Classes

- class BaseProperty

  Helper class to ensure that all Python property objects derive from the same base class.
- class Property< T >

  Property is a templated wrapper around a C++ property object.

Functions

- bool __eq__Ex_Ex (const cadabra::Ex &, const cadabra::Ex &)

  Comparison operator for Ex objects in Python.
- bool __eq__Ex_int (const cadabra::Ex &, int)

  Comparison operator for Ex objects in Python.
- std::shared_ptr< cadabra::Ex > fetch_from_python (const std::string &nm)

  Fetch an Ex object from the Python side using its Python identifier.
- std::string Ex_str_ (const cadabra::Ex &)

  Generate the Python str() and repr() representation of the Ex object.
- std::string Ex_repr_ (const cadabra::Ex &)
- std::string Ex_latex_ (const cadabra::Ex &)

  The Python 'print' function always calls the 'str' member on objects to be printed.
- boost::python::object Ex_to_Sympy (const cadabra::Ex &)

  Convert a Cadabra 'Ex' to a Sympy expression.
- cadabra::Ex operator+ (const cadabra::Ex &ex1, const cadabra::Ex &ex2)

  Add two expressions, adding a top-level node if required.
- cadabra::Ex operator- (const cadabra::Ex &ex1, const cadabra::Ex &ex2)

  Subtract two expressions, adding a top-level node if required.
- cadabra::Kernel * create_scope ()

Setup of kernels in current scope, callable from Python.

- cadabra::Kernel * create_scope_from_global ()
- cadabra::Kernel * create_empty_scope ()
- void inject_defaults (cadabra::Kernel *)

  *Inject properties directly into the Kernel, even if the kernel is not yet on the Python stack (needed when we create a new local scope: in this case we create the kernel and pass it back to be turned into local **cdbkernel** by Python, but we want to populate the kernel with defaults before we hand it back).*
- cadabra::Kernel * get_kernel_from_scope ()

  Get a pointer to the currently visible kernel.
- void call_post_process (cadabra::Kernel &, cadabra::Ex &ex)

  Run the post-process Python function (if defined) on the given expression.

10.281.1 Function Documentation

10.281.1.1 cadabra::Kernel* create_empty_scope ( )

10.281.1.2 cadabra::Kernel* create_scope_from_global ( )

10.281.1.3 std::string Ex_repr_ (const cadabra::Ex &)

10.281.1.4 std::shared_ptr<cadabra::Ex> fetch_from_python (const std::string & *nm*)

Fetch an Ex object from the Python side using its Python identifier.

10.282 core/PythonException.cc File Reference

```
#include <boost/python.hpp>
#include <stdexcept>
#include "PythonException.hh"
```

Functions

- std::string parse_python_exception ()

10.282.1 Function Documentation

10.282.1.1 std::string parse_python_exception ( )

10.283 core/PythonException.hh File Reference

```
#include <string>
```

Functions

- std::string parse_python_exception ()

10.283.1 Function Documentation

10.283.1.1 std::string parse_python_exception ( )

10.284 core/ServerWrapper.cc File Reference

```
#include "ServerWrapper.hh"
#include <boost/python.hpp>
```

10.285 core/ServerWrapper.hh File Reference

```
#include "ProgressMonitor.hh"
#include <boost/python/implicit.hpp>
```

Classes

- class ServerWrapper

  A class which enables access to a Python-side defined Server object with ProgressMonitor interface.

10.286 core/Stopwatch.cc File Reference

```
#include "Stopwatch.hh"
#include <assert.h>
```

Functions

- std::ostream & operator<< (std::ostream &os, const Stopwatch &mt)

10.286.1 Function Documentation

10.286.1.1 std::ostream& operator<< (std::ostream & *os*, const Stopwatch & *mt*)

10.287 core/Stopwatch.hh File Reference

```
#include <sys/time.h>
#include <unistd.h>
#include <signal.h>
#include <iostream>
```

Classes

- class Stopwatch

Functions

- std::ostream & operator<< (std::ostream &, const Stopwatch &)

10.287.1 Function Documentation

10.287.1.1 std::ostream& operator<< (std::ostream & , const Stopwatch &)

10.288 core/Storage.cc File Reference

```
#include "Storage.hh"
#include "Combinatorics.hh"
#include "Exceptions.hh"
#include <iomanip>
#include <sstream>
#include <pcrecpp.h>
```

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Functions

- long cadabra::to_long (multiplier_t mul)
- std::string cadabra::to_string (long num)
- void cadabra::multiply (rset_t::iterator &, multiplier_t)

  Helper functions for manipulation of multipliers.
- void cadabra::add (rset_t::iterator &num, multiplier_t fac)
- void cadabra::zero (rset_t::iterator &num)
- void cadabra::one (rset_t::iterator &num)
- void cadabra::flip_sign (rset_t::iterator &num)
- void cadabra::half (rset_t::iterator &num)
- std::ostream & operator<< (std::ostream &str, const cadabra::Ex &ex)

Variables

- nset_t cadabra::name_set
- rset_t cadabra::rat_set

10.288.1 Function Documentation

10.288.1.1 std::ostream& operator<< (std::ostream & *str,* const cadabra::Ex & *ex*)

10.289 core/Storage.hh File Reference

```
#include <cstddef>
#include <iostream>
#include <gmpxx.h>
#include <string>
#include <vector>
#include <set>
#include <map>
#include <stdint.h>
#include <assert.h>
#include <initializer_list>
#include "tree.hh"
```

Classes

- class cadabra::str_node

  Elementary building block for a mathematical expression.
- struct cadabra::str_node::flag_t
- class cadabra::Ex

  Basic storage class for symbolic mathememattical expressions.
- class cadabra::nset_it_less

  Compare two nset iterators by comparing the strings to which they point.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

Typedefs

- typedef mpq_class cadabra::multiplier_t
- typedef std::set< std::string > cadabra::nset_t
- typedef std::set< multiplier_t > cadabra::rset_t
- typedef uintptr_t cadabra::hashval_t

Functions

- long cadabra::to_long (multiplier_t mul)
- std::string cadabra::to_string (long num)
- void cadabra::multiply (rset_t::iterator &, multiplier_t)

  Helper functions for manipulation of multipliers.
- void cadabra::add (rset_t::iterator &num, multiplier_t fac)
- void cadabra::zero (rset_t::iterator &num)
- void cadabra::one (rset_t::iterator &num)
- void cadabra::flip_sign (rset_t::iterator &num)
- void cadabra::half (rset_t::iterator &num)
- template<typename T >
  bool cadabra::is_in (const T &val, const std::initializer_list< T > &list)

  Bare output operator for Ex objects, mainly to provide a simple way to generate debugging output.
- std::ostream & operator<< (std::ostream &, const cadabra::Ex &)

10.289.1 Function Documentation

10.289.1.1 std::ostream& operator<< (std::ostream & , const cadabra::Ex &)

10.290 core/Symbols.cc File Reference

```
#include "Symbols.hh"
```

10.291 core/Symbols.hh File Reference

```
#include <set>
#include <string>
```

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.
- cadabra::symbols

Variables

- const std::set< std::string > cadabra::symbols::greek

10.292 core/SympyCdb.cc File Reference

```
#include <boost/python.hpp>
#include "Functional.hh"
#include "SympyCdb.hh"
#include "PreClean.hh"
#include "Cleanup.hh"
#include "Parser.hh"
#include "Kernel.hh"
#include "DisplaySympy.hh"
#include "algorithms/substitute.hh"
```

10.293 core/SympyCdb.hh File Reference

```
#include "Props.hh"
#include "Storage.hh"
#include "Kernel.hh"
#include "Stopwatch.hh"
```

Namespaces

- sympy

Functions

- cadabra::Ex * sympy::map_sympy (const cadabra::Kernel &, cadabra::Ex &, const std::vector< std::string > &wrap, const std::string &args, const std::string &method)

  Functionality to act with Sympy on all scalar parts of an expression, and keep the result in-place.
- cadabra::Ex::iterator sympy::apply (const cadabra::Kernel &, cadabra::Ex &, cadabra::Ex::iterator &, const std::vector< std::string > &wrap, const std::string &args, const std::string &method)

  Functionality to act with Sympy functions on (parts of) Cadabra Ex expressions and read the result back into the same Ex.
- cadabra::Ex sympy::invert_matrix (const cadabra::Kernel &, cadabra::Ex &ex, cadabra::Ex &rules)

  Use Sympy to invert a matrix, given a set of rules determining its sparse components.

10.294 core/TerminalStream.cc File Reference

```
#include "DisplayTerminal.hh"
#include "TerminalStream.hh"
```

10.295 core/TerminalStream.hh File Reference

```
#include "Kernel.hh"
#include <ostream>
```

Classes

- class cadabra::TerminalStream

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.296 core/test_permutations.cc File Reference

```
#include "Permutations.hh"
#include <iostream>
```

Functions

- int main ()

10.296.1 Function Documentation

10.296.1.1 int main ( )

10.297 core/test_preprocessor.cc File Reference

```
#include <stdlib.h>
#include <stdexcept>
#include <iostream>
#include <unistd.h>
#include <sstream>
#include "PreProcessor.hh"
```

Functions

- bool testit (const std::string &input, const std::string &output)
- int main (int argc, char **argv)

10.297.1 Function Documentation

10.297.1.1 int main (int *argc,* char ** *argv*)

10.297.1.2 bool testit (const std::string & *input,* const std::string & *output*)

10.298 core/YoungTab.cc File Reference

```
#include "YoungTab.hh"
#include <cassert>
```

Namespaces

- yngtab

  Generic Young tableaux routines.

Functions

- std::ostream & yngtab::operator<< (std::ostream &str, const tableau &tab)
- template<>
  void yngtab::add_box (tableau &tab1, unsigned int row1, const tableau &tab2, unsigned int row2, unsigned int col2)

10.299 core/YoungTab.hh File Reference

```
#include <cstddef>
#include <iostream>
#include <iterator>
#include <vector>
#include <list>
#include <gmpxx.h>
#include "Combinatorics.hh"
```

Classes

- class yngtab::tableau_base
- class yngtab::tableau
- class yngtab::tableaux< T >
- class yngtab::filled_tableau< T >
- class yngtab::filled_tableau< T >::iterator_base
- class yngtab::filled_tableau< T >::in_column_iterator

  An iterator which stays inside a given column of a tableau.
- class yngtab::filled_tableau< T >::iterator

  An iterator over all boxes of a tableau, left to right, top to bottom.
- class yngtab::tableaux< T >

Namespaces

- yngtab

  Generic Young tableaux routines.

Typedefs

- typedef mpz_class yngint_t
- typedef mpq_class yngrat_t
- typedef filled_tableau< std::pair< int, int > > yngtab::keeptrack_tab_t

Functions

- bool yngtab::legal_box (const std::vector< std::pair< int, int > > &prev, const std::vector< std::pair< int, int > > &ths, int colpos, int trypos)
- template<class T , class OutputIterator >
  void yngtab::LR_tensor (const tableaux< T > &tabs1, const T &tab2, unsigned int maxrows, OutputIterator out, bool alltabs=false)
- template<class T1 , class T2 >
  void yngtab::add_box (T1 &tab1, unsigned int row1, const T2 &tab2, unsigned int row2, unsigned int col2)
- template<class T1 >
  void yngtab::add_box (T1 &tab1, unsigned int row1, const tableau &tab2, unsigned int row2, unsigned int col2)
- template<class Tab , class OutputIterator >
  void yngtab::LR_add_box (const Tab &tab2, Tab &newtab, unsigned int currow2, unsigned int curcol2, unsigned int startrow, unsigned int maxrows, OutputIterator outit, keeptrack_tab_t &Ycurrent, bool alltabs)

- template<class Tab , class OutputIterator >
  void yngtab::LR_tensor (const Tab &tab1, const Tab &tab2, unsigned int maxrows, OutputIterator outit, bool alltabs=false)
- template<class T , class OutputIterator >
  void yngtab::LR_tensor (const tableaux< T > &, bool symmetric, unsigned int maxrows, OutputIterator outit)
- std::ostream & yngtab::operator<< (std::ostream &str, const tableau &tab)
- template<class T >
  std::ostream & yngtab::operator<< (std::ostream &, const tableaux< T > &)
- template<class T >
  std::ostream & yngtab::operator<< (std::ostream &, const filled_tableau< T > &)

10.299.1 Typedef Documentation

10.299.1.1 typedef mpz_class yngint_t

10.299.1.2 typedef mpq_class yngrat_t

10.300 doc/main.md File Reference

10.301 doc/modules.dox File Reference

10.302 frontend/common/exec-stream.cc File Reference

```
#include "exec-stream.h"
#include <list>
#include <vector>
#include <algorithm>
#include <stdexcept>
#include <errno.h>
#include <string.h>
#include <unistd.h>
#include <fcntl.h>
#include <signal.h>
#include <sys/time.h>
#include <sys/types.h>
#include <sys/wait.h>
#include <pthread.h>
```

Macros

- #define HELPERS_H "posix/exec-stream-helpers.h"
- #define HELPERS_CPP "posix/exec-stream-helpers.cpp"
- #define IMPL_CPP "posix/exec-stream-impl.cpp"

10.302.1 Macro Definition Documentation

10.302.1.1 #define HELPERS_CPP "posix/exec-stream-helpers.cpp"

10.302.1.2 #define HELPERS_H "posix/exec-stream-helpers.h"

10.302.1.3 #define IMPL_CPP "posix/exec-stream-impl.cpp"

10.303 frontend/common/exec-stream.h File Reference

```
#include <string>
#include <stdexcept>
#include <istream>
#include <ostream>
#include <vector>
```

Classes

- class exec_stream_t
- class exec_stream_t::error_t
- class exec_stream_t::next_arg_t
- class exec_stream_t::next_arg_impl_t< iterator >

10.304 frontend/common/test_tex.cc File Reference

```
#include "TeXEngine.hh"
```

Functions

- int main ()

10.304.1 Function Documentation

10.304.1.1 int main ( )

10.305 frontend/common/TeXEngine.cc File Reference

```
#include "TeXEngine.hh"
#include "Config.hh"
#include <iostream>
#include <boost/filesystem.hpp>
#include <boost/algorithm/string.hpp>
#include "exec-stream.h"
#include "lodepng.h"
#include <fstream>
#include <sstream>
#include <unistd.h>
```

10.306 frontend/common/TeXEngine.hh File Reference

```
#include <stdexcept>
#include <vector>
#include <set>
#include <string>
#include <memory>
```

Classes

- class cadabra::TeXEngine

  TeXEngine is used to convert LaTeX strings into PNG images.
- class cadabra::TeXEngine::TeXException
- class cadabra::TeXEngine::TeXRequest

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.307 frontend/gtkmm/Cadabra.cc File Reference

```
#include "Cadabra.hh"
#include <signal.h>
#include <fstream>
#include <gtkmm/messagedialog.h>
#include <gtkmm/entry.h>
#include <gtkmm/main.h>
#include "Snoop.hh"
#include "Config.hh"
```

Functions

- void signal_handler (int signal)

Variables

- cadabra::NotebookWindow * signal_window

10.307.1 Function Documentation

10.307.1.1 void signal_handler (int *signal*)

10.307.2 Variable Documentation

10.307.2.1 cadabra::NotebookWindow* signal_window

10.308 frontend/gtkmm/Cadabra.hh File Reference

```
#include <gtkmm/application.h>
#include <gtkmm/grid.h>
#include "NotebookWindow.hh"
#include "ComputeThread.hh"
```

Classes

- class Cadabra

  The Cadabra notebook application.

10.309 frontend/gtkmm/CodeInput.cc File Reference

```
#include "CodeInput.hh"
#include <gdkmm/general.h>
#include <gtkmm/messagedialog.h>
#include <gdk/gdkkeysyms.h>
#include <iostream>
```

Functions

- std::string trim (const std::string &s)

10.309.1 Function Documentation

10.309.1.1 std::string trim (const std::string & *s*)

10.310 frontend/gtkmm/CodeInput.hh File Reference

```
#include "DataCell.hh"
#include <gtkmm/box.h>
#include <gtkmm/textview.h>
#include <gtkmm/separator.h>
```

Classes

- class cadabra::CodeInput

  A text cell editor widget with support for editing Python and LaTeX.
- class cadabra::CodeInput::exp_input_tv

  The actual text widget used by CodeInput.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.311 frontend/gtkmm/ImageView.cc File Reference

```
#include "ImageView.hh"
#include <giomm/memoryinputstream.h>
#include <glibmm/base64.h>
#include <iostream>
#include <fstream>
```

10.312 frontend/gtkmm/ImageView.hh File Reference

```
#include <gtkmm/box.h>
#include <gtkmm/image.h>
```

Classes

- class cadabra::ImageView

  An image viewing widget.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.313 frontend/gtkmm/main.cc File Reference

```
#include "Cadabra.hh"
#include <gtkmm/application.h>
#include <gtkmm/cssprovider.h>
#include <gtkmm/label.h>
#include <glibmm/spawn.h>
```

Functions

- int main (int argc, char **argv)

10.313.1 Function Documentation

10.313.1.1 int main (int *argc,* char ** *argv*)

10.314 frontend/gtkmm/NotebookCanvas.cc File Reference

```
#include "NotebookCanvas.hh"
#include "NotebookWindow.hh"
#include <gtkmm/box.h>
#include <iostream>
```

10.315 frontend/gtkmm/NotebookCanvas.hh File Reference

```
#include <map>
#include <gtkmm/paned.h>
#include <gtkmm/scrolledwindow.h>
#include <gtkmm/separator.h>
#include <gtkmm/eventbox.h>
#include "VisualCell.hh"
```

Classes

- class cadabra::NotebookCanvas

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.316 frontend/osx/Cadabra/Cadabra/NotebookCanvas.hh File Reference

Classes

- class cadabra::NotebookCanvas

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.317 frontend/gtkmm/NotebookWindow.cc File Reference

```
#include <iostream>
#include "Actions.hh"
#include "Cadabra.hh"
#include "Config.hh"
#include "NotebookWindow.hh"
#include "DataCell.hh"
#include <gtkmm/box.h>
#include <gtkmm/filechooserdialog.h>
#include <gtkmm/messagedialog.h>
#include <gtkmm/aboutdialog.h>
#include <gtkmm/radioaction.h>
#include <gtkmm/scrollbar.h>
#include <fstream>
#include <gtkmm/main.h>
#include "Snoop.hh"
```

10.318 frontend/gtkmm/NotebookWindow.hh File Reference

```
#include <gtkmm/window.h>
#include <gtkmm/box.h>
#include <gtkmm/progressbar.h>
#include <gtkmm/spinner.h>
#include <gtkmm/label.h>
#include <gtkmm/stock.h>
#include <gtkmm/button.h>
#include <gtkmm/uimanager.h>
#include <gtkmm/cssprovider.h>
#include <glibmm/dispatcher.h>
#include <giomm/settings.h>
#include <thread>
#include <mutex>
#include "DocumentThread.hh"
#include "ComputeThread.hh"
#include "GUIBase.hh"
#include "NotebookCanvas.hh"
#include "../common/TeXEngine.hh"
```

Classes

- class cadabra::NotebookWindow

  Each notebook has one main window which controls it.
- class cadabra::NotebookWindow::Prefs

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.319 frontend/osx/Cadabra/Cadabra/NotebookWindow.hh File Reference

```
#include <stdio.h>
#include "DocumentThread.hh"
#include "GUIBase.hh"
#include "NotebookController.h"
#include "NotebookCanvas.hh"
```

Classes

- class cadabra_osx::NotebookWindow

  Objective-C++ class implementing DocumentThread and providing an OS-X notebook interface.

Namespaces

- cadabra_osx

10.320 frontend/gtkmm/Preferences.hh File Reference

```
#include <gtkmm/window.h>
#include <gtkmm/box.h>
```

Classes

- class PreferencesWindow

10.321 frontend/gtkmm/TeXView.cc File Reference

```
#include "TeXView.hh"
#include <iostream>
```

10.322 frontend/gtkmm/TeXView.hh File Reference

```
#include <gtkmm/eventbox.h>
#include <gtkmm/box.h>
#include <gtkmm/image.h>
#include "DataCell.hh"
#include "../common/TeXEngine.hh"
```

Classes

- class cadabra::TeXView

  TeXView is a widget which knows how to turn a string into a LaTeX-rendered image and display that.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.323 frontend/gtkmm/VisualCell.hh File Reference

```
#include "TeXView.hh"
#include "ImageView.hh"
#include "CodeInput.hh"
#include "DataCell.hh"
```

Classes

- class cadabra::VisualCell

  Structure holding a pointer to one of the possible GUI widgets that can appear in a document.

Namespaces

- cadabra

  Class to display expressions in a format that Sympy can parse.

10.324 frontend/osx/Cadabra/Cadabra/AppDelegate.h File Reference

```
#import <Cocoa/Cocoa.h>
#include "NotebookController.h"
```

Classes

- class AppDelegate

10.325 frontend/osx/Cadabra/Cadabra/AppDelegate.mm File Reference

```
#import "AppDelegate.h"
```

10.326 frontend/osx/Cadabra/Cadabra/main.m File Reference

```
#import <Cocoa/Cocoa.h>
```

Functions

- int main (int argc, const char ∗argv[ ])

10.326.1 Function Documentation

10.326.1.1 int main (int *argc,* const char ∗ *argv[ ]*)

10.327 frontend/osx/Cadabra/Cadabra/NotebookCanvas.mm File Reference

```
#import <Foundation/Foundation.h>
```

10.328 frontend/osx/Cadabra/Cadabra/NotebookWindow.mm File Reference

```
#include "NotebookWindow.hh"
#import <Cocoa/Cocoa.h>
```

10.329 frontend/osx/Cadabra/NotebookController.h File Reference

```
#import <Cocoa/Cocoa.h>
```

Classes

- class NotebookController

10.330 frontend/osx/Cadabra/NotebookController.mm File Reference

```
#import "NotebookController.h"
#include <thread>
#include "ComputeThread.hh"
#include "NotebookWindow.hh"
```

Variables

- cadabra::ComputeThread * compute
- std::thread * compute_thread

10.330.1 Variable Documentation

10.330.1.1 cadabra::ComputeThread* compute

Initial value:

```
{
    cadabra::NotebookWindow *nw
```

10.330.1.2 std::thread* compute_thread

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