MPCOTool

3.4.4

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Chapter 1

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Chapter 3

Data Structure Documentation

3.1 Experiment Struct Reference

Struct to define the experiment data.

`#include <experiment.h>`

Data Fields

- char * name

  File name.
- char * stencil [MAX_NINPUTS]

  Array of template names of input files.
- double weight

  Objective function weight.
- unsigned int ninputs

  Number of input files to the simulator.

3.1.1 Detailed Description

Struct to define the experiment data.

Definition at line 45 of file experiment.h.

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

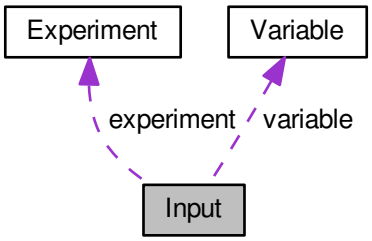
- experiment.h

3.2 Input Struct Reference

Struct to define the optimization input file.

`#include <input.h>`

Collaboration diagram for Input:



Data Fields

- Experiment * experiment
  Array or experiments.
- Variable * variable
  Array of variables.
- char * result
  Name of the result file.
- char * variables
  Name of the variables file.
- char * simulator
  Name of the simulator program.
- char * evaluator
  Name of the program to evaluate the objective function.
- char * directory
  Working directory.
- char * name
  Input data file name.
- double tolerance
  Algorithm tolerance.
- double mutation_ratio
  Mutation probability.
- double reproduction_ratio
  Reproduction probability.
- double adaptation_ratio
  Adaptation probability.
- double relaxation
  Relaxation parameter.

- double p

  Exponent of the P error norm.
- double threshold

  Threshold to finish the optimization.
- unsigned long int seed

  Seed of the pseudo-random numbers generator.
- unsigned int nvariables

  Variables number.
- unsigned int nexperiments

  Experiments number.
- unsigned int nsimulations

  Simulations number per experiment.
- unsigned int algorithm

  Algorithm type.
- unsigned int nsteps

  Number of steps to do the direction search method.
- unsigned int direction

  Method to estimate the direction search.
- unsigned int nestimates

  Number of simulations to estimate the direction search.
- unsigned int niterations

  Number of algorithm iterations.
- unsigned int nbest

  Number of best simulations.
- unsigned int norm

  Error norm type.
- unsigned int type

  Type of input file.

3.2.1 Detailed Description

Struct to define the optimization input file.

Definition at line 71 of file input.h.

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

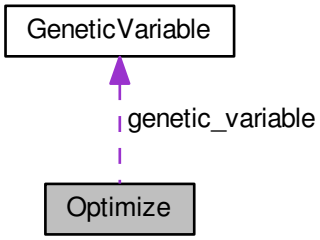
- input.h

3.3 Optimize Struct Reference

Struct to define the optimization ation data.

`#include <optimize.h>`

Collaboration diagram for Optimize:



Data Fields

- GMappedFile ** file [MAX_NINPUTS]

  Matrix of input template files.
- char ** experiment

  Array of experimental data file names.
- char ** label

  Array of variable names.
- gsl_rng * rng

  GSL random number generator.
- **GeneticVariable** * genetic_variable

  Array of variables for the genetic algorithm.
- FILE * file_result

  Result file.
- FILE * file_variables

  Variables file.
- char * result

  Name of the result file.
- char * variables

  Name of the variables file.
- char * simulator

  Name of the simulator program.
- char * evaluator

  Name of the program to evaluate the objective function.
- double * value

  Array of variable values.
- double * rangemin

  Array of minimum variable values.
- double * rangemax

  Array of maximum variable values.
- double * rangeminabs

  Array of absolute minimum variable values.
- double * rangemaxabs

  Array of absolute maximum variable values.

- double * error_best
  Array of the best minimum errors.
- double * weight
  Array of the experiment weights.
- double * step
  Array of direction search method step sizes.
- double * direction
  Vector of direction search estimation.
- double * value_old
  Array of the best variable values on the previous step.
- double * error_old
  Array of the best minimum errors on the previous step.
- unsigned int * precision
  Array of variable precisions.
- unsigned int * nsweeps
  Array of sweeps of the sweep algorithm.
- unsigned int * nbits
  Array of bits number of the genetic algorithm.
- unsigned int * thread
  Array of simulation numbers to calculate on the thread.
- unsigned int * thread_direction
- unsigned int * simulation_best
  Array of best simulation numbers.
- double tolerance
  Algorithm tolerance.
- double mutation_ratio
  Mutation probability.
- double reproduction_ratio
  Reproduction probability.
- double adaptation_ratio
  Adaptation probability.
- double relaxation
  Relaxation parameter.
- double calculation_time
  Calculation time.
- double p
  Exponent of the P error norm.
- double threshold
  Threshold to finish the optimization.
- unsigned long int seed
  Seed of the pseudo-random numbers generator.
- unsigned int nvariables
  Variables number.
- unsigned int nexperiments
  Experiments number.
- unsigned int ninputs
  Number of input files to the simulator.
- unsigned int nsimulations
  Simulations number per experiment.
- unsigned int nsteps
  Number of steps for the direction search method.

- unsigned int nestimates

  Number of simulations to estimate the direction.
- unsigned int algorithm

  Algorithm type.
- unsigned int nstart

  Beginning simulation number of the task.
- unsigned int nend

  Ending simulation number of the task.
- unsigned int nstart_direction

  Beginning simulation number of the task for the direction search method.
- unsigned int nend_direction

  Ending simulation number of the task for the direction search method.
- unsigned int niterations

  Number of algorithm iterations.
- unsigned int nbest

  Number of best simulations.
- unsigned int nsaveds

  Number of saved simulations.
- unsigned int stop

  To stop the simulations.
- int mpi_rank

  Number of MPI task.

3.3.1 Detailed Description

Struct to define the optimization ation data.

Definition at line 45 of file optimize.h.

3.3.2 Field Documentation

3.3.2.1 thread_direction

```
unsigned int* Optimize::thread_direction
```

Array of simulation numbers to calculate on the thread for the direction search method.

Definition at line 80 of file optimize.h.

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

- optimize.h

3.4 Options Struct Reference

Struct to define the options dialog.

`#include <interface.h>`

Data Fields

- GtkDialog * dialog
  Main GtkDialog.
- GtkGrid * grid
  Main GtkGrid.
- GtkLabel * label_seed
  Pseudo-random numbers generator seed GtkLabel.
- GtkSpinButton * spin_seed
  Pseudo-random numbers generator seed GtkSpinButton.
- GtkLabel * label_threads
  Threads number GtkLabel.
- GtkSpinButton * spin_threads
  Threads number GtkSpinButton.
- GtkLabel * label_direction
  Direction threads number GtkLabel.
- GtkSpinButton * spin_direction
  Direction threads number GtkSpinButton.

3.4.1 Detailed Description

Struct to define the options dialog.

Definition at line 48 of file interface.h.

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

- interface.h

3.5 ParallelData Struct Reference

Struct to pass to the GThreads parallelized function.

`#include <optimize.h>`

Data Fields

- unsigned int thread
  Thread number.

3.5.1 Detailed Description

Struct to pass to the GThreads parallelized function.

Definition at line 122 of file optimize.h.

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

- optimize.h

3.6 Running Struct Reference

Struct to define the running dialog.

`#include <interface.h>`

Data Fields

- GtkDialog * dialog
  Main GtkDialog.
- GtkLabel * label
  Label GtkLabel.
- GtkSpinner * spinner
  Animation GtkSpinner.
- GtkGrid * grid
  Grid GtkGrid.

3.6.1 Detailed Description

Struct to define the running dialog.

Definition at line 67 of file interface.h.

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

- interface.h

3.7 Variable Struct Reference

Struct to define the variable data.

`#include <variable.h>`

Data Fields

- char * name
  Variable name.
- double rangemin
  Minimum variable value.
- double rangemax
  Maximum variable value.
- double rangeminabs
  Absolute minimum variable value.
- double rangemaxabs
  Absolute maximum variable value.
- double step
  Direction search method step size.
- unsigned int precision
  Variable precision.
- unsigned int nsweeps
  Sweeps of the sweep algorithm.
- unsigned int nbits
  Bits number of the genetic algorithm.

3.7.1 Detailed Description

Struct to define the variable data.

Definition at line 56 of file variable.h.

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

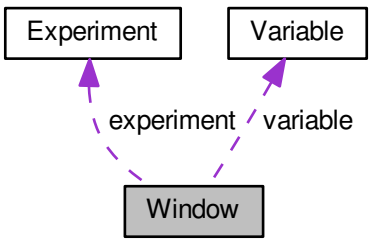
- variable.h

3.8 Window Struct Reference

Struct to define the main window.

`#include <interface.h>`

Collaboration diagram for Window:



Data Fields

- GtkWindow * window
  Main GtkWindow.
- GtkGrid * grid
  Main GtkGrid.
- GtkToolbar * bar_buttons
  GtkToolbar to store the main buttons.
- GtkToolButton * button_open
  Open GtkToolButton.
- GtkToolButton * button_save
  Save GtkToolButton.
- GtkToolButton * button_run
  Run GtkToolButton.
- GtkToolButton * button_options
  Options GtkToolButton.
- GtkToolButton * button_help
  Help GtkToolButton.
- GtkToolButton * button_about
  Help GtkToolButton.
- GtkToolButton * button_exit
  Exit GtkToolButton.
- GtkGrid * grid_files
  Files GtkGrid.
- GtkLabel * label_simulator
  Simulator program GtkLabel.
- GtkFileChooserButton * button_simulator
  Simulator program GtkFileChooserButton.
- GtkCheckButton * check_evaluator
  Evaluator program GtkCheckButton.
- GtkFileChooserButton * button_evaluator
  Evaluator program GtkFileChooserButton.
- GtkLabel * label_result
  Result file GtkLabel.
- GtkEntry * entry_result
  Result file GtkEntry.
- GtkLabel * label_variables
  Variables file GtkLabel.
- GtkEntry * entry_variables
  Variables file GtkEntry.
- GtkFrame * frame_norm
  GtkFrame to set the error norm.
- GtkGrid * grid_norm
  GtkGrid to set the error norm.
- GtkRadioButton * button_norm [NNORMS]
  Array of GtkButtons to set the error norm.
- GtkLabel * label_p
  GtkLabel to set the p parameter.
- GtkSpinButton * spin_p
  GtkSpinButton to set the p parameter.
- GtkScrolledWindow * scrolled_p

GtkScrolledWindow to set the p parameter.

- GtkFrame * frame_algorithm

  GtkFrame to set the algorithm.
- GtkGrid * grid_algorithm

  GtkGrid to set the algorithm.
- GtkRadioButton * button_algorithm [NALGORITHMS]

  Array of GtkButtons to set the algorithm.
- GtkLabel * label_simulations

  GtkLabel to set the simulations number.
- GtkSpinButton * spin_simulations

  GtkSpinButton to set the simulations number.
- GtkLabel * label_iterations

  GtkLabel to set the iterations number.
- GtkSpinButton * spin_iterations

  GtkSpinButton to set the iterations number.
- GtkLabel * label_tolerance

  GtkLabel to set the tolerance.
- GtkSpinButton * spin_tolerance

  GtkSpinButton to set the tolerance.
- GtkLabel * label_bests

  GtkLabel to set the best number.
- GtkSpinButton * spin_bests

  GtkSpinButton to set the best number.
- GtkLabel * label_population

  GtkLabel to set the population number.
- GtkSpinButton * spin_population

  GtkSpinButton to set the population number.
- GtkLabel * label_generations

  GtkLabel to set the generations number.
- GtkSpinButton * spin_generations

  GtkSpinButton to set the generations number.
- GtkLabel * label_mutation

  GtkLabel to set the mutation ratio.
- GtkSpinButton * spin_mutation

  GtkSpinButton to set the mutation ratio.
- GtkLabel * label_reproduction

  GtkLabel to set the reproduction ratio.
- GtkSpinButton * spin_reproduction

  GtkSpinButton to set the reproduction ratio.
- GtkLabel * label_adaptation

  GtkLabel to set the adaptation ratio.
- GtkSpinButton * spin_adaptation

  GtkSpinButton to set the adaptation ratio.
- GtkCheckButton * check_direction

  GtkCheckButton to check running the direction search method.
- GtkGrid * grid_direction

  GtkGrid to pack the direction search method widgets.
- GtkRadioButton * button_direction [NDIRECTIONS]

  GtkRadioButtons array to set the direction estimate method.
- GtkLabel * label_steps

  GtkLabel to set the steps number.

- GtkSpinButton * spin_steps

  GtkSpinButton to set the steps number.
- GtkLabel * label_estimates

  GtkLabel to set the estimates number.
- GtkSpinButton * spin_estimates

  GtkSpinButton to set the estimates number.
- GtkLabel * label_relaxation

  GtkLabel to set the relaxation parameter.
- GtkSpinButton * spin_relaxation

  GtkSpinButton to set the relaxation parameter.
- GtkLabel * label_threshold

  GtkLabel to set the threshold.
- GtkSpinButton * spin_threshold

  GtkSpinButton to set the threshold.
- GtkScrolledWindow * scrolled_threshold

  GtkScrolledWindow to set the threshold.
- GtkFrame * frame_variable

  Variable GtkFrame.
- GtkGrid * grid_variable

  Variable GtkGrid.
- GtkComboBoxText * combo_variable

  GtkComboBoxEntry to select a variable.
- GtkButton * button_add_variable

  GtkButton to add a variable.
- GtkButton * button_remove_variable

  GtkButton to remove a variable.
- GtkLabel * label_variable

  Variable GtkLabel.
- GtkEntry * entry_variable

  GtkEntry to set the variable name.
- GtkLabel * label_min

  Minimum GtkLabel.
- GtkSpinButton * spin_min

  Minimum GtkSpinButton.
- GtkScrolledWindow * scrolled_min

  Minimum GtkScrolledWindow.
- GtkLabel * label_max

  Maximum GtkLabel.
- GtkSpinButton * spin_max

  Maximum GtkSpinButton.
- GtkScrolledWindow * scrolled_max

  Maximum GtkScrolledWindow.
- GtkCheckButton * check_minabs

  Absolute minimum GtkCheckButton.
- GtkSpinButton * spin_minabs

  Absolute minimum GtkSpinButton.
- GtkScrolledWindow * scrolled_minabs

  Absolute minimum GtkScrolledWindow.
- GtkCheckButton * check_maxabs

  Absolute maximum GtkCheckButton.
- GtkSpinButton * spin_maxabs

Absolute maximum GtkSpinButton.

- GtkScrolledWindow * scrolled_maxabs

  Absolute maximum GtkScrolledWindow.
- GtkLabel * label_precision

  Precision GtkLabel.
- GtkSpinButton * spin_precision

  Precision digits GtkSpinButton.
- GtkLabel * label_sweeps

  Sweeps number GtkLabel.
- GtkSpinButton * spin_sweeps

  Sweeps number GtkSpinButton.
- GtkLabel * label_bits

  Bits number GtkLabel.
- GtkSpinButton * spin_bits

  Bits number GtkSpinButton.
- GtkLabel * label_step

  GtkLabel to set the step.
- GtkSpinButton * spin_step

  GtkSpinButton to set the step.
- GtkScrolledWindow * scrolled_step

  step GtkScrolledWindow.
- GtkFrame * frame_experiment

  Experiment GtkFrame.
- GtkGrid * grid_experiment

  Experiment GtkGrid.
- GtkComboBoxText * combo_experiment

  Experiment GtkComboBoxEntry.
- GtkButton * button_add_experiment

  GtkButton to add a experiment.
- GtkButton * button_remove_experiment

  GtkButton to remove a experiment.
- GtkLabel * label_experiment

  Experiment GtkLabel.
- GtkFileChooserButton * button_experiment

  GtkFileChooserButton to set the experimental data file.
- GtkLabel * label_weight

  Weight GtkLabel.
- GtkSpinButton * spin_weight

  Weight GtkSpinButton.
- GtkCheckButton * check_template [MAX_NINPUTS]

  Array of GtkCheckButtons to set the input templates.
- GtkFileChooserButton * button_template [MAX_NINPUTS]

  Array of GtkFileChooserButtons to set the input templates.
- GdkPixbuf * logo

  Logo GdkPixbuf.
- Experiment * experiment

  Array of experiments data.
- Variable * variable

  Array of variables data.
- char * application_directory

  Application directory.

- gulong id_experiment

  Identifier of the combo_experiment signal.
- gulong id_experiment_name

  Identifier of the button_experiment signal.
- gulong id_variable

  Identifier of the combo_variable signal.
- gulong id_variable_label

  Identifier of the entry_variable signal.
- gulong id_template [MAX_NINPUTS]

  Array of identifiers of the check_template signal.
- gulong id_input [MAX_NINPUTS]

  Array of identifiers of the button_template signal.
- unsigned int nexperiments

  Number of experiments.
- unsigned int nvariables

  Number of variables.

3.8.1 Detailed Description

Struct to define the main window.

Definition at line 79 of file interface.h.

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

- interface.h

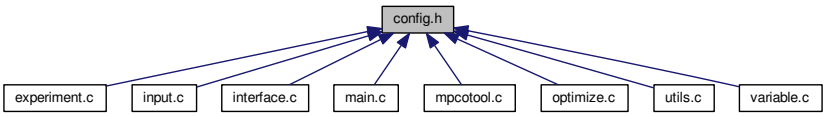
Chapter 4

File Documentation

4.1 config.h File Reference

Configuration header file.

This graph shows which files directly or indirectly include this file:



Macros

- #define _(string) (gettext(string))
- #define MAX_NINPUTS 8

  Maximum number of input files in the simulator program.
- #define NALGORITHMS 3

  Number of stochastic algorithms.
- #define NDIRECTIONS 2

  Number of direction estimate methods.
- #define NNORMS 4

  Number of error norms.
- #define NPRECISIONS 15

  Number of precisions.
- #define DEFAULT_PRECISION (NPRECISIONS - 1)

  Default precision digits.
- #define DEFAULT_RANDOM_SEED 7007

  Default pseudo-random numbers seed.
- #define DEFAULT_RELAXATION 1.

  Default relaxation parameter.
- #define LOCALE_DIR "locales"

Locales directory.

- #define PROGRAM_INTERFACE "mpcotool"

  Name of the interface program.
- #define LABEL_ABSOLUTE_MINIMUM "absolute_minimum"

  absolute minimum label.
- #define LABEL_ABSOLUTE_MAXIMUM "absolute_maximum"

  absolute maximum label.
- #define LABEL_ADAPTATION "adaptation"

  adaption label.
- #define LABEL_ALGORITHM "algorithm"

  algoritm label.
- #define LABEL_OPTIMIZE "optimize"

  optimize label.
- #define LABEL_COORDINATES "coordinates"

  coordinates label.
- #define LABEL_DIRECTION "direction"

  direction label.
- #define LABEL_EUCLIDIAN "euclidian"

  euclidian label.
- #define LABEL_EVALUATOR "evaluator"

  evaluator label.
- #define LABEL_EXPERIMENT "experiment"

  experiment label.
- #define LABEL_EXPERIMENTS "experiments"

  experiment label.
- #define LABEL_GENETIC "genetic"

  genetic label.
- #define LABEL_MINIMUM "minimum"

  minimum label.
- #define LABEL_MAXIMUM "maximum"

  maximum label.
- #define LABEL_MONTE_CARLO "Monte-Carlo"

  Monte-Carlo label.
- #define LABEL_MUTATION "mutation"

  mutation label.
- #define LABEL_NAME "name"

  name label.
- #define LABEL_NBEST "nbest"

  nbest label.
- #define LABEL_NBITS "nbits"

  nbits label.
- #define LABEL_NESTIMATES "nestimates"

  nestimates label.
- #define LABEL_NGENERATIONS "ngenerations"

  ngenerations label.
- #define LABEL_NITERATIONS "niterations"

  niterations label.
- #define LABEL_NORM "norm"

  norm label.
- #define LABEL_NPOPULATION "npopulation"

  npopulation label.

- #define LABEL_NSIMULATIONS "nsimulations"

  nsimulations label.
- #define LABEL_NSTEPS "nsteps"

  nsteps label.
- #define LABEL_NSWEEPS "nsweeps"

  nsweeps label.
- #define LABEL_P "p"

  p label.
- #define LABEL_PRECISION "precision"

  precision label.
- #define LABEL_RANDOM "random"

  random label.
- #define LABEL_RELAXATION "relaxation"

  relaxation label.
- #define LABEL_REPRODUCTION "reproduction"

  reproduction label.
- #define LABEL_RESULT_FILE "result_file"

  result_file label.
- #define LABEL_SIMULATOR "simulator"

  simulator label.
- #define LABEL_SEED "seed"

  seed label.
- #define LABEL_STEP "step"

  step label.
- #define LABEL_SWEEP "sweep"

  sweep label.
- #define LABEL_TAXICAB "taxicab"

  taxicab label.
- #define LABEL_TEMPLATE1 "template1"

  template1 label.
- #define LABEL_TEMPLATE2 "template2"

  template2 label.
- #define LABEL_TEMPLATE3 "template3"

  template3 label.
- #define LABEL_TEMPLATE4 "template4"

  template4 label.
- #define LABEL_TEMPLATE5 "template5"

  template5 label.
- #define LABEL_TEMPLATE6 "template6"

  template6 label.
- #define LABEL_TEMPLATE7 "template7"

  template7 label.
- #define LABEL_TEMPLATE8 "template8"

  template8 label.
- #define LABEL_THRESHOLD "threshold"

  threshold label.
- #define LABEL_TOLERANCE "tolerance"

  tolerance label.
- #define LABEL_VARIABLE "variable"

  variable label.
- #define LABEL_VARIABLES "variables"

variables label.

- #define LABEL_VARIABLES_FILE "variables_file"

  variables label.

- #define LABEL_WEIGHT "weight"

  weight label.

Enumerations

- enum INPUT_TYPE { INPUT_TYPE_XML = 0, INPUT_TYPE_JSON = 1 }

  Enum to define the input file types.

4.1.1 Detailed Description

Configuration header file.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file config.h.

4.1.2 Enumeration Type Documentation

4.1.2.1 INPUT_TYPE

```
enum INPUT_TYPE
```

Enum to define the input file types.

Enumerator

INPUT_TYPE_XML	XML input file.
INPUT_TYPE_JSON	JSON input file.

Definition at line 128 of file config.h.

```
00129 {
00130   INPUT_TYPE_XML = 0,
00131   INPUT_TYPE_JSON = 1
00132 };
```

4.2 config.h

```
00001 /* config.h.  Generated from config.h.in by configure.  */
00002 /*
00003 MPCOTool:
00004 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00005 calibrations or optimizations of empirical parameters.
00006
00007 AUTHORS: Javier Burguete and Borja Latorre.
00008
00009 Copyright 2012-2017, AUTHORS.
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00012 are permitted provided that the following conditions are met:
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00014     1. Redistributions of source code must retain the above copyright notice,
00015        this list of conditions and the following disclaimer.
00016
00017     2. Redistributions in binary form must reproduce the above copyright notice,
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00019        documentation and/or other materials provided with the distribution.
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00021 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00022 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00023 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00024 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00025 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00026 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00027 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00028 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00029 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00030 OF SUCH DAMAGE.
00031 */
00032
00039 #ifndef CONFIG__H
00040 #define CONFIG__H 1
00041
00042 // Gettext simplification
00043 #define _(string) (gettext(string))
00044
00045 // Array sizes
00046
00047 #define MAX_NINPUTS 8
00048 #define NALGORITHMS 3
00050 #define NDIRECTIONS 2
00051 #define NNORMS 4
00052 #define NPRECISIONS 15
00053
00054 // Default choices
00055
00056 #define DEFAULT_PRECISION (NPRECISIONS - 1)
00057 #define DEFAULT_RANDOM_SEED 7007
00058 #define DEFAULT_RELAXATION 1.
00059
00060 // Interface labels
00061
00062 #define LOCALE_DIR "locales"
00063 #define PROGRAM_INTERFACE "mpcotool"
00064
00065 // Labels
00066
00067 #define LABEL_ABSOLUTE_MINIMUM "absolute_minimum"
00068 #define LABEL_ABSOLUTE_MAXIMUM "absolute_maximum"
00070 #define LABEL_ADAPTATION "adaptation"
00072 #define LABEL_ALGORITHM "algorithm"
00073 #define LABEL_OPTIMIZE "optimize"
00074 #define LABEL_COORDINATES "coordinates"
00075 #define LABEL_DIRECTION "direction"
00076 #define LABEL_EUCLIDIAN "euclidian"
00077 #define LABEL_EVALUATOR "evaluator"
00078 #define LABEL_EXPERIMENT "experiment"
00079 #define LABEL_EXPERIMENTS "experiments"
00080 #define LABEL_GENETIC "genetic"
00081 #define LABEL_MINIMUM "minimum"
00082 #define LABEL_MAXIMUM "maximum"
00083 #define LABEL_MONTE_CARLO "Monte-Carlo"
00084 #define LABEL_MUTATION "mutation"
00085 #define LABEL_NAME "name"
00086 #define LABEL_NBEST "nbest"
00087 #define LABEL_NBITS "nbits"
00088 #define LABEL_NESTIMATES "nestimates"
00089 #define LABEL_NGENERATIONS "ngenerations"
00090 #define LABEL_NITERATIONS "niterations"
00091 #define LABEL_NORM "norm"
00092 #define LABEL_NPOPULATION "npopulation"
00093 #define LABEL_NSIMULATIONS "nsimulations"
```

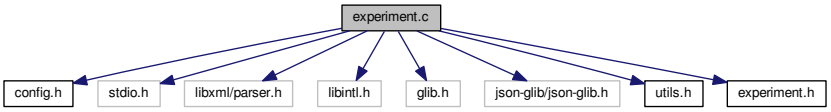
```
00094 #define LABEL_NSTEPS "nsteps"
00095 #define LABEL_NSWEEPS "nsweeps"
00096 #define LABEL_P "p"
00097 #define LABEL_PRECISION "precision"
00098 #define LABEL_RANDOM "random"
00099 #define LABEL_RELAXATION "relaxation"
00100 #define LABEL_REPRODUCTION "reproduction"
00101 #define LABEL_RESULT_FILE "result_file"
00102 #define LABEL_SIMULATOR "simulator"
00103 #define LABEL_SEED "seed"
00104 #define LABEL_STEP "step"
00105 #define LABEL_SWEEP "sweep"
00106 #define LABEL_TAXICAB "taxicab"
00107 #define LABEL_TEMPLATE1 "template1"
00108 #define LABEL_TEMPLATE2 "template2"
00109 #define LABEL_TEMPLATE3 "template3"
00110 #define LABEL_TEMPLATE4 "template4"
00111 #define LABEL_TEMPLATE5 "template5"
00112 #define LABEL_TEMPLATE6 "template6"
00113 #define LABEL_TEMPLATE7 "template7"
00114 #define LABEL_TEMPLATE8 "template8"
00115 #define LABEL_THRESHOLD "threshold"
00116 #define LABEL_TOLERANCE "tolerance"
00117 #define LABEL_VARIABLE "variable"
00118 #define LABEL_VARIABLES "variables"
00119 #define LABEL_VARIABLES_FILE "variables_file"
00120 #define LABEL_WEIGHT "weight"
00121
00122 // Enumerations
00123
00128 enum INPUT_TYPE
00129 {
00130   INPUT_TYPE_XML = 0,
00131   INPUT_TYPE_JSON = 1
00132 };
00133
00134 #endif
```

4.3 experiment.c File Reference

Source file to define the experiment data.

```
#include "config.h"
#include <stdio.h>
#include <libxml/parser.h>
#include <libintl.h>
#include <glib.h>
#include <json-glib/json-glib.h>
#include "utils.h"
#include "experiment.h"
```

Include dependency graph for experiment.c:



Macros

- #define DEBUG_EXPERIMENT 0

  Macro to debug experiment functions.

Functions

- void experiment_new (Experiment *experiment)

  Function to create a new Experiment struct.
- void experiment_free (Experiment *experiment, unsigned int type)

  Function to free the memory of an Experiment struct.
- void experiment_error (Experiment *experiment, char *message)

  Function to print a message error opening an Experiment struct.
- int experiment_open_xml (Experiment *experiment, xmlNode *node, unsigned int ninputs)

  Function to open the Experiment struct on a XML node.
- int experiment_open_json (Experiment *experiment, JsonNode *node, unsigned int ninputs)

  Function to open the Experiment struct on a XML node.

Variables

- const char * stencil [MAX_NINPUTS]

  Array of xmlChar strings with stencil labels.

4.3.1 Detailed Description

Source file to define the experiment data.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file experiment.c.

4.3.2 Function Documentation

4.3.2.1 experiment_error()

```
void experiment_error (
            Experiment * experiment,
            char * message )
```

Function to print a message error opening an Experiment struct.

Parameters

experiment	Experiment struct.
message	Error message.

Definition at line 121 of file experiment.c.

```
00122 {
00123   char buffer[64];
00124   if (!experiment->name)
00125     snprintf (buffer, 64, "%s: %s", _("Experiment"), message);
00126   else
00127     snprintf (buffer, 64, "%s %s: %s", _("Experiment"),
00128               experiment->name, message);
00129   error_message = g_strdup (buffer);
00130 }
```

4.3.2.2 experiment_free()

```
void experiment_free (
             Experiment * experiment,
             unsigned int type )
```

Function to free the memory of an Experiment struct.

Parameters

experiment	Experiment struct.
type	Type of input file.

Definition at line 88 of file experiment.c.

```
00089 {
00090   unsigned int i;
00091 #if DEBUG_EXPERIMENT
00092   fprintf (stderr, "experiment_free: start\n");
00093 #endif
00094   if (type == INPUT_TYPE_XML)
00095     {
00096       for (i = 0; i < experiment->ninputs; ++i)
00097         xmlFree (experiment->stencil[i]);
00098       xmlFree (experiment->name);
00099     }
00100   else
00101     {
00102       for (i = 0; i < experiment->ninputs; ++i)
00103         g_free (experiment->stencil[i]);
00104       g_free (experiment->name);
00105     }
00106   experiment->ninputs = 0;
00107 #if DEBUG_EXPERIMENT
00108   fprintf (stderr, "experiment_free: end\n");
00109 #endif
00110 }
```

4.3.2.3 experiment_new()

```
void experiment_new (
             Experiment * experiment )
```

Function to create a new Experiment struct.

Parameters

experiment	Experiment struct.

Definition at line 64 of file experiment.c.

```
00065 {
00066   unsigned int i;
00067 #if DEBUG_EXPERIMENT
00068   fprintf (stderr, "experiment_new: start\n");
00069 #endif
00070   experiment->name = NULL;
00071   experiment->ninputs = 0;
00072   for (i = 0; i < MAX_NINPUTS; ++i)
00073     experiment->stencil[i] = NULL;
00074 #if DEBUG_EXPERIMENT
00075   fprintf (stderr, "input_new: end\n");
00076 #endif
00077 }
```

4.3.2.4 experiment_open_json()

```
int experiment_open_json (
              Experiment * experiment,
              JsonNode * node,
              unsigned int ninputs )
```

Function to open the Experiment struct on a XML node.

Parameters

experiment	Experiment struct.
node	JSON node.
ninputs	Number of the simulator input files.

Returns

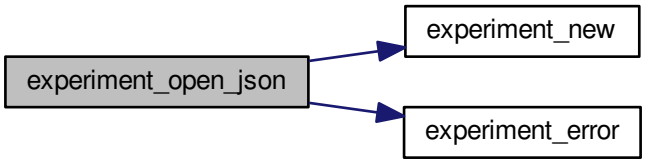
1 on success, 0 on error.

Definition at line 254 of file experiment.c.

```
00256 {
00257   char buffer[64];
00258   JsonObject *object;
00259   const char *name;
00260   int error_code;
00261   unsigned int i;
00262
00263 #if DEBUG_EXPERIMENT
00264   fprintf (stderr, "experiment_open_json: start\n");
00265 #endif
00266
00267   // Resetting experiment data
00268   experiment_new (experiment);
00269
00270   // Getting JSON object
00271   object = json_node_get_object (node);
00272
```

```
00273   // Reading the experimental data
00274   name = json_object_get_string_member (object, LABEL_NAME);
00275   if (!name)
00276     {
00277       experiment_error (experiment, _("no data file name"));
00278       goto exit_on_error;
00279     }
00280   experiment->name = g_strdup (name);
00281 #if DEBUG_EXPERIMENT
00282   fprintf (stderr, "experiment_open_json: name=%s\n", experiment->name);
00283 #endif
00284   experiment->weight
00285     = json_object_get_float_with_default (object,
      LABEL_WEIGHT, 1.,
00286                                           &error_code);
00287   if (error_code)
00288     {
00289       experiment_error (experiment, _("bad weight"));
00290       goto exit_on_error;
00291     }
00292 #if DEBUG_EXPERIMENT
00293   fprintf (stderr, "experiment_open_json: weight=%lg\n", experiment->weight);
00294 #endif
00295   name = json_object_get_string_member (object, stencil[0]);
00296   if (name)
00297     {
00298 #if DEBUG_EXPERIMENT
00299       fprintf (stderr, "experiment_open_json: experiment=%s template1=%s\n",
00300                name, stencil[0]);
00301 #endif
00302       ++experiment->ninputs;
00303     }
00304   else
00305     {
00306       experiment_error (experiment, _("no template"));
00307       goto exit_on_error;
00308     }
00309   experiment->stencil[0] = g_strdup (name);
00310   for (i = 1; i < MAX_NINPUTS; ++i)
00311     {
00312 #if DEBUG_EXPERIMENT
00313       fprintf (stderr, "experiment_open_json: stencil%u\n", i + 1);
00314 #endif
00315       if (json_object_get_member (object, stencil[i]))
00316         {
00317           if (ninputs && ninputs <= i)
00318             {
00319               experiment_error (experiment, _("bad templates number"));
00320               goto exit_on_error;
00321             }
00322           name = json_object_get_string_member (object, stencil[i]);
00323 #if DEBUG_EXPERIMENT
00324           fprintf (stderr,
00325                    "experiment_open_json: experiment=%s stencil%u=%s\n",
00326                    experiment->nexperiments, name, stencil[i]);
00327 #endif
00328           experiment->stencil[i] = g_strdup (name);
00329           ++experiment->ninputs;
00330         }
00331       else if (ninputs && ninputs > i)
00332         {
00333           snprintf (buffer, 64, "%s%u", _("no template"), i + 1);
00334           experiment_error (experiment, buffer);
00335           goto exit_on_error;
00336         }
00337       else
00338         break;
00339     }
00340
00341 #if DEBUG_EXPERIMENT
00342   fprintf (stderr, "experiment_open_json: end\n");
00343 #endif
00344   return 1;
00345
00346 exit_on_error:
00347   experiment_free (experiment, INPUT_TYPE_JSON);
00348 #if DEBUG_EXPERIMENT
00349   fprintf (stderr, "experiment_open_json: end\n");
00350 #endif
00351   return 0;
00352 }
```

Here is the call graph for this function:



4.3.2.5 experiment_open_xml()

```
int experiment_open_xml (
              Experiment * experiment,
              xmlNode * node,
              unsigned int ninputs )
```

Function to open the Experiment struct on a XML node.

Parameters

experiment	Experiment struct.
node	XML node.
ninputs	Number of the simulator input files.

Returns

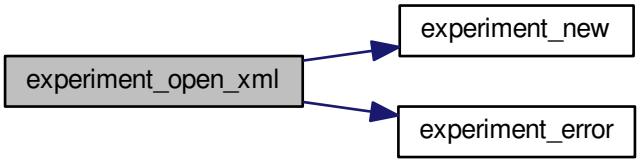
1 on success, 0 on error.

Definition at line 145 of file experiment.c.

```
00147 {
00148   char buffer[64];
00149   int error_code;
00150   unsigned int i;
00151
00152 #if DEBUG_EXPERIMENT
00153   fprintf (stderr, "experiment_open_xml: start\n");
00154 #endif
00155
00156   // Resetting experiment data
00157   experiment_new (experiment);
00158
00159   // Reading the experimental data
00160   experiment->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
00161   if (!experiment->name)
00162     {
00163       experiment_error (experiment, _("no data file name"));
00164       goto exit_on_error;
00165     }
00166 #if DEBUG_EXPERIMENT
00167   fprintf (stderr, "experiment_open_xml: name=%s\n", experiment->name);
```

```
00168 #endif
00169   experiment->weight
00170     =
00171     xml_node_get_float_with_default (node, (const xmlChar *)
      LABEL_WEIGHT, 1.,
00172                                      &error_code);
00173   if (error_code)
00174     {
00175       experiment_error (experiment, _("bad weight"));
00176       goto exit_on_error;
00177     }
00178 #if DEBUG_EXPERIMENT
00179   fprintf (stderr, "experiment_open_xml: weight=%lg\n", experiment->weight);
00180 #endif
00181   experiment->stencil[0]
00182     = (char *) xmlGetProp (node, (const xmlChar *) stencil[0]);
00183   if (experiment->stencil[0])
00184     {
00185 #if DEBUG_EXPERIMENT
00186       fprintf (stderr, "experiment_open_xml: experiment=%s stencil1=%s\n",
00187                experiment->name, stencil[0]);
00188 #endif
00189       ++experiment->ninputs;
00190     }
00191   else
00192     {
00193       experiment_error (experiment, _("no template"));
00194       goto exit_on_error;
00195     }
00196   for (i = 1; i < MAX_NINPUTS; ++i)
00197     {
00198 #if DEBUG_EXPERIMENT
00199       fprintf (stderr, "experiment_open_xml: stencil%u\n", i + 1);
00200 #endif
00201       if (xmlHasProp (node, (const xmlChar *) stencil[i]))
00202         {
00203           if (ninputs && ninputs <= i)
00204             {
00205               experiment_error (experiment, _("bad templates number"));
00206               goto exit_on_error;
00207             }
00208           experiment->stencil[i]
00209             = (char *) xmlGetProp (node, (const xmlChar *) stencil[i]);
00210 #if DEBUG_EXPERIMENT
00211           fprintf (stderr,
00212                    "experiment_open_xml: experiment=%s stencil%u=%s\n",
00213                    experiment->nexperiments, experiment->name,
00214                    experiment->stencil[i]);
00215 #endif
00216           ++experiment->ninputs;
00217         }
00218       else if (ninputs && ninputs > i)
00219         {
00220           snprintf (buffer, 64, "%s%u", _("no template"), i + 1);
00221           experiment_error (experiment, buffer);
00222           goto exit_on_error;
00223         }
00224       else
00225         break;
00226     }
00227
00228 #if DEBUG_EXPERIMENT
00229   fprintf (stderr, "experiment_open_xml: end\n");
00230 #endif
00231   return 1;
00232
00233 exit_on_error:
00234   experiment_free (experiment, INPUT_TYPE_XML);
00235 #if DEBUG_EXPERIMENT
00236   fprintf (stderr, "experiment_open_xml: end\n");
00237 #endif
00238   return 0;
00239 }
```

Here is the call graph for this function:



4.3.3 Variable Documentation

4.3.3.1 stencil

```
const char* stencil[MAX_NINPUTS]
```

Initial value:

```
= {
  LABEL_TEMPLATE1, LABEL_TEMPLATE2,
      LABEL_TEMPLATE3, LABEL_TEMPLATE4,
  LABEL_TEMPLATE5, LABEL_TEMPLATE6,
      LABEL_TEMPLATE7, LABEL_TEMPLATE8
}
```

Array of xmlChar strings with stencil labels.

Definition at line 50 of file experiment.c.

4.4 experiment.c

```
00001 /*
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
00007
00008 Copyright 2012-2017, AUTHORS.
00009
00010 Redistribution and use in source and binary forms, with or without modification,
00011 are permitted provided that the following conditions are met:
00012
00013     1. Redistributions of source code must retain the above copyright notice,
00014         this list of conditions and the following disclaimer.
00015
00016     2. Redistributions in binary form must reproduce the above copyright notice,
00017         this list of conditions and the following disclaimer in the
00018         documentation and/or other materials provided with the distribution.
00019
00020 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00021 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
```

```
00022 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00023 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00024 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00025 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00026 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #define _GNU_SOURCE
00039 #include "config.h"
00040 #include <stdio.h>
00041 #include <libxml/parser.h>
00042 #include <libintl.h>
00043 #include <glib.h>
00044 #include <json-glib/json-glib.h>
00045 #include "utils.h"
00046 #include "experiment.h"
00047
00048 #define DEBUG_EXPERIMENT 0
00049
00050 const char *stencil[MAX_NINPUTS] = {
00051   LABEL_TEMPLATE1, LABEL_TEMPLATE2,
      LABEL_TEMPLATE3, LABEL_TEMPLATE4,
00052   LABEL_TEMPLATE5, LABEL_TEMPLATE6,
      LABEL_TEMPLATE7, LABEL_TEMPLATE8
00053 };
00054
00056
00063 void
00064 experiment_new (Experiment * experiment)
00065 {
00066   unsigned int i;
00067 #if DEBUG_EXPERIMENT
00068   fprintf (stderr, "experiment_new: start\n");
00069 #endif
00070   experiment->name = NULL;
00071   experiment->ninputs = 0;
00072   for (i = 0; i < MAX_NINPUTS; ++i)
00073     experiment->stencil[i] = NULL;
00074 #if DEBUG_EXPERIMENT
00075   fprintf (stderr, "input_new: end\n");
00076 #endif
00077 }
00078
00087 void
00088 experiment_free (Experiment * experiment, unsigned int type)
00089 {
00090   unsigned int i;
00091 #if DEBUG_EXPERIMENT
00092   fprintf (stderr, "experiment_free: start\n");
00093 #endif
00094   if (type == INPUT_TYPE_XML)
00095     {
00096       for (i = 0; i < experiment->ninputs; ++i)
00097         xmlFree (experiment->stencil[i]);
00098       xmlFree (experiment->name);
00099     }
00100   else
00101     {
00102       for (i = 0; i < experiment->ninputs; ++i)
00103         g_free (experiment->stencil[i]);
00104       g_free (experiment->name);
00105     }
00106   experiment->ninputs = 0;
00107 #if DEBUG_EXPERIMENT
00108   fprintf (stderr, "experiment_free: end\n");
00109 #endif
00110 }
00111
00120 void
00121 experiment_error (Experiment * experiment, char *message)
00122 {
00123   char buffer[64];
00124   if (!experiment->name)
00125     snprintf (buffer, 64, "%s: %s", _("Experiment"), message);
00126   else
00127     snprintf (buffer, 64, "%s %s: %s", _("Experiment"),
00128               experiment->name, message);
00129   error_message = g_strdup (buffer);
00130 }
00131
00144 int
00145 experiment_open_xml (Experiment * experiment, xmlNode * node,
00146                      unsigned int ninputs)
00147 {
```

```
00148   char buffer[64];
00149   int error_code;
00150   unsigned int i;
00151
00152 #if DEBUG_EXPERIMENT
00153   fprintf (stderr, "experiment_open_xml: start\n");
00154 #endif
00155
00156   // Resetting experiment data
00157   experiment_new (experiment);
00158
00159   // Reading the experimental data
00160   experiment->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
00161   if (!experiment->name)
00162     {
00163       experiment_error (experiment, _("no data file name"));
00164       goto exit_on_error;
00165     }
00166 #if DEBUG_EXPERIMENT
00167   fprintf (stderr, "experiment_open_xml: name=%s\n", experiment->name);
00168 #endif
00169   experiment->weight
00170     =
00171     xml_node_get_float_with_default (node, (const xmlChar *)
      LABEL_WEIGHT, 1.,
00172                                      &error_code);
00173   if (error_code)
00174     {
00175       experiment_error (experiment, _("bad weight"));
00176       goto exit_on_error;
00177     }
00178 #if DEBUG_EXPERIMENT
00179   fprintf (stderr, "experiment_open_xml: weight=%lg\n", experiment->weight);
00180 #endif
00181   experiment->stencil[0]
00182     = (char *) xmlGetProp (node, (const xmlChar *) stencil[0]);
00183   if (experiment->stencil[0])
00184     {
00185 #if DEBUG_EXPERIMENT
00186       fprintf (stderr, "experiment_open_xml: experiment=%s stencil1=%s\n",
00187                experiment->name, stencil[0]);
00188 #endif
00189       ++experiment->ninputs;
00190     }
00191   else
00192     {
00193       experiment_error (experiment, _("no template"));
00194       goto exit_on_error;
00195     }
00196   for (i = 1; i < MAX_NINPUTS; ++i)
00197     {
00198 #if DEBUG_EXPERIMENT
00199       fprintf (stderr, "experiment_open_xml: stencil%u\n", i + 1);
00200 #endif
00201       if (xmlHasProp (node, (const xmlChar *) stencil[i]))
00202         {
00203           if (ninputs && ninputs <= i)
00204             {
00205               experiment_error (experiment, _("bad templates number"));
00206               goto exit_on_error;
00207             }
00208           experiment->stencil[i]
00209             = (char *) xmlGetProp (node, (const xmlChar *) stencil[i]);
00210 #if DEBUG_EXPERIMENT
00211           fprintf (stderr,
00212                    "experiment_open_xml: experiment=%s stencil%u=%s\n",
00213                    experiment->nexperiments, experiment->name,
00214                    experiment->stencil[i]);
00215 #endif
00216           ++experiment->ninputs;
00217         }
00218       else if (ninputs && ninputs > i)
00219         {
00220           snprintf (buffer, 64, "%s%u", _("no template"), i + 1);
00221           experiment_error (experiment, buffer);
00222           goto exit_on_error;
00223         }
00224       else
00225         break;
00226     }
00227
00228 #if DEBUG_EXPERIMENT
00229   fprintf (stderr, "experiment_open_xml: end\n");
00230 #endif
00231   return 1;
00232
00233 exit_on_error:
```

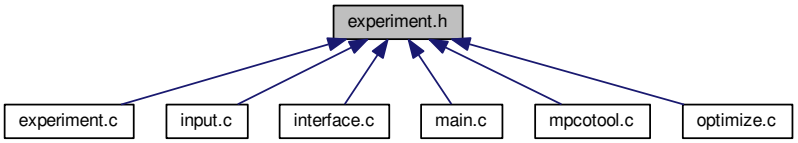
```
00234   experiment_free (experiment, INPUT_TYPE_XML);
00235 #if DEBUG_EXPERIMENT
00236   fprintf (stderr, "experiment_open_xml: end\n");
00237 #endif
00238   return 0;
00239 }
00240
00253 int
00254 experiment_open_json (Experiment * experiment, JsonNode * node,
00255                       unsigned int ninputs)
00256 {
00257   char buffer[64];
00258   JsonObject *object;
00259   const char *name;
00260   int error_code;
00261   unsigned int i;
00262
00263 #if DEBUG_EXPERIMENT
00264   fprintf (stderr, "experiment_open_json: start\n");
00265 #endif
00266
00267   // Resetting experiment data
00268   experiment_new (experiment);
00269
00270   // Getting JSON object
00271   object = json_node_get_object (node);
00272
00273   // Reading the experimental data
00274   name = json_object_get_string_member (object, LABEL_NAME);
00275   if (!name)
00276     {
00277       experiment_error (experiment, _("no data file name"));
00278       goto exit_on_error;
00279     }
00280   experiment->name = g_strdup (name);
00281 #if DEBUG_EXPERIMENT
00282   fprintf (stderr, "experiment_open_json: name=%s\n", experiment->name);
00283 #endif
00284   experiment->weight
00285     = json_object_get_float_with_default (object,
      LABEL_WEIGHT, 1.,
00286                                           &error_code);
00287   if (error_code)
00288     {
00289       experiment_error (experiment, _("bad weight"));
00290       goto exit_on_error;
00291     }
00292 #if DEBUG_EXPERIMENT
00293   fprintf (stderr, "experiment_open_json: weight=%lg\n", experiment->weight);
00294 #endif
00295   name = json_object_get_string_member (object, stencil[0]);
00296   if (name)
00297     {
00298 #if DEBUG_EXPERIMENT
00299       fprintf (stderr, "experiment_open_json: experiment=%s template1=%s\n",
00300                name, stencil[0]);
00301 #endif
00302       ++experiment->ninputs;
00303     }
00304   else
00305     {
00306       experiment_error (experiment, _("no template"));
00307       goto exit_on_error;
00308     }
00309   experiment->stencil[0] = g_strdup (name);
00310   for (i = 1; i < MAX_NINPUTS; ++i)
00311     {
00312 #if DEBUG_EXPERIMENT
00313       fprintf (stderr, "experiment_open_json: stencil%u\n", i + 1);
00314 #endif
00315       if (json_object_get_member (object, stencil[i]))
00316         {
00317           if (ninputs && ninputs <= i)
00318             {
00319               experiment_error (experiment, _("bad templates number"));
00320               goto exit_on_error;
00321             }
00322           name = json_object_get_string_member (object, stencil[i]);
00323 #if DEBUG_EXPERIMENT
00324           fprintf (stderr,
00325                    "experiment_open_json: experiment=%s stencil%u=%s\n",
00326                    experiment->nexperiments, name, stencil[i]);
00327 #endif
00328           experiment->stencil[i] = g_strdup (name);
00329           ++experiment->ninputs;
00330         }
00331       else if (ninputs && ninputs > i)
```

```
00332         {
00333           snprintf (buffer, 64, "%s%u", _("no template"), i + 1);
00334           experiment_error (experiment, buffer);
00335           goto exit_on_error;
00336         }
00337       else
00338         break;
00339     }
00340
00341 #if DEBUG_EXPERIMENT
00342   fprintf (stderr, "experiment_open_json: end\n");
00343 #endif
00344   return 1;
00345
00346 exit_on_error:
00347   experiment_free (experiment, INPUT_TYPE_JSON);
00348 #if DEBUG_EXPERIMENT
00349   fprintf (stderr, "experiment_open_json: end\n");
00350 #endif
00351   return 0;
00352 }
```

4.5 experiment.h File Reference

Header file to define the experiment data.

This graph shows which files directly or indirectly include this file:



Data Structures

- struct Experiment

  Struct to define the experiment data.

Functions

- void experiment_new (Experiment *experiment)

  Function to create a new Experiment struct.
- void experiment_free (Experiment *experiment, unsigned int type)

  Function to free the memory of an Experiment struct.
- void experiment_error (Experiment *experiment, char *message)

  Function to print a message error opening an Experiment struct.
- int experiment_open_xml (Experiment *experiment, xmlNode *node, unsigned int ninputs)

  Function to open the Experiment struct on a XML node.
- int experiment_open_json (Experiment *experiment, JsonNode *node, unsigned int ninputs)

  Function to open the Experiment struct on a XML node.

Variables

- const char * stencil [MAX_NINPUTS]

  Array of xmlChar strings with stencil labels.

4.5.1 Detailed Description

Header file to define the experiment data.

Authors

Javier Burguete.

Copyright

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Definition in file experiment.h.

4.5.2 Function Documentation

4.5.2.1 experiment_error()

```
void experiment_error (
             Experiment * experiment,
             char * message )
```

Function to print a message error opening an Experiment struct.

Parameters

experiment	Experiment struct.
message	Error message.

Definition at line 121 of file experiment.c.

```
00122 {
00123   char buffer[64];
00124   if (!experiment->name)
00125     snprintf (buffer, 64, "%s: %s", _("Experiment"), message);
00126   else
00127     snprintf (buffer, 64, "%s %s: %s", _("Experiment"),
00128               experiment->name, message);
00129   error_message = g_strdup (buffer);
00130 }
```

4.5.2.2 experiment_free()

```
void experiment_free (
            Experiment * experiment,
            unsigned int type )
```

Function to free the memory of an Experiment struct.

Parameters

experiment	Experiment struct.
type	Type of input file.

Definition at line 88 of file experiment.c.

```
00089 {
00090   unsigned int i;
00091 #if DEBUG_EXPERIMENT
00092   fprintf (stderr, "experiment_free: start\n");
00093 #endif
00094   if (type == INPUT_TYPE_XML)
00095     {
00096       for (i = 0; i < experiment->ninputs; ++i)
00097         xmlFree (experiment->stencil[i]);
00098       xmlFree (experiment->name);
00099     }
00100   else
00101     {
00102       for (i = 0; i < experiment->ninputs; ++i)
00103         g_free (experiment->stencil[i]);
00104       g_free (experiment->name);
00105     }
00106   experiment->ninputs = 0;
00107 #if DEBUG_EXPERIMENT
00108   fprintf (stderr, "experiment_free: end\n");
00109 #endif
00110 }
```

4.5.2.3 experiment_new()

```
void experiment_new (
            Experiment * experiment )
```

Function to create a new Experiment struct.

Parameters

experiment	Experiment struct.

Definition at line 64 of file experiment.c.

```
00065 {
00066   unsigned int i;
00067 #if DEBUG_EXPERIMENT
00068   fprintf (stderr, "experiment_new: start\n");
00069 #endif
00070   experiment->name = NULL;
00071   experiment->ninputs = 0;
```

```
00072   for (i = 0; i < MAX_NINPUTS; ++i)
00073     experiment->stencil[i] = NULL;
00074 #if DEBUG_EXPERIMENT
00075   fprintf (stderr, "input_new: end\n");
00076 #endif
00077 }
```

4.5.2.4 experiment_open_json()

```
int experiment_open_json (
              Experiment * experiment,
              JsonNode * node,
              unsigned int ninputs )
```

Function to open the Experiment struct on a XML node.

Parameters

experiment	Experiment struct.
node	JSON node.
ninputs	Number of the simulator input files.

Returns

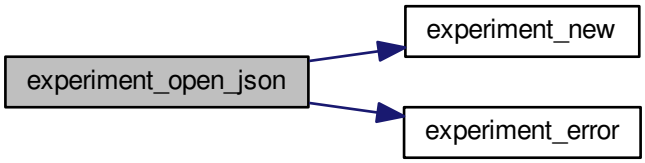
1 on success, 0 on error.

Definition at line 254 of file experiment.c.

```
00256 {
00257   char buffer[64];
00258   JsonObject *object;
00259   const char *name;
00260   int error_code;
00261   unsigned int i;
00262
00263 #if DEBUG_EXPERIMENT
00264   fprintf (stderr, "experiment_open_json: start\n");
00265 #endif
00266
00267   // Resetting experiment data
00268   experiment_new (experiment);
00269
00270   // Getting JSON object
00271   object = json_node_get_object (node);
00272
00273   // Reading the experimental data
00274   name = json_object_get_string_member (object, LABEL_NAME);
00275   if (!name)
00276     {
00277       experiment_error (experiment, _("no data file name"));
00278       goto exit_on_error;
00279     }
00280   experiment->name = g_strdup (name);
00281 #if DEBUG_EXPERIMENT
00282   fprintf (stderr, "experiment_open_json: name=%s\n", experiment->name);
00283 #endif
00284   experiment->weight
00285     = json_object_get_float_with_default (object,
      LABEL_WEIGHT, 1.,
00286                                           &error_code);
00287   if (error_code)
00288     {
00289       experiment_error (experiment, _("bad weight"));
00290       goto exit_on_error;
```

```
00291     }
00292 #if DEBUG_EXPERIMENT
00293   fprintf (stderr, "experiment_open_json: weight=%lg\n", experiment->weight);
00294 #endif
00295   name = json_object_get_string_member (object, stencil[0]);
00296   if (name)
00297     {
00298 #if DEBUG_EXPERIMENT
00299       fprintf (stderr, "experiment_open_json: experiment=%s template1=%s\n",
00300                name, stencil[0]);
00301 #endif
00302       ++experiment->ninputs;
00303     }
00304   else
00305     {
00306       experiment_error (experiment, _("no template"));
00307       goto exit_on_error;
00308     }
00309   experiment->stencil[0] = g_strdup (name);
00310   for (i = 1; i < MAX_NINPUTS; ++i)
00311     {
00312 #if DEBUG_EXPERIMENT
00313       fprintf (stderr, "experiment_open_json: stencil%u\n", i + 1);
00314 #endif
00315       if (json_object_get_member (object, stencil[i]))
00316         {
00317           if (ninputs && ninputs <= i)
00318             {
00319               experiment_error (experiment, _("bad templates number"));
00320               goto exit_on_error;
00321             }
00322           name = json_object_get_string_member (object, stencil[i]);
00323 #if DEBUG_EXPERIMENT
00324           fprintf (stderr,
00325                    "experiment_open_json: experiment=%s stencil%u=%s\n",
00326                    experiment->nexperiments, name, stencil[i]);
00327 #endif
00328           experiment->stencil[i] = g_strdup (name);
00329           ++experiment->ninputs;
00330         }
00331       else if (ninputs && ninputs > i)
00332         {
00333           snprintf (buffer, 64, "%s%u", _("no template"), i + 1);
00334           experiment_error (experiment, buffer);
00335           goto exit_on_error;
00336         }
00337       else
00338         break;
00339     }
00340
00341 #if DEBUG_EXPERIMENT
00342   fprintf (stderr, "experiment_open_json: end\n");
00343 #endif
00344   return 1;
00345
00346 exit_on_error:
00347   experiment_free (experiment, INPUT_TYPE_JSON);
00348 #if DEBUG_EXPERIMENT
00349   fprintf (stderr, "experiment_open_json: end\n");
00350 #endif
00351   return 0;
00352 }
```

Here is the call graph for this function:



4.5.2.5 experiment_open_xml()

```
int experiment_open_xml (
              Experiment * experiment,
              xmlNode * node,
              unsigned int ninputs )
```

Function to open the Experiment struct on a XML node.

Parameters

experiment	Experiment struct.
node	XML node.
ninputs	Number of the simulator input files.

Returns

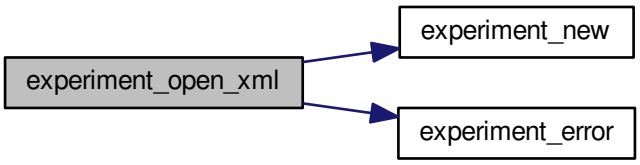
1 on success, 0 on error.

Definition at line 145 of file experiment.c.

```
00147 {
00148   char buffer[64];
00149   int error_code;
00150   unsigned int i;
00151
00152 #if DEBUG_EXPERIMENT
00153   fprintf (stderr, "experiment_open_xml: start\n");
00154 #endif
00155
00156   // Resetting experiment data
00157   experiment_new (experiment);
00158
00159   // Reading the experimental data
00160   experiment->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
00161   if (!experiment->name)
00162     {
00163       experiment_error (experiment, _("no data file name"));
00164       goto exit_on_error;
00165     }
00166 #if DEBUG_EXPERIMENT
00167   fprintf (stderr, "experiment_open_xml: name=%s\n", experiment->name);
00168 #endif
00169   experiment->weight
00170     =
00171     xml_node_get_float_with_default (node, (const xmlChar *)
      LABEL_WEIGHT, 1.,
00172                                      &error_code);
00173   if (error_code)
00174     {
00175       experiment_error (experiment, _("bad weight"));
00176       goto exit_on_error;
00177     }
00178 #if DEBUG_EXPERIMENT
00179   fprintf (stderr, "experiment_open_xml: weight=%lg\n", experiment->weight);
00180 #endif
00181   experiment->stencil[0]
00182     = (char *) xmlGetProp (node, (const xmlChar *) stencil[0]);
00183   if (experiment->stencil[0])
00184     {
00185 #if DEBUG_EXPERIMENT
00186       fprintf (stderr, "experiment_open_xml: experiment=%s stencil1=%s\n",
00187                experiment->name, stencil[0]);
00188 #endif
00189       ++experiment->ninputs;
00190     }
00191   else
```

```
00192     {
00193       experiment_error (experiment, _("no template"));
00194       goto exit_on_error;
00195     }
00196   for (i = 1; i < MAX_NINPUTS; ++i)
00197     {
00198 #if DEBUG_EXPERIMENT
00199       fprintf (stderr, "experiment_open_xml: stencil%u\n", i + 1);
00200 #endif
00201       if (xmlHasProp (node, (const xmlChar *) stencil[i]))
00202         {
00203           if (ninputs && ninputs <= i)
00204             {
00205               experiment_error (experiment, _("bad templates number"));
00206               goto exit_on_error;
00207             }
00208           experiment->stencil[i]
00209             = (char *) xmlGetProp (node, (const xmlChar *) stencil[i]);
00210 #if DEBUG_EXPERIMENT
00211           fprintf (stderr,
00212                    "experiment_open_xml: experiment=%s stencil%u=%s\n",
00213                    experiment->nexperiments, experiment->name,
00214                    experiment->stencil[i]);
00215 #endif
00216           ++experiment->ninputs;
00217         }
00218       else if (ninputs && ninputs > i)
00219         {
00220           snprintf (buffer, 64, "%s%u", _("no template"), i + 1);
00221           experiment_error (experiment, buffer);
00222           goto exit_on_error;
00223         }
00224       else
00225         break;
00226     }
00227
00228 #if DEBUG_EXPERIMENT
00229   fprintf (stderr, "experiment_open_xml: end\n");
00230 #endif
00231   return 1;
00232
00233 exit_on_error:
00234   experiment_free (experiment, INPUT_TYPE_XML);
00235 #if DEBUG_EXPERIMENT
00236   fprintf (stderr, "experiment_open_xml: end\n");
00237 #endif
00238   return 0;
00239 }
```

Here is the call graph for this function:



4.6 experiment.h

```
00001 /*
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
```

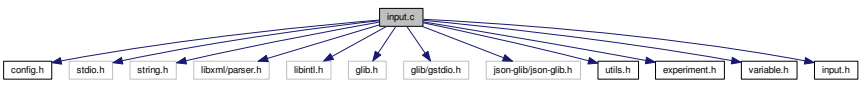
```
00007
00008 Copyright 2012-2017, AUTHORS.
00009
00010 Redistribution and use in source and binary forms, with or without modification,
00011 are permitted provided that the following conditions are met:
00012
00013   1. Redistributions of source code must retain the above copyright notice,
00014     this list of conditions and the following disclaimer.
00015
00016   2. Redistributions in binary form must reproduce the above copyright notice,
00017     this list of conditions and the following disclaimer in the
00018     documentation and/or other materials provided with the distribution.
00019
00020 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00021 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00022 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00023 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00024 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00025 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00026 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #ifndef EXPERIMENT__H
00039 #define EXPERIMENT__H 1
00040
00045 typedef struct
00046 {
00047   char *name;
00048   char *stencil[MAX_NINPUTS];
00049   double weight;
00050   unsigned int ninputs;
00051 } Experiment;
00052
00053 extern const char *stencil[MAX_NINPUTS];
00054
00055 // Public functions
00056 void experiment_new (Experiment * experiment);
00057 void experiment_free (Experiment * experiment, unsigned int type);
00058 void experiment_error (Experiment * experiment, char *message);
00059 int experiment_open_xml (Experiment * experiment, xmlNode * node,
00060                          unsigned int ninputs);
00061 int experiment_open_json (Experiment * experiment, JsonNode * node,
00062                           unsigned int ninputs);
00063
00064 #endif
```

4.7 input.c File Reference

Source file to define the input functions.

```
#include "config.h"
#include <stdio.h>
#include <string.h>
#include <libxml/parser.h>
#include <libintl.h>
#include <glib.h>
#include <glib/gstdio.h>
#include <json-glib/json-glib.h>
#include "utils.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"
```

Include dependency graph for input.c:



Macros

- #define DEBUG_INPUT 0

  Macro to debug input functions.

Functions

- void input_new ()

  Function to create a new Input struct.
- void input_free ()

  Function to free the memory of the input file data.
- void input_error (char *message)

  Function to print an error message opening an Input struct.
- int input_open_xml (xmlDoc *doc)

  Function to open the input file in XML format.
- int input_open_json (JsonParser *parser)

  Function to open the input file in JSON format.
- int input_open (char *filename)

  Function to open the input file.

Variables

- Input input [1]

  Global Input struct to set the input data.
- const char * result_name = "result"

  Name of the result file.
- const char * variables_name = "variables"

  Name of the variables file.

4.7.1 Detailed Description

Source file to define the input functions.

Authors

Javier Burguete and Borja Latorre.

Copyright

Copyright 2012-2017, all rights reserved.

Definition in file input.c.

4.7.2 Function Documentation

4.7.2.1 input_error()

```
void input_error (
            char * message )
```

Function to print an error message opening an Input struct.

Parameters

message	Error message.

Definition at line 124 of file input.c.

```
00125 {
00126   char buffer[64];
00127   snprintf (buffer, 64, "%s: %s\n", _("Input"), message);
00128   error_message = g_strdup (buffer);
00129 }
```

4.7.2.2 input_open()

```
int input_open (
            char * filename )
```

Function to open the input file.

Parameters

filename	Input data file name.

Returns

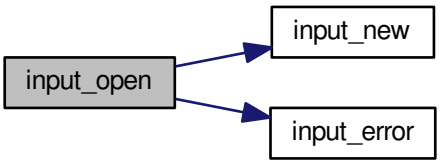
1_on_success, 0_on_error.

Definition at line 958 of file input.c.

```
00959 {
00960   xmlDoc *doc;
00961   JsonParser *parser;
00962
00963 #if DEBUG_INPUT
00964   fprintf (stderr, "input_open: start\n");
00965 #endif
00966
00967   // Resetting input data
00968   input_new ();
00969
00970   // Opening input file
00971 #if DEBUG_INPUT
00972   fprintf (stderr, "input_open: opening the input file %s\n", filename);
00973   fprintf (stderr, "input_open: trying XML format\n");
00974 #endif
00975   doc = xmlParseFile (filename);
00976   if (!doc)
00977     {
00978 #if DEBUG_INPUT
00979       fprintf (stderr, "input_open: trying JSON format\n");
00980 #endif
00981       parser = json_parser_new ();
00982       if (!json_parser_load_from_file (parser, filename, NULL))
00983         {
00984           input_error (_("Unable to parse the input file"));
00985           goto exit_on_error;
00986         }
00987       if (!input_open_json (parser))
00988         goto exit_on_error;
00989     }
00990   else if (!input_open_xml (doc))
```

```
00991     goto exit_on_error;
00992
00993   // Getting the working directory
00994   input->directory = g_path_get_dirname (filename);
00995   input->name = g_path_get_basename (filename);
00996
00997 #if DEBUG_INPUT
00998   fprintf (stderr, "input_open: end\n");
00999 #endif
01000   return 1;
01001
01002 exit_on_error:
01003   show_error (error_message);
01004   g_free (error_message);
01005   input_free ();
01006 #if DEBUG_INPUT
01007   fprintf (stderr, "input_open: end\n");
01008 #endif
01009   return 0;
01010 }
```

Here is the call graph for this function:



4.7.2.3 input_open_json()

```
int input_open_json (
              JsonParser * parser )
```

Function to open the input file in JSON format.

Parameters

parser	JsonParser struct.

Returns

1_on_success, 0_on_error.

Definition at line 569 of file input.c.

```
00570 {
00571   JsonNode *node, *child;
00572   JsonObject *object;
00573   JsonArray *array;
```

```
00574   const char *buffer;
00575   int error_code;
00576   unsigned int i, n;
00577
00578 #if DEBUG_INPUT
00579   fprintf (stderr, "input_open_json: start\n");
00580 #endif
00581
00582   // Resetting input data
00583   input->type = INPUT_TYPE_JSON;
00584
00585   // Getting the root node
00586 #if DEBUG_INPUT
00587   fprintf (stderr, "input_open_json: getting the root node\n");
00588 #endif
00589   node = json_parser_get_root (parser);
00590   object = json_node_get_object (node);
00591
00592   // Getting result and variables file names
00593   if (!input->result)
00594     {
00595       buffer = json_object_get_string_member (object, LABEL_RESULT_FILE);
00596       if (!buffer)
00597         buffer = result_name;
00598       input->result = g_strdup (buffer);
00599     }
00600   else
00601     input->result = g_strdup (result_name);
00602   if (!input->variables)
00603     {
00604       buffer = json_object_get_string_member (object, LABEL_VARIABLES_FILE);
00605       if (!buffer)
00606         buffer = variables_name;
00607       input->variables = g_strdup (buffer);
00608     }
00609   else
00610     input->variables = g_strdup (variables_name);
00611
00612   // Opening simulator program name
00613   buffer = json_object_get_string_member (object, LABEL_SIMULATOR);
00614   if (!buffer)
00615     {
00616       input_error (_("Bad simulator program"));
00617       goto exit_on_error;
00618     }
00619   input->simulator = g_strdup (buffer);
00620
00621   // Opening evaluator program name
00622   buffer = json_object_get_string_member (object, LABEL_EVALUATOR);
00623   if (buffer)
00624     input->evaluator = g_strdup (buffer);
00625
00626   // Obtaining pseudo-random numbers generator seed
00627   input->seed
00628     = json_object_get_uint_with_default (object,
      LABEL_SEED,
00629                                          DEFAULT_RANDOM_SEED, &error_code);
00630   if (error_code)
00631     {
00632       input_error (_("Bad pseudo-random numbers generator seed"));
00633       goto exit_on_error;
00634     }
00635
00636   // Opening algorithm
00637   buffer = json_object_get_string_member (object, LABEL_ALGORITHM);
00638   if (!strcmp (buffer, LABEL_MONTE_CARLO))
00639     {
00640       input->algorithm = ALGORITHM_MONTE_CARLO;
00641
00642       // Obtaining simulations number
00643       input->nsimulations
00644         = json_object_get_int (object, LABEL_NSIMULATIONS, &error_code
      );
00645       if (error_code)
00646         {
00647           input_error (_("Bad simulations number"));
00648           goto exit_on_error;
00649         }
00650     }
00651   else if (!strcmp (buffer, LABEL_SWEEP))
00652     input->algorithm = ALGORITHM_SWEEP;
00653   else if (!strcmp (buffer, LABEL_GENETIC))
00654     {
00655       input->algorithm = ALGORITHM_GENETIC;
00656
00657       // Obtaining population
00658       if (json_object_get_member (object, LABEL_NPOPULATION))
```

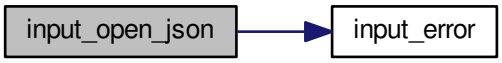
```
00659         {
00660           input->nsimulations
00661             = json_object_get_uint (object,
      LABEL_NPOPULATION, &error_code);
00662           if (error_code || input->nsimulations < 3)
00663             {
00664               input_error (_("Invalid population number"));
00665               goto exit_on_error;
00666             }
00667         }
00668       else
00669         {
00670           input_error (_("No population number"));
00671           goto exit_on_error;
00672         }
00673
00674       // Obtaining generations
00675       if (json_object_get_member (object, LABEL_NGENERATIONS))
00676         {
00677           input->niterations
00678             = json_object_get_uint (object,
      LABEL_NGENERATIONS, &error_code);
00679           if (error_code || !input->niterations)
00680             {
00681               input_error (_("Invalid generations number"));
00682               goto exit_on_error;
00683             }
00684         }
00685       else
00686         {
00687           input_error (_("No generations number"));
00688           goto exit_on_error;
00689         }
00690
00691       // Obtaining mutation probability
00692       if (json_object_get_member (object, LABEL_MUTATION))
00693         {
00694           input->mutation_ratio
00695             = json_object_get_float (object, LABEL_MUTATION, &error_code
      );
00696           if (error_code || input->mutation_ratio < 0.
00697               || input->mutation_ratio >= 1.)
00698             {
00699               input_error (_("Invalid mutation probability"));
00700               goto exit_on_error;
00701             }
00702         }
00703       else
00704         {
00705           input_error (_("No mutation probability"));
00706           goto exit_on_error;
00707         }
00708
00709       // Obtaining reproduction probability
00710       if (json_object_get_member (object, LABEL_REPRODUCTION))
00711         {
00712           input->reproduction_ratio
00713             = json_object_get_float (object,
      LABEL_REPRODUCTION, &error_code);
00714           if (error_code || input->reproduction_ratio < 0.
00715               || input->reproduction_ratio >= 1.0)
00716             {
00717               input_error (_("Invalid reproduction probability"));
00718               goto exit_on_error;
00719             }
00720         }
00721       else
00722         {
00723           input_error (_("No reproduction probability"));
00724           goto exit_on_error;
00725         }
00726
00727       // Obtaining adaptation probability
00728       if (json_object_get_member (object, LABEL_ADAPTATION))
00729         {
00730           input->adaptation_ratio
00731             = json_object_get_float (object,
      LABEL_ADAPTATION, &error_code);
00732           if (error_code || input->adaptation_ratio < 0.
00733               || input->adaptation_ratio >= 1.)
00734             {
00735               input_error (_("Invalid adaptation probability"));
00736               goto exit_on_error;
00737             }
00738         }
00739       else
00740         {
```

```
00741           input_error (_("No adaptation probability"));
00742           goto exit_on_error;
00743         }
00744
00745       // Checking survivals
00746       i = input->mutation_ratio * input->nsimulations;
00747       i += input->reproduction_ratio * input->
      nsimulations;
00748       i += input->adaptation_ratio * input->
      nsimulations;
00749       if (i > input->nsimulations - 2)
00750         {
00751           input_error
00752             (_("No enough survival entities to reproduce the population"));
00753           goto exit_on_error;
00754         }
00755     }
00756   else
00757     {
00758       input_error (_("Unknown algorithm"));
00759       goto exit_on_error;
00760     }
00761
00762   if (input->algorithm == ALGORITHM_MONTE_CARLO
00763       || input->algorithm == ALGORITHM_SWEEP)
00764     {
00765
00766       // Obtaining iterations number
00767       input->niterations
00768         = json_object_get_uint (object, LABEL_NITERATIONS, &error_code
      );
00769       if (error_code == 1)
00770         input->niterations = 1;
00771       else if (error_code)
00772         {
00773           input_error (_("Bad iterations number"));
00774           goto exit_on_error;
00775         }
00776
00777       // Obtaining best number
00778       input->nbest
00779         = json_object_get_uint_with_default (object,
      LABEL_NBEST, 1,
00780                                              &error_code);
00781       if (error_code || !input->nbest)
00782         {
00783           input_error (_("Invalid best number"));
00784           goto exit_on_error;
00785         }
00786
00787       // Obtaining tolerance
00788       input->tolerance
00789         = json_object_get_float_with_default (object,
      LABEL_TOLERANCE, 0.,
00790                                               &error_code);
00791       if (error_code || input->tolerance < 0.)
00792         {
00793           input_error (_("Invalid tolerance"));
00794           goto exit_on_error;
00795         }
00796
00797       // Getting direction search method parameters
00798       if (json_object_get_member (object, LABEL_NSTEPS))
00799         {
00800           input->nsteps
00801             = json_object_get_uint (object, LABEL_NSTEPS, &error_code);
00802           if (error_code)
00803             {
00804               input_error (_("Invalid steps number"));
00805               goto exit_on_error;
00806             }
00807           buffer = json_object_get_string_member (object, LABEL_DIRECTION);
00808           if (!strcmp (buffer, LABEL_COORDINATES))
00809             input->direction = DIRECTION_METHOD_COORDINATES;
00810           else if (!strcmp (buffer, LABEL_RANDOM))
00811             {
00812               input->direction = DIRECTION_METHOD_RANDOM;
00813               input->nestimates
00814                 = json_object_get_uint (object,
      LABEL_NESTIMATES, &error_code);
00815               if (error_code || !input->nestimates)
00816                 {
00817                   input_error (_("Invalid estimates number"));
00818                   goto exit_on_error;
00819                 }
00820             }
00821           else
```

```
00822             {
00823               input_error
00824                 (_("Unknown method to estimate the direction search"));
00825               goto exit_on_error;
00826             }
00827           input->relaxation
00828             = json_object_get_float_with_default (object,
      LABEL_RELAXATION,
00829                                                   DEFAULT_RELAXATION,
00830                                                   &error_code);
00831           if (error_code || input->relaxation < 0. || input->
      relaxation > 2.)
00832             {
00833               input_error (_("Invalid relaxation parameter"));
00834               goto exit_on_error;
00835             }
00836         }
00837       else
00838         input->nsteps = 0;
00839     }
00840   // Obtaining the threshold
00841   input->threshold
00842     = json_object_get_float_with_default (object,
      LABEL_THRESHOLD, 0.,
00843                                           &error_code);
00844   if (error_code)
00845     {
00846       input_error (_("Invalid threshold"));
00847       goto exit_on_error;
00848     }
00849
00850   // Reading the experimental data
00851   array = json_object_get_array_member (object, LABEL_EXPERIMENTS);
00852   n = json_array_get_length (array);
00853   input->experiment = (Experiment *) g_malloc (n * sizeof (
      Experiment));
00854   for (i = 0; i < n; ++i)
00855     {
00856 #if DEBUG_INPUT
00857       fprintf (stderr, "input_open_json: nexperiments=%u\n",
00858                input->nexperiments);
00859 #endif
00860       child = json_array_get_element (array, i);
00861       if (!input->nexperiments)
00862         {
00863           if (!experiment_open_json (input->experiment, child, 0))
00864             goto exit_on_error;
00865         }
00866       else
00867         {
00868           if (!experiment_open_json (input->experiment +
      input->nexperiments,
00869                                      child, input->experiment->
      ninputs))
00870             goto exit_on_error;
00871         }
00872       ++input->nexperiments;
00873 #if DEBUG_INPUT
00874       fprintf (stderr, "input_open_json: nexperiments=%u\n",
00875                input->nexperiments);
00876 #endif
00877     }
00878   if (!input->nexperiments)
00879     {
00880       input_error (_("No optimization experiments"));
00881       goto exit_on_error;
00882     }
00883
00884   // Reading the variables data
00885   array = json_object_get_array_member (object, LABEL_VARIABLES);
00886   n = json_array_get_length (array);
00887   input->variable = (Variable *) g_malloc (n * sizeof (
      Variable));
00888   for (i = 0; i < n; ++i)
00889     {
00890 #if DEBUG_INPUT
00891       fprintf (stderr, "input_open_json: nvariables=%u\n", input->
      nvariables);
00892 #endif
00893       child = json_array_get_element (array, i);
00894       if (!variable_open_json (input->variable +
      input->nvariables, child,
00895                                input->algorithm, input->
      nsteps))
00896         goto exit_on_error;
00897       ++input->nvariables;
00898     }
```

```
00899   if (!input->nvariables)
00900     {
00901       input_error (_("No optimization variables"));
00902       goto exit_on_error;
00903     }
00904
00905   // Obtaining the error norm
00906   if (json_object_get_member (object, LABEL_NORM))
00907     {
00908       buffer = json_object_get_string_member (object, LABEL_NORM);
00909       if (!strcmp (buffer, LABEL_EUCLIDIAN))
00910         input->norm = ERROR_NORM_EUCLIDIAN;
00911       else if (!strcmp (buffer, LABEL_MAXIMUM))
00912         input->norm = ERROR_NORM_MAXIMUM;
00913       else if (!strcmp (buffer, LABEL_P))
00914         {
00915           input->norm = ERROR_NORM_P;
00916           input->p = json_object_get_float (object,
      LABEL_P, &error_code);
00917           if (!error_code)
00918             {
00919               input_error (_("Bad P parameter"));
00920               goto exit_on_error;
00921             }
00922         }
00923       else if (!strcmp (buffer, LABEL_TAXICAB))
00924         input->norm = ERROR_NORM_TAXICAB;
00925       else
00926         {
00927           input_error (_("Unknown error norm"));
00928           goto exit_on_error;
00929         }
00930     }
00931   else
00932     input->norm = ERROR_NORM_EUCLIDIAN;
00933
00934   // Closing the JSON document
00935   g_object_unref (parser);
00936
00937 #if DEBUG_INPUT
00938   fprintf (stderr, "input_open_json: end\n");
00939 #endif
00940   return 1;
00941
00942 exit_on_error:
00943   g_object_unref (parser);
00944 #if DEBUG_INPUT
00945   fprintf (stderr, "input_open_json: end\n");
00946 #endif
00947   return 0;
00948 }
```

Here is the call graph for this function:



4.7.2.4 input_open_xml()

```
int input_open_xml (
              xmlDoc * doc )
```

Function to open the input file in XML format.

Parameters

doc	xmlDoc struct.

Returns

1_on_success, 0_on_error.

Definition at line 139 of file input.c.

```
00140 {
00141   char buffer2[64];
00142   xmlNode *node, *child;
00143   xmlChar *buffer;
00144   int error_code;
00145   unsigned int i;
00146
00147 #if DEBUG_INPUT
00148   fprintf (stderr, "input_open_xml: start\n");
00149 #endif
00150
00151   // Resetting input data
00152   buffer = NULL;
00153   input->type = INPUT_TYPE_XML;
00154
00155   // Getting the root node
00156 #if DEBUG_INPUT
00157   fprintf (stderr, "input_open_xml: getting the root node\n");
00158 #endif
00159   node = xmlDocGetRootElement (doc);
00160   if (xmlStrcmp (node->name, (const xmlChar *) LABEL_OPTIMIZE))
00161     {
00162       input_error (_("Bad root XML node"));
00163       goto exit_on_error;
00164     }
00165
00166   // Getting result and variables file names
00167   if (!input->result)
00168     {
00169       input->result =
00170         (char *) xmlGetProp (node, (const xmlChar *) LABEL_RESULT_FILE);
00171       if (!input->result)
00172         input->result = (char *) xmlStrdup ((const xmlChar *)
      result_name);
00173     }
00174 #if DEBUG_INPUT
00175   fprintf (stderr, "input_open_xml: result file=%s\n", input->result);
00176 #endif
00177   if (!input->variables)
00178     {
00179       input->variables =
00180         (char *) xmlGetProp (node, (const xmlChar *) LABEL_VARIABLES_FILE);
00181       if (!input->variables)
00182         input->variables =
00183           (char *) xmlStrdup ((const xmlChar *) variables_name);
00184     }
00185 #if DEBUG_INPUT
00186   fprintf (stderr, "input_open_xml: variables file=%s\n", input->variables);
00187 #endif
00188
00189   // Opening simulator program name
00190   input->simulator =
00191     (char *) xmlGetProp (node, (const xmlChar *) LABEL_SIMULATOR);
00192   if (!input->simulator)
00193     {
00194       input_error (_("Bad simulator program"));
00195       goto exit_on_error;
00196     }
00197
00198   // Opening evaluator program name
00199   input->evaluator =
00200     (char *) xmlGetProp (node, (const xmlChar *) LABEL_EVALUATOR);
00201
00202   // Obtaining pseudo-random numbers generator seed
00203   input->seed
00204     = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_SEED,
00205                                       DEFAULT_RANDOM_SEED, &error_code);
00206   if (error_code)
```

```
00207     {
00208       input_error (_("Bad pseudo-random numbers generator seed"));
00209       goto exit_on_error;
00210     }
00211
00212   // Opening algorithm
00213   buffer = xmlGetProp (node, (const xmlChar *) LABEL_ALGORITHM);
00214   if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MONTE_CARLO))
00215     {
00216       input->algorithm = ALGORITHM_MONTE_CARLO;
00217
00218       // Obtaining simulations number
00219       input->nsimulations
00220         = xml_node_get_int (node, (const xmlChar *)
      LABEL_NSIMULATIONS,
00221                             &error_code);
00222       if (error_code)
00223         {
00224           input_error (_("Bad simulations number"));
00225           goto exit_on_error;
00226         }
00227     }
00228   else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_SWEEP))
00229     input->algorithm = ALGORITHM_SWEEP;
00230   else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_GENETIC))
00231     {
00232       input->algorithm = ALGORITHM_GENETIC;
00233
00234       // Obtaining population
00235       if (xmlHasProp (node, (const xmlChar *) LABEL_NPOPULATION))
00236         {
00237           input->nsimulations
00238             = xml_node_get_uint (node, (const xmlChar *) LABEL_NPOPULATION,
00239                                  &error_code);
00240           if (error_code || input->nsimulations < 3)
00241             {
00242               input_error (_("Invalid population number"));
00243               goto exit_on_error;
00244             }
00245         }
00246       else
00247         {
00248           input_error (_("No population number"));
00249           goto exit_on_error;
00250         }
00251
00252       // Obtaining generations
00253       if (xmlHasProp (node, (const xmlChar *) LABEL_NGENERATIONS))
00254         {
00255           input->niterations
00256             = xml_node_get_uint (node, (const xmlChar *) LABEL_NGENERATIONS,
00257                                  &error_code);
00258           if (error_code || !input->niterations)
00259             {
00260               input_error (_("Invalid generations number"));
00261               goto exit_on_error;
00262             }
00263         }
00264       else
00265         {
00266           input_error (_("No generations number"));
00267           goto exit_on_error;
00268         }
00269
00270       // Obtaining mutation probability
00271       if (xmlHasProp (node, (const xmlChar *) LABEL_MUTATION))
00272         {
00273           input->mutation_ratio
00274             = xml_node_get_float (node, (const xmlChar *) LABEL_MUTATION,
00275                                   &error_code);
00276           if (error_code || input->mutation_ratio < 0.
00277               || input->mutation_ratio >= 1.)
00278             {
00279               input_error (_("Invalid mutation probability"));
00280               goto exit_on_error;
00281             }
00282         }
00283       else
00284         {
00285           input_error (_("No mutation probability"));
00286           goto exit_on_error;
00287         }
00288
00289       // Obtaining reproduction probability
00290       if (xmlHasProp (node, (const xmlChar *) LABEL_REPRODUCTION))
00291         {
00292           input->reproduction_ratio
```

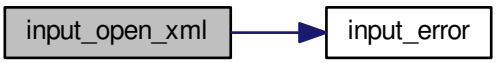
```
00293             = xml_node_get_float (node, (const xmlChar *) LABEL_REPRODUCTION,
00294                                   &error_code);
00295           if (error_code || input->reproduction_ratio < 0.
00296               || input->reproduction_ratio >= 1.0)
00297             {
00298               input_error (_("Invalid reproduction probability"));
00299               goto exit_on_error;
00300             }
00301         }
00302       else
00303         {
00304           input_error (_("No reproduction probability"));
00305           goto exit_on_error;
00306         }
00307
00308       // Obtaining adaptation probability
00309       if (xmlHasProp (node, (const xmlChar *) LABEL_ADAPTATION))
00310         {
00311           input->adaptation_ratio
00312             = xml_node_get_float (node, (const xmlChar *) LABEL_ADAPTATION,
00313                                   &error_code);
00314           if (error_code || input->adaptation_ratio < 0.
00315               || input->adaptation_ratio >= 1.)
00316             {
00317               input_error (_("Invalid adaptation probability"));
00318               goto exit_on_error;
00319             }
00320         }
00321       else
00322         {
00323           input_error (_("No adaptation probability"));
00324           goto exit_on_error;
00325         }
00326
00327       // Checking survivals
00328       i = input->mutation_ratio * input->nsimulations;
00329       i += input->reproduction_ratio * input->
      nsimulations;
00330       i += input->adaptation_ratio * input->
      nsimulations;
00331       if (i > input->nsimulations - 2)
00332         {
00333           input_error
00334             (_("No enough survival entities to reproduce the population"));
00335           goto exit_on_error;
00336         }
00337     }
00338   else
00339     {
00340       input_error (_("Unknown algorithm"));
00341       goto exit_on_error;
00342     }
00343   xmlFree (buffer);
00344   buffer = NULL;
00345
00346   if (input->algorithm == ALGORITHM_MONTE_CARLO
00347       || input->algorithm == ALGORITHM_SWEEP)
00348     {
00349
00350       // Obtaining iterations number
00351       input->niterations
00352         = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NITERATIONS,
00353                              &error_code);
00354       if (error_code == 1)
00355         input->niterations = 1;
00356       else if (error_code)
00357         {
00358           input_error (_("Bad iterations number"));
00359           goto exit_on_error;
00360         }
00361
00362       // Obtaining best number
00363       input->nbest
00364         = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_NBEST,
00365                                           1, &error_code);
00366       if (error_code || !input->nbest)
00367         {
00368           input_error (_("Invalid best number"));
00369           goto exit_on_error;
00370         }
00371       if (input->nbest > input->nsimulations)
00372         {
00373           input_error (_("Best number higher than simulations number"));
00374           goto exit_on_error;
00375         }
```

```
00376
00377       // Obtaining tolerance
00378       input->tolerance
00379         = xml_node_get_float_with_default (node,
00380                                            (const xmlChar *) LABEL_TOLERANCE,
00381                                            0., &error_code);
00382       if (error_code || input->tolerance < 0.)
00383         {
00384           input_error (_("Invalid tolerance"));
00385           goto exit_on_error;
00386         }
00387
00388       // Getting direction search method parameters
00389       if (xmlHasProp (node, (const xmlChar *) LABEL_NSTEPS))
00390         {
00391           input->nsteps =
00392             xml_node_get_uint (node, (const xmlChar *) LABEL_NSTEPS,
00393                                &error_code);
00394           if (error_code)
00395             {
00396               input_error (_("Invalid steps number"));
00397               goto exit_on_error;
00398             }
00399 #if DEBUG_INPUT
00400           fprintf (stderr, "input_open_xml: nsteps=%u\n", input->nsteps);
00401 #endif
00402           buffer = xmlGetProp (node, (const xmlChar *) LABEL_DIRECTION);
00403           if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_COORDINATES))
00404             input->direction = DIRECTION_METHOD_COORDINATES;
00405           else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_RANDOM))
00406             {
00407               input->direction = DIRECTION_METHOD_RANDOM;
00408               input->nestimates
00409                 = xml_node_get_uint (node, (const xmlChar *)
    LABEL_NESTIMATES,
00410                                      &error_code);
00411               if (error_code || !input->nestimates)
00412                 {
00413                   input_error (_("Invalid estimates number"));
00414                   goto exit_on_error;
00415                 }
00416             }
00417           else
00418             {
00419               input_error
00420                 (_("Unknown method to estimate the direction search"));
00421               goto exit_on_error;
00422             }
00423           xmlFree (buffer);
00424           buffer = NULL;
00425           input->relaxation
00426             = xml_node_get_float_with_default (node,
00427                                                (const xmlChar *)
00428                                                LABEL_RELAXATION,
00429                                                DEFAULT_RELAXATION, &error_code);
00430           if (error_code || input->relaxation < 0. || input->
    relaxation > 2.)
00431             {
00432               input_error (_("Invalid relaxation parameter"));
00433               goto exit_on_error;
00434             }
00435         }
00436       else
00437         input->nsteps = 0;
00438     }
00439   // Obtaining the threshold
00440   input->threshold =
00441     xml_node_get_float_with_default (node, (const xmlChar *)
    LABEL_THRESHOLD,
00442                                      0., &error_code);
00443   if (error_code)
00444     {
00445       input_error (_("Invalid threshold"));
00446       goto exit_on_error;
00447     }
00448
00449   // Reading the experimental data
00450   for (child = node->children; child; child = child->next)
00451     {
00452       if (xmlStrcmp (child->name, (const xmlChar *) LABEL_EXPERIMENT))
00453         break;
00454 #if DEBUG_INPUT
00455       fprintf (stderr, "input_open_xml: nexperiments=%u\n",
00456                input->nexperiments);
00457 #endif
00458       input->experiment = (Experiment *)
00459         g_realloc (input->experiment,
```

```
00460                   (1 + input->nexperiments) * sizeof (
      Experiment));
00461       if (!input->nexperiments)
00462         {
00463           if (!experiment_open_xml (input->experiment, child, 0))
00464             goto exit_on_error;
00465         }
00466       else
00467         {
00468           if (!experiment_open_xml (input->experiment +
      input->nexperiments,
00469                                     child, input->experiment->
      ninputs))
00470             goto exit_on_error;
00471         }
00472       ++input->nexperiments;
00473 #if DEBUG_INPUT
00474       fprintf (stderr, "input_open_xml: nexperiments=%u\n",
00475                input->nexperiments);
00476 #endif
00477     }
00478   if (!input->nexperiments)
00479     {
00480       input_error (_("No optimization experiments"));
00481       goto exit_on_error;
00482     }
00483   buffer = NULL;
00484
00485   // Reading the variables data
00486   for (; child; child = child->next)
00487     {
00488 #if DEBUG_INPUT
00489       fprintf (stderr, "input_open_xml: nvariables=%u\n", input->nvariables);
00490 #endif
00491       if (xmlStrcmp (child->name, (const xmlChar *) LABEL_VARIABLE))
00492         {
00493           snprintf (buffer2, 64, "%s %u: %s",
00494                     _("Variable"), input->nvariables + 1, _("bad XML node"));
00495           input_error (buffer2);
00496           goto exit_on_error;
00497         }
00498       input->variable = (Variable *)
00499         g_realloc (input->variable,
00500                    (1 + input->nvariables) * sizeof (Variable));
00501       if (!variable_open_xml (input->variable +
      input->nvariables, child,
00502                               input->algorithm, input->nsteps))
00503         goto exit_on_error;
00504       ++input->nvariables;
00505     }
00506   if (!input->nvariables)
00507     {
00508       input_error (_("No optimization variables"));
00509       goto exit_on_error;
00510     }
00511   buffer = NULL;
00512
00513   // Obtaining the error norm
00514   if (xmlHasProp (node, (const xmlChar *) LABEL_NORM))
00515     {
00516       buffer = xmlGetProp (node, (const xmlChar *) LABEL_NORM);
00517       if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_EUCLIDIAN))
00518         input->norm = ERROR_NORM_EUCLIDIAN;
00519       else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MAXIMUM))
00520         input->norm = ERROR_NORM_MAXIMUM;
00521       else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_P))
00522         {
00523           input->norm = ERROR_NORM_P;
00524           input->p
00525             = xml_node_get_float (node, (const xmlChar *) LABEL_P, &error_code);
00526           if (!error_code)
00527             {
00528               input_error (_("Bad P parameter"));
00529               goto exit_on_error;
00530             }
00531         }
00532       else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_TAXICAB))
00533         input->norm = ERROR_NORM_TAXICAB;
00534       else
00535         {
00536           input_error (_("Unknown error norm"));
00537           goto exit_on_error;
00538         }
00539       xmlFree (buffer);
00540     }
00541   else
00542     input->norm = ERROR_NORM_EUCLIDIAN;
```

```
00543
00544   // Closing the XML document
00545   xmlFreeDoc (doc);
00546
00547 #if DEBUG_INPUT
00548   fprintf (stderr, "input_open_xml: end\n");
00549 #endif
00550   return 1;
00551
00552 exit_on_error:
00553   xmlFree (buffer);
00554   xmlFreeDoc (doc);
00555 #if DEBUG_INPUT
00556   fprintf (stderr, "input_open_xml: end\n");
00557 #endif
00558   return 0;
00559 }
```

Here is the call graph for this function:



4.8 input.c

```
00001 /*
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
00007
00008 Copyright 2012-2017, AUTHORS.
00009
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00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #define _GNU_SOURCE
00039 #include "config.h"
00040 #include <stdio.h>
00041 #include <string.h>
00042 #include <libxml/parser.h>
00043 #include <libintl.h>
00044 #include <glib.h>
00045 #include <glib/gstdio.h>
00046 #include <json-glib/json-glib.h>
00047 #include "utils.h"
00048 #include "experiment.h"
```

```
00049 #include "variable.h"
00050 #include "input.h"
00051
00052 #define DEBUG_INPUT 0
00053
00054 Input input[1];
00055
00056 const char *result_name = "result";
00057 const char *variables_name = "variables";
00058
00063 void
00064 input_new ()
00065 {
00066 #if DEBUG_INPUT
00067   fprintf (stderr, "input_new: start\n");
00068 #endif
00069   input->nvariables = input->nexperiments = input->nsteps = 0;
00070   input->simulator = input->evaluator = input->directory = input->
      name = NULL;
00071   input->experiment = NULL;
00072   input->variable = NULL;
00073 #if DEBUG_INPUT
00074   fprintf (stderr, "input_new: end\n");
00075 #endif
00076 }
00077
00082 void
00083 input_free ()
00084 {
00085   unsigned int i;
00086 #if DEBUG_INPUT
00087   fprintf (stderr, "input_free: start\n");
00088 #endif
00089   g_free (input->name);
00090   g_free (input->directory);
00091   for (i = 0; i < input->nexperiments; ++i)
00092     experiment_free (input->experiment + i, input->type);
00093   for (i = 0; i < input->nvariables; ++i)
00094     variable_free (input->variable + i, input->type);
00095   g_free (input->experiment);
00096   g_free (input->variable);
00097   if (input->type == INPUT_TYPE_XML)
00098     {
00099       xmlFree (input->evaluator);
00100       xmlFree (input->simulator);
00101       xmlFree (input->result);
00102       xmlFree (input->variables);
00103     }
00104   else
00105     {
00106       g_free (input->evaluator);
00107       g_free (input->simulator);
00108       g_free (input->result);
00109       g_free (input->variables);
00110     }
00111   input->nexperiments = input->nvariables = input->nsteps = 0;
00112 #if DEBUG_INPUT
00113   fprintf (stderr, "input_free: end\n");
00114 #endif
00115 }
00116
00123 void
00124 input_error (char *message)
00125 {
00126   char buffer[64];
00127   snprintf (buffer, 64, "%s: %s\n", _("Input"), message);
00128   error_message = g_strdup (buffer);
00129 }
00130
00138 int
00139 input_open_xml (xmlDoc * doc)
00140 {
00141   char buffer2[64];
00142   xmlNode *node, *child;
00143   xmlChar *buffer;
00144   int error_code;
00145   unsigned int i;
00146
00147 #if DEBUG_INPUT
00148   fprintf (stderr, "input_open_xml: start\n");
00149 #endif
00150
00151   // Resetting input data
00152   buffer = NULL;
00153   input->type = INPUT_TYPE_XML;
00154
00155   // Getting the root node
```

```
00156 #if DEBUG_INPUT
00157   fprintf (stderr, "input_open_xml: getting the root node\n");
00158 #endif
00159   node = xmlDocGetRootElement (doc);
00160   if (xmlStrcmp (node->name, (const xmlChar *) LABEL_OPTIMIZE))
00161     {
00162       input_error (_("Bad root XML node"));
00163       goto exit_on_error;
00164     }
00165
00166   // Getting result and variables file names
00167   if (!input->result)
00168     {
00169       input->result =
00170         (char *) xmlGetProp (node, (const xmlChar *) LABEL_RESULT_FILE);
00171       if (!input->result)
00172         input->result = (char *) xmlStrdup ((const xmlChar *) result_name);
00173     }
00174 #if DEBUG_INPUT
00175   fprintf (stderr, "input_open_xml: result file=%s\n", input->result);
00176 #endif
00177   if (!input->variables)
00178     {
00179       input->variables =
00180         (char *) xmlGetProp (node, (const xmlChar *) LABEL_VARIABLES_FILE);
00181       if (!input->variables)
00182         input->variables =
00183           (char *) xmlStrdup ((const xmlChar *) variables_name);
00184     }
00185 #if DEBUG_INPUT
00186   fprintf (stderr, "input_open_xml: variables file=%s\n", input->variables);
00187 #endif
00188
00189   // Opening simulator program name
00190   input->simulator =
00191     (char *) xmlGetProp (node, (const xmlChar *) LABEL_SIMULATOR);
00192   if (!input->simulator)
00193     {
00194       input_error (_("Bad simulator program"));
00195       goto exit_on_error;
00196     }
00197
00198   // Opening evaluator program name
00199   input->evaluator =
00200     (char *) xmlGetProp (node, (const xmlChar *) LABEL_EVALUATOR);
00201
00202   // Obtaining pseudo-random numbers generator seed
00203   input->seed
00204     = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_SEED,
00205                                       DEFAULT_RANDOM_SEED, &error_code);
00206   if (error_code)
00207     {
00208       input_error (_("Bad pseudo-random numbers generator seed"));
00209       goto exit_on_error;
00210     }
00211
00212   // Opening algorithm
00213   buffer = xmlGetProp (node, (const xmlChar *) LABEL_ALGORITHM);
00214   if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MONTE_CARLO))
00215     {
00216       input->algorithm = ALGORITHM_MONTE_CARLO;
00217
00218       // Obtaining simulations number
00219       input->nsimulations
00220         = xml_node_get_int (node, (const xmlChar *)
      LABEL_NSIMULATIONS,
00221                             &error_code);
00222       if (error_code)
00223         {
00224           input_error (_("Bad simulations number"));
00225           goto exit_on_error;
00226         }
00227     }
00228   else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_SWEEP))
00229     input->algorithm = ALGORITHM_SWEEP;
00230   else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_GENETIC))
00231     {
00232       input->algorithm = ALGORITHM_GENETIC;
00233
00234       // Obtaining population
00235       if (xmlHasProp (node, (const xmlChar *) LABEL_NPOPULATION))
00236         {
00237           input->nsimulations
00238             = xml_node_get_uint (node, (const xmlChar *) LABEL_NPOPULATION,
00239                                  &error_code);
00240           if (error_code || input->nsimulations < 3)
```

```
00241             {
00242               input_error (_("Invalid population number"));
00243               goto exit_on_error;
00244             }
00245         }
00246       else
00247         {
00248           input_error (_("No population number"));
00249           goto exit_on_error;
00250         }
00251
00252       // Obtaining generations
00253       if (xmlHasProp (node, (const xmlChar *) LABEL_NGENERATIONS))
00254         {
00255           input->niterations
00256             = xml_node_get_uint (node, (const xmlChar *) LABEL_NGENERATIONS,
00257                                  &error_code);
00258           if (error_code || !input->niterations)
00259             {
00260               input_error (_("Invalid generations number"));
00261               goto exit_on_error;
00262             }
00263         }
00264       else
00265         {
00266           input_error (_("No generations number"));
00267           goto exit_on_error;
00268         }
00269
00270       // Obtaining mutation probability
00271       if (xmlHasProp (node, (const xmlChar *) LABEL_MUTATION))
00272         {
00273           input->mutation_ratio
00274             = xml_node_get_float (node, (const xmlChar *) LABEL_MUTATION,
00275                                   &error_code);
00276           if (error_code || input->mutation_ratio < 0.
00277               || input->mutation_ratio >= 1.)
00278             {
00279               input_error (_("Invalid mutation probability"));
00280               goto exit_on_error;
00281             }
00282         }
00283       else
00284         {
00285           input_error (_("No mutation probability"));
00286           goto exit_on_error;
00287         }
00288
00289       // Obtaining reproduction probability
00290       if (xmlHasProp (node, (const xmlChar *) LABEL_REPRODUCTION))
00291         {
00292           input->reproduction_ratio
00293             = xml_node_get_float (node, (const xmlChar *) LABEL_REPRODUCTION,
00294                                   &error_code);
00295           if (error_code || input->reproduction_ratio < 0.
00296               || input->reproduction_ratio >= 1.0)
00297             {
00298               input_error (_("Invalid reproduction probability"));
00299               goto exit_on_error;
00300             }
00301         }
00302       else
00303         {
00304           input_error (_("No reproduction probability"));
00305           goto exit_on_error;
00306         }
00307
00308       // Obtaining adaptation probability
00309       if (xmlHasProp (node, (const xmlChar *) LABEL_ADAPTATION))
00310         {
00311           input->adaptation_ratio
00312             = xml_node_get_float (node, (const xmlChar *) LABEL_ADAPTATION,
00313                                   &error_code);
00314           if (error_code || input->adaptation_ratio < 0.
00315               || input->adaptation_ratio >= 1.)
00316             {
00317               input_error (_("Invalid adaptation probability"));
00318               goto exit_on_error;
00319             }
00320         }
00321       else
00322         {
00323           input_error (_("No adaptation probability"));
00324           goto exit_on_error;
00325         }
00326
00327       // Checking survivals
```

```
00328       i = input->mutation_ratio * input->nsimulations;
00329       i += input->reproduction_ratio * input->nsimulations;
00330       i += input->adaptation_ratio * input->nsimulations;
00331       if (i > input->nsimulations - 2)
00332         {
00333           input_error
00334             (_("No enough survival entities to reproduce the population"));
00335           goto exit_on_error;
00336         }
00337     }
00338   else
00339     {
00340       input_error (_("Unknown algorithm"));
00341       goto exit_on_error;
00342     }
00343   xmlFree (buffer);
00344   buffer = NULL;
00345
00346   if (input->algorithm == ALGORITHM_MONTE_CARLO
00347       || input->algorithm == ALGORITHM_SWEEP)
00348     {
00349
00350       // Obtaining iterations number
00351       input->niterations
00352         = xml_node_get_uint (node, (const xmlChar *)
    LABEL_NITERATIONS,
00353                              &error_code);
00354       if (error_code == 1)
00355         input->niterations = 1;
00356       else if (error_code)
00357         {
00358           input_error (_("Bad iterations number"));
00359           goto exit_on_error;
00360         }
00361
00362       // Obtaining best number
00363       input->nbest
00364         = xml_node_get_uint_with_default (node, (const xmlChar *)
    LABEL_NBEST,
00365                                           1, &error_code);
00366       if (error_code || !input->nbest)
00367         {
00368           input_error (_("Invalid best number"));
00369           goto exit_on_error;
00370         }
00371       if (input->nbest > input->nsimulations)
00372         {
00373           input_error (_("Best number higher than simulations number"));
00374           goto exit_on_error;
00375         }
00376
00377       // Obtaining tolerance
00378       input->tolerance
00379         = xml_node_get_float_with_default (node,
00380                                            (const xmlChar *) LABEL_TOLERANCE,
00381                                            0., &error_code);
00382       if (error_code || input->tolerance < 0.)
00383         {
00384           input_error (_("Invalid tolerance"));
00385           goto exit_on_error;
00386         }
00387
00388       // Getting direction search method parameters
00389       if (xmlHasProp (node, (const xmlChar *) LABEL_NSTEPS))
00390         {
00391           input->nsteps =
00392             xml_node_get_uint (node, (const xmlChar *) LABEL_NSTEPS,
00393                                &error_code);
00394           if (error_code)
00395             {
00396               input_error (_("Invalid steps number"));
00397               goto exit_on_error;
00398             }
00399 #if DEBUG_INPUT
00400           fprintf (stderr, "input_open_xml: nsteps=%u\n", input->nsteps);
00401 #endif
00402           buffer = xmlGetProp (node, (const xmlChar *) LABEL_DIRECTION);
00403           if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_COORDINATES))
00404             input->direction = DIRECTION_METHOD_COORDINATES;
00405           else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_RANDOM))
00406             {
00407               input->direction = DIRECTION_METHOD_RANDOM;
00408               input->nestimates
00409                 = xml_node_get_uint (node, (const xmlChar *)
    LABEL_NESTIMATES,
00410                                      &error_code);
00411               if (error_code || !input->nestimates)
```

```
00412                 {
00413                   input_error (_("Invalid estimates number"));
00414                   goto exit_on_error;
00415                 }
00416             }
00417           else
00418             {
00419               input_error
00420                 (_("Unknown method to estimate the direction search"));
00421               goto exit_on_error;
00422             }
00423           xmlFree (buffer);
00424           buffer = NULL;
00425           input->relaxation
00426             = xml_node_get_float_with_default (node,
00427                                                (const xmlChar *)
00428                                                LABEL_RELAXATION,
00429                                                DEFAULT_RELAXATION, &error_code);
00430           if (error_code || input->relaxation < 0. || input->
      relaxation > 2.)
00431             {
00432               input_error (_("Invalid relaxation parameter"));
00433               goto exit_on_error;
00434             }
00435         }
00436       else
00437         input->nsteps = 0;
00438     }
00439   // Obtaining the threshold
00440   input->threshold =
00441     xml_node_get_float_with_default (node, (const xmlChar *)
      LABEL_THRESHOLD,
00442                                      0., &error_code);
00443   if (error_code)
00444     {
00445       input_error (_("Invalid threshold"));
00446       goto exit_on_error;
00447     }
00448
00449   // Reading the experimental data
00450   for (child = node->children; child; child = child->next)
00451     {
00452       if (xmlStrcmp (child->name, (const xmlChar *) LABEL_EXPERIMENT))
00453         break;
00454 #if DEBUG_INPUT
00455       fprintf (stderr, "input_open_xml: nexperiments=%u\n",
00456                input->nexperiments);
00457 #endif
00458       input->experiment = (Experiment *)
00459         g_realloc (input->experiment,
00460                    (1 + input->nexperiments) * sizeof (Experiment));
00461       if (!input->nexperiments)
00462         {
00463           if (!experiment_open_xml (input->experiment, child, 0))
00464             goto exit_on_error;
00465         }
00466       else
00467         {
00468           if (!experiment_open_xml (input->experiment + input->
      nexperiments,
00469                                     child, input->experiment->ninputs))
00470             goto exit_on_error;
00471         }
00472       ++input->nexperiments;
00473 #if DEBUG_INPUT
00474       fprintf (stderr, "input_open_xml: nexperiments=%u\n",
00475                input->nexperiments);
00476 #endif
00477     }
00478   if (!input->nexperiments)
00479     {
00480       input_error (_("No optimization experiments"));
00481       goto exit_on_error;
00482     }
00483   buffer = NULL;
00484
00485   // Reading the variables data
00486   for (; child; child = child->next)
00487     {
00488 #if DEBUG_INPUT
00489       fprintf (stderr, "input_open_xml: nvariables=%u\n", input->nvariables);
00490 #endif
00491       if (xmlStrcmp (child->name, (const xmlChar *) LABEL_VARIABLE))
00492         {
00493           snprintf (buffer2, 64, "%s %u: %s",
00494                     _("Variable"), input->nvariables + 1, _("bad XML node"));
00495           input_error (buffer2);
```

```
00496           goto exit_on_error;
00497         }
00498       input->variable = (Variable *)
00499         g_realloc (input->variable,
00500                    (1 + input->nvariables) * sizeof (Variable));
00501       if (!variable_open_xml (input->variable + input->
    nvariables, child,
00502                               input->algorithm, input->nsteps))
00503         goto exit_on_error;
00504       ++input->nvariables;
00505     }
00506   if (!input->nvariables)
00507     {
00508       input_error (_("No optimization variables"));
00509       goto exit_on_error;
00510     }
00511   buffer = NULL;
00512
00513   // Obtaining the error norm
00514   if (xmlHasProp (node, (const xmlChar *) LABEL_NORM))
00515     {
00516       buffer = xmlGetProp (node, (const xmlChar *) LABEL_NORM);
00517       if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_EUCLIDIAN))
00518         input->norm = ERROR_NORM_EUCLIDIAN;
00519       else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MAXIMUM))
00520         input->norm = ERROR_NORM_MAXIMUM;
00521       else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_P))
00522         {
00523           input->norm = ERROR_NORM_P;
00524           input->p
00525             = xml_node_get_float (node, (const xmlChar *) LABEL_P, &error_code);
00526           if (!error_code)
00527             {
00528               input_error (_("Bad P parameter"));
00529               goto exit_on_error;
00530             }
00531         }
00532       else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_TAXICAB))
00533         input->norm = ERROR_NORM_TAXICAB;
00534       else
00535         {
00536           input_error (_("Unknown error norm"));
00537           goto exit_on_error;
00538         }
00539       xmlFree (buffer);
00540     }
00541   else
00542     input->norm = ERROR_NORM_EUCLIDIAN;
00543
00544   // Closing the XML document
00545   xmlFreeDoc (doc);
00546
00547 #if DEBUG_INPUT
00548   fprintf (stderr, "input_open_xml: end\n");
00549 #endif
00550   return 1;
00551
00552 exit_on_error:
00553   xmlFree (buffer);
00554   xmlFreeDoc (doc);
00555 #if DEBUG_INPUT
00556   fprintf (stderr, "input_open_xml: end\n");
00557 #endif
00558   return 0;
00559 }
00560
00568 int
00569 input_open_json (JsonParser * parser)
00570 {
00571   JsonNode *node, *child;
00572   JsonObject *object;
00573   JsonArray *array;
00574   const char *buffer;
00575   int error_code;
00576   unsigned int i, n;
00577
00578 #if DEBUG_INPUT
00579   fprintf (stderr, "input_open_json: start\n");
00580 #endif
00581
00582   // Resetting input data
00583   input->type = INPUT_TYPE_JSON;
00584
00585   // Getting the root node
00586 #if DEBUG_INPUT
00587   fprintf (stderr, "input_open_json: getting the root node\n");
00588 #endif
```

```
00589   node = json_parser_get_root (parser);
00590   object = json_node_get_object (node);
00591
00592   // Getting result and variables file names
00593   if (!input->result)
00594     {
00595       buffer = json_object_get_string_member (object, LABEL_RESULT_FILE);
00596       if (!buffer)
00597         buffer = result_name;
00598       input->result = g_strdup (buffer);
00599     }
00600   else
00601     input->result = g_strdup (result_name);
00602   if (!input->variables)
00603     {
00604       buffer = json_object_get_string_member (object, LABEL_VARIABLES_FILE);
00605       if (!buffer)
00606         buffer = variables_name;
00607       input->variables = g_strdup (buffer);
00608     }
00609   else
00610     input->variables = g_strdup (variables_name);
00611
00612   // Opening simulator program name
00613   buffer = json_object_get_string_member (object, LABEL_SIMULATOR);
00614   if (!buffer)
00615     {
00616       input_error (_("Bad simulator program"));
00617       goto exit_on_error;
00618     }
00619   input->simulator = g_strdup (buffer);
00620
00621   // Opening evaluator program name
00622   buffer = json_object_get_string_member (object, LABEL_EVALUATOR);
00623   if (buffer)
00624     input->evaluator = g_strdup (buffer);
00625
00626   // Obtaining pseudo-random numbers generator seed
00627   input->seed
00628     = json_object_get_uint_with_default (object,
      LABEL_SEED,
00629                                          DEFAULT_RANDOM_SEED, &error_code);
00630   if (error_code)
00631     {
00632       input_error (_("Bad pseudo-random numbers generator seed"));
00633       goto exit_on_error;
00634     }
00635
00636   // Opening algorithm
00637   buffer = json_object_get_string_member (object, LABEL_ALGORITHM);
00638   if (!strcmp (buffer, LABEL_MONTE_CARLO))
00639     {
00640       input->algorithm = ALGORITHM_MONTE_CARLO;
00641
00642       // Obtaining simulations number
00643       input->nsimulations
00644         = json_object_get_int (object, LABEL_NSIMULATIONS, &error_code
      );
00645       if (error_code)
00646         {
00647           input_error (_("Bad simulations number"));
00648           goto exit_on_error;
00649         }
00650     }
00651   else if (!strcmp (buffer, LABEL_SWEEP))
00652     input->algorithm = ALGORITHM_SWEEP;
00653   else if (!strcmp (buffer, LABEL_GENETIC))
00654     {
00655       input->algorithm = ALGORITHM_GENETIC;
00656
00657       // Obtaining population
00658       if (json_object_get_member (object, LABEL_NPOPULATION))
00659         {
00660           input->nsimulations
00661             = json_object_get_uint (object,
      LABEL_NPOPULATION, &error_code);
00662           if (error_code || input->nsimulations < 3)
00663             {
00664               input_error (_("Invalid population number"));
00665               goto exit_on_error;
00666             }
00667         }
00668       else
00669         {
00670           input_error (_("No population number"));
00671           goto exit_on_error;
00672         }
```

```
00673
00674       // Obtaining generations
00675       if (json_object_get_member (object, LABEL_NGENERATIONS))
00676         {
00677           input->niterations
00678             = json_object_get_uint (object,
      LABEL_NGENERATIONS, &error_code);
00679           if (error_code || !input->niterations)
00680             {
00681               input_error (_("Invalid generations number"));
00682               goto exit_on_error;
00683             }
00684         }
00685       else
00686         {
00687           input_error (_("No generations number"));
00688           goto exit_on_error;
00689         }
00690
00691       // Obtaining mutation probability
00692       if (json_object_get_member (object, LABEL_MUTATION))
00693         {
00694           input->mutation_ratio
00695             = json_object_get_float (object, LABEL_MUTATION, &error_code
      );
00696           if (error_code || input->mutation_ratio < 0.
00697               || input->mutation_ratio >= 1.)
00698             {
00699               input_error (_("Invalid mutation probability"));
00700               goto exit_on_error;
00701             }
00702         }
00703       else
00704         {
00705           input_error (_("No mutation probability"));
00706           goto exit_on_error;
00707         }
00708
00709       // Obtaining reproduction probability
00710       if (json_object_get_member (object, LABEL_REPRODUCTION))
00711         {
00712           input->reproduction_ratio
00713             = json_object_get_float (object,
      LABEL_REPRODUCTION, &error_code);
00714           if (error_code || input->reproduction_ratio < 0.
00715               || input->reproduction_ratio >= 1.0)
00716             {
00717               input_error (_("Invalid reproduction probability"));
00718               goto exit_on_error;
00719             }
00720         }
00721       else
00722         {
00723           input_error (_("No reproduction probability"));
00724           goto exit_on_error;
00725         }
00726
00727       // Obtaining adaptation probability
00728       if (json_object_get_member (object, LABEL_ADAPTATION))
00729         {
00730           input->adaptation_ratio
00731             = json_object_get_float (object,
      LABEL_ADAPTATION, &error_code);
00732           if (error_code || input->adaptation_ratio < 0.
00733               || input->adaptation_ratio >= 1.)
00734             {
00735               input_error (_("Invalid adaptation probability"));
00736               goto exit_on_error;
00737             }
00738         }
00739       else
00740         {
00741           input_error (_("No adaptation probability"));
00742           goto exit_on_error;
00743         }
00744
00745       // Checking survivals
00746       i = input->mutation_ratio * input->nsimulations;
00747       i += input->reproduction_ratio * input->nsimulations;
00748       i += input->adaptation_ratio * input->nsimulations;
00749       if (i > input->nsimulations - 2)
00750         {
00751           input_error
00752             (_("No enough survival entities to reproduce the population"));
00753           goto exit_on_error;
00754         }
00755     }
```

```
00756   else
00757     {
00758       input_error (_("Unknown algorithm"));
00759       goto exit_on_error;
00760     }
00761
00762   if (input->algorithm == ALGORITHM_MONTE_CARLO
00763       || input->algorithm == ALGORITHM_SWEEP)
00764     {
00765
00766       // Obtaining iterations number
00767       input->niterations
00768         = json_object_get_uint (object, LABEL_NITERATIONS, &error_code
      );
00769       if (error_code == 1)
00770         input->niterations = 1;
00771       else if (error_code)
00772         {
00773           input_error (_("Bad iterations number"));
00774           goto exit_on_error;
00775         }
00776
00777       // Obtaining best number
00778       input->nbest
00779         = json_object_get_uint_with_default (object,
      LABEL_NBEST, 1,
00780                                              &error_code);
00781       if (error_code || !input->nbest)
00782         {
00783           input_error (_("Invalid best number"));
00784           goto exit_on_error;
00785         }
00786
00787       // Obtaining tolerance
00788       input->tolerance
00789         = json_object_get_float_with_default (object,
      LABEL_TOLERANCE, 0.,
00790                                               &error_code);
00791       if (error_code || input->tolerance < 0.)
00792         {
00793           input_error (_("Invalid tolerance"));
00794           goto exit_on_error;
00795         }
00796
00797       // Getting direction search method parameters
00798       if (json_object_get_member (object, LABEL_NSTEPS))
00799         {
00800           input->nsteps
00801             = json_object_get_uint (object, LABEL_NSTEPS, &error_code);
00802           if (error_code)
00803             {
00804               input_error (_("Invalid steps number"));
00805               goto exit_on_error;
00806             }
00807           buffer = json_object_get_string_member (object, LABEL_DIRECTION);
00808           if (!strcmp (buffer, LABEL_COORDINATES))
00809             input->direction = DIRECTION_METHOD_COORDINATES;
00810           else if (!strcmp (buffer, LABEL_RANDOM))
00811             {
00812               input->direction = DIRECTION_METHOD_RANDOM;
00813               input->nestimates
00814                 = json_object_get_uint (object,
      LABEL_NESTIMATES, &error_code);
00815               if (error_code || !input->nestimates)
00816                 {
00817                   input_error (_("Invalid estimates number"));
00818                   goto exit_on_error;
00819                 }
00820             }
00821           else
00822             {
00823               input_error
00824                 (_("Unknown method to estimate the direction search"));
00825               goto exit_on_error;
00826             }
00827           input->relaxation
00828             = json_object_get_float_with_default (object,
      LABEL_RELAXATION,
00829                                                   DEFAULT_RELAXATION,
00830                                                   &error_code);
00831           if (error_code || input->relaxation < 0. || input->
      relaxation > 2.)
00832             {
00833               input_error (_("Invalid relaxation parameter"));
00834               goto exit_on_error;
00835             }
00836         }
```

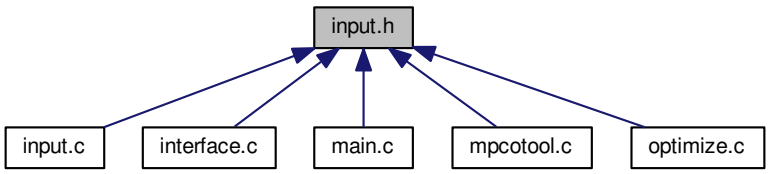
```
00837       else
00838         input->nsteps = 0;
00839     }
00840   // Obtaining the threshold
00841   input->threshold
00842     = json_object_get_float_with_default (object,
      LABEL_THRESHOLD, 0.,
00843                                           &error_code);
00844   if (error_code)
00845     {
00846       input_error (_("Invalid threshold"));
00847       goto exit_on_error;
00848     }
00849
00850   // Reading the experimental data
00851   array = json_object_get_array_member (object, LABEL_EXPERIMENTS);
00852   n = json_array_get_length (array);
00853   input->experiment = (Experiment *) g_malloc (n * sizeof (
      Experiment));
00854   for (i = 0; i < n; ++i)
00855     {
00856 #if DEBUG_INPUT
00857       fprintf (stderr, "input_open_json: nexperiments=%u\n",
00858                input->nexperiments);
00859 #endif
00860       child = json_array_get_element (array, i);
00861       if (!input->nexperiments)
00862         {
00863           if (!experiment_open_json (input->experiment, child, 0))
00864             goto exit_on_error;
00865         }
00866       else
00867         {
00868           if (!experiment_open_json (input->experiment + input->
      nexperiments,
00869                                      child, input->experiment->ninputs))
00870             goto exit_on_error;
00871         }
00872       ++input->nexperiments;
00873 #if DEBUG_INPUT
00874       fprintf (stderr, "input_open_json: nexperiments=%u\n",
00875                input->nexperiments);
00876 #endif
00877     }
00878   if (!input->nexperiments)
00879     {
00880       input_error (_("No optimization experiments"));
00881       goto exit_on_error;
00882     }
00883
00884   // Reading the variables data
00885   array = json_object_get_array_member (object, LABEL_VARIABLES);
00886   n = json_array_get_length (array);
00887   input->variable = (Variable *) g_malloc (n * sizeof (Variable));
00888   for (i = 0; i < n; ++i)
00889     {
00890 #if DEBUG_INPUT
00891       fprintf (stderr, "input_open_json: nvariables=%u\n", input->nvariables);
00892 #endif
00893       child = json_array_get_element (array, i);
00894       if (!variable_open_json (input->variable + input->
      nvariables, child,
00895                                input->algorithm, input->nsteps))
00896         goto exit_on_error;
00897       ++input->nvariables;
00898     }
00899   if (!input->nvariables)
00900     {
00901       input_error (_("No optimization variables"));
00902       goto exit_on_error;
00903     }
00904
00905   // Obtaining the error norm
00906   if (json_object_get_member (object, LABEL_NORM))
00907     {
00908       buffer = json_object_get_string_member (object, LABEL_NORM);
00909       if (!strcmp (buffer, LABEL_EUCLIDIAN))
00910         input->norm = ERROR_NORM_EUCLIDIAN;
00911       else if (!strcmp (buffer, LABEL_MAXIMUM))
00912         input->norm = ERROR_NORM_MAXIMUM;
00913       else if (!strcmp (buffer, LABEL_P))
00914         {
00915           input->norm = ERROR_NORM_P;
00916           input->p = json_object_get_float (object,
      LABEL_P, &error_code);
00917           if (!error_code)
00918             {
```

```
00919               input_error (_("Bad P parameter"));
00920               goto exit_on_error;
00921             }
00922         }
00923       else if (!strcmp (buffer, LABEL_TAXICAB))
00924         input->norm = ERROR_NORM_TAXICAB;
00925       else
00926         {
00927           input_error (_("Unknown error norm"));
00928           goto exit_on_error;
00929         }
00930     }
00931   else
00932     input->norm = ERROR_NORM_EUCLIDIAN;
00933
00934   // Closing the JSON document
00935   g_object_unref (parser);
00936
00937 #if DEBUG_INPUT
00938   fprintf (stderr, "input_open_json: end\n");
00939 #endif
00940   return 1;
00941
00942 exit_on_error:
00943   g_object_unref (parser);
00944 #if DEBUG_INPUT
00945   fprintf (stderr, "input_open_json: end\n");
00946 #endif
00947   return 0;
00948 }
00949
00957 int
00958 input_open (char *filename)
00959 {
00960   xmlDoc *doc;
00961   JsonParser *parser;
00962
00963 #if DEBUG_INPUT
00964   fprintf (stderr, "input_open: start\n");
00965 #endif
00966
00967   // Resetting input data
00968   input_new ();
00969
00970   // Opening input file
00971 #if DEBUG_INPUT
00972   fprintf (stderr, "input_open: opening the input file %s\n", filename);
00973   fprintf (stderr, "input_open: trying XML format\n");
00974 #endif
00975   doc = xmlParseFile (filename);
00976   if (!doc)
00977     {
00978 #if DEBUG_INPUT
00979       fprintf (stderr, "input_open: trying JSON format\n");
00980 #endif
00981       parser = json_parser_new ();
00982       if (!json_parser_load_from_file (parser, filename, NULL))
00983         {
00984           input_error (_("Unable to parse the input file"));
00985           goto exit_on_error;
00986         }
00987       if (!input_open_json (parser))
00988         goto exit_on_error;
00989     }
00990   else if (!input_open_xml (doc))
00991     goto exit_on_error;
00992
00993   // Getting the working directory
00994   input->directory = g_path_get_dirname (filename);
00995   input->name = g_path_get_basename (filename);
00996
00997 #if DEBUG_INPUT
00998   fprintf (stderr, "input_open: end\n");
00999 #endif
01000   return 1;
01001
01002 exit_on_error:
01003   show_error (error_message);
01004   g_free (error_message);
01005   input_free ();
01006 #if DEBUG_INPUT
01007   fprintf (stderr, "input_open: end\n");
01008 #endif
01009   return 0;
01010 }
```

4.9 input.h File Reference

Header file to define the input functions.

This graph shows which files directly or indirectly include this file:



Data Structures

- struct Input

  Struct to define the optimization input file.

Enumerations

- enum DirectionMethod { DIRECTION_METHOD_COORDINATES = 0, DIRECTION_METHOD_RANDOM = 1 }

  Enum to define the methods to estimate the direction search.
- enum ErrorNorm { ERROR_NORM_EUCLIDIAN = 0, ERROR_NORM_MAXIMUM = 1, ERROR_NORM_P = 2, ERROR_NORM_TAXICAB = 3 }

  Enum to define the error norm.

Functions

- void input_new ()

  Function to create a new Input struct.
- void input_free ()

  Function to free the memory of the input file data.
- void input_error (char *message)

  Function to print an error message opening an Input struct.
- int input_open_xml (xmlDoc *doc)

  Function to open the input file in XML format.
- int input_open_json (JsonParser *parser)

  Function to open the input file in JSON format.
- int input_open (char *filename)

  Function to open the input file.

Variables

- Input input [1]

  Global Input struct to set the input data.
- const char * result_name

  Name of the result file.
- const char * variables_name

  Name of the variables file.

4.9.1 Detailed Description

Header file to define the input functions.

Authors

Javier Burguete.

Copyright

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Definition in file input.h.

4.9.2 Enumeration Type Documentation

4.9.2.1 DirectionMethod

```
enum DirectionMethod
```

Enum to define the methods to estimate the direction search.

Enumerator

DIRECTION_METHOD_COORDINATES	Coordinates descent method.
DIRECTION_METHOD_RANDOM	Random method.

Definition at line 45 of file input.h.

```
00046 {
00047   DIRECTION_METHOD_COORDINATES = 0,
00048   DIRECTION_METHOD_RANDOM = 1,
00049 };
```

4.9.2.2 ErrorNorm

```
enum ErrorNorm
```

Enum to define the error norm.

Enumerator

ERROR_NORM_EUCLIDIAN	Euclidian norm: $\sqrt{\sum_i (w_i\,x_i)^2}$.
ERROR_NORM_MAXIMUM	Maximum norm: $\max_i \lvert w_i\,x_i\rvert$.
ERROR_NORM_P	P-norm $\sqrt[p]{\sum_i \lvert w_i\,x_i\rvert^p}$.
ERROR_NORM_TAXICAB	Taxicab norm $\sum_i \lvert w_i\,x_i\rvert$.

Definition at line 55 of file input.h.

```
00056 {
00057   ERROR_NORM_EUCLIDIAN = 0,
00059   ERROR_NORM_MAXIMUM = 1,
00061   ERROR_NORM_P = 2,
00063   ERROR_NORM_TAXICAB = 3
00065 };
```

4.9.3 Function Documentation

4.9.3.1 input_error()

```
void input_error (
            char * message )
```

Function to print an error message opening an Input struct.

Parameters

message	Error message.

Definition at line 124 of file input.c.

```
00125 {
00126   char buffer[64];
00127   snprintf (buffer, 64, "%s: %s\n", _("Input"), message);
00128   error_message = g_strdup (buffer);
00129 }
```

4.9.3.2 input_open()

```
int input_open (
            char * filename )
```

Function to open the input file.

Parameters

filename	Input data file name.

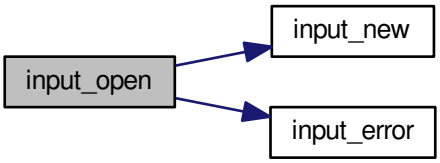
Returns

1_on_success, 0_on_error.

Definition at line 958 of file input.c.

```
00959 {
00960   xmlDoc *doc;
00961   JsonParser *parser;
00962
00963 #if DEBUG_INPUT
00964   fprintf (stderr, "input_open: start\n");
00965 #endif
00966
00967   // Resetting input data
00968   input_new ();
00969
00970   // Opening input file
00971 #if DEBUG_INPUT
00972   fprintf (stderr, "input_open: opening the input file %s\n", filename);
00973   fprintf (stderr, "input_open: trying XML format\n");
00974 #endif
00975   doc = xmlParseFile (filename);
00976   if (!doc)
00977     {
00978 #if DEBUG_INPUT
00979       fprintf (stderr, "input_open: trying JSON format\n");
00980 #endif
00981       parser = json_parser_new ();
00982       if (!json_parser_load_from_file (parser, filename, NULL))
00983         {
00984           input_error (_("Unable to parse the input file"));
00985           goto exit_on_error;
00986         }
00987       if (!input_open_json (parser))
00988         goto exit_on_error;
00989     }
00990   else if (!input_open_xml (doc))
00991     goto exit_on_error;
00992
00993   // Getting the working directory
00994   input->directory = g_path_get_dirname (filename);
00995   input->name = g_path_get_basename (filename);
00996
00997 #if DEBUG_INPUT
00998   fprintf (stderr, "input_open: end\n");
00999 #endif
01000   return 1;
01001
01002 exit_on_error:
01003   show_error (error_message);
01004   g_free (error_message);
01005   input_free ();
01006 #if DEBUG_INPUT
01007   fprintf (stderr, "input_open: end\n");
01008 #endif
01009   return 0;
01010 }
```

Here is the call graph for this function:



4.9.3.3 input_open_json()

```
int input_open_json (
            JsonParser * parser )
```

Function to open the input file in JSON format.

Parameters

parser	JsonParser struct.

Returns

1_on_success, 0_on_error.

Definition at line 569 of file input.c.

```
00570 {
00571   JsonNode *node, *child;
00572   JsonObject *object;
00573   JsonArray *array;
00574   const char *buffer;
00575   int error_code;
00576   unsigned int i, n;
00577
00578 #if DEBUG_INPUT
00579   fprintf (stderr, "input_open_json: start\n");
00580 #endif
00581
00582   // Resetting input data
00583   input->type = INPUT_TYPE_JSON;
00584
00585   // Getting the root node
00586 #if DEBUG_INPUT
00587   fprintf (stderr, "input_open_json: getting the root node\n");
00588 #endif
00589   node = json_parser_get_root (parser);
00590   object = json_node_get_object (node);
00591
00592   // Getting result and variables file names
00593   if (!input->result)
00594     {
00595       buffer = json_object_get_string_member (object, LABEL_RESULT_FILE);
00596       if (!buffer)
```

```
00597         buffer = result_name;
00598       input->result = g_strdup (buffer);
00599     }
00600   else
00601     input->result = g_strdup (result_name);
00602   if (!input->variables)
00603     {
00604       buffer = json_object_get_string_member (object, LABEL_VARIABLES_FILE);
00605       if (!buffer)
00606         buffer = variables_name;
00607       input->variables = g_strdup (buffer);
00608     }
00609   else
00610     input->variables = g_strdup (variables_name);
00611
00612   // Opening simulator program name
00613   buffer = json_object_get_string_member (object, LABEL_SIMULATOR);
00614   if (!buffer)
00615     {
00616       input_error (_("Bad simulator program"));
00617       goto exit_on_error;
00618     }
00619   input->simulator = g_strdup (buffer);
00620
00621   // Opening evaluator program name
00622   buffer = json_object_get_string_member (object, LABEL_EVALUATOR);
00623   if (buffer)
00624     input->evaluator = g_strdup (buffer);
00625
00626   // Obtaining pseudo-random numbers generator seed
00627   input->seed
00628     = json_object_get_uint_with_default (object,
      LABEL_SEED,
00629                                          DEFAULT_RANDOM_SEED, &error_code);
00630   if (error_code)
00631     {
00632       input_error (_("Bad pseudo-random numbers generator seed"));
00633       goto exit_on_error;
00634     }
00635
00636   // Opening algorithm
00637   buffer = json_object_get_string_member (object, LABEL_ALGORITHM);
00638   if (!strcmp (buffer, LABEL_MONTE_CARLO))
00639     {
00640       input->algorithm = ALGORITHM_MONTE_CARLO;
00641
00642       // Obtaining simulations number
00643       input->nsimulations
00644         = json_object_get_int (object, LABEL_NSIMULATIONS, &error_code
      );
00645       if (error_code)
00646         {
00647           input_error (_("Bad simulations number"));
00648           goto exit_on_error;
00649         }
00650     }
00651   else if (!strcmp (buffer, LABEL_SWEEP))
00652     input->algorithm = ALGORITHM_SWEEP;
00653   else if (!strcmp (buffer, LABEL_GENETIC))
00654     {
00655       input->algorithm = ALGORITHM_GENETIC;
00656
00657       // Obtaining population
00658       if (json_object_get_member (object, LABEL_NPOPULATION))
00659         {
00660           input->nsimulations
00661             = json_object_get_uint (object,
      LABEL_NPOPULATION, &error_code);
00662           if (error_code || input->nsimulations < 3)
00663             {
00664               input_error (_("Invalid population number"));
00665               goto exit_on_error;
00666             }
00667         }
00668       else
00669         {
00670           input_error (_("No population number"));
00671           goto exit_on_error;
00672         }
00673
00674       // Obtaining generations
00675       if (json_object_get_member (object, LABEL_NGENERATIONS))
00676         {
00677           input->niterations
00678             = json_object_get_uint (object,
      LABEL_NGENERATIONS, &error_code);
00679           if (error_code || !input->niterations)
```

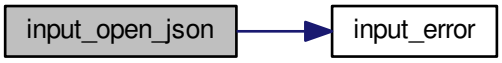
```
00680             {
00681               input_error (_("Invalid generations number"));
00682               goto exit_on_error;
00683             }
00684         }
00685       else
00686         {
00687           input_error (_("No generations number"));
00688           goto exit_on_error;
00689         }
00690
00691       // Obtaining mutation probability
00692       if (json_object_get_member (object, LABEL_MUTATION))
00693         {
00694           input->mutation_ratio
00695             = json_object_get_float (object, LABEL_MUTATION, &error_code
      );
00696           if (error_code || input->mutation_ratio < 0.
00697               || input->mutation_ratio >= 1.)
00698             {
00699               input_error (_("Invalid mutation probability"));
00700               goto exit_on_error;
00701             }
00702         }
00703       else
00704         {
00705           input_error (_("No mutation probability"));
00706           goto exit_on_error;
00707         }
00708
00709       // Obtaining reproduction probability
00710       if (json_object_get_member (object, LABEL_REPRODUCTION))
00711         {
00712           input->reproduction_ratio
00713             = json_object_get_float (object,
      LABEL_REPRODUCTION, &error_code);
00714           if (error_code || input->reproduction_ratio < 0.
00715               || input->reproduction_ratio >= 1.0)
00716             {
00717               input_error (_("Invalid reproduction probability"));
00718               goto exit_on_error;
00719             }
00720         }
00721       else
00722         {
00723           input_error (_("No reproduction probability"));
00724           goto exit_on_error;
00725         }
00726
00727       // Obtaining adaptation probability
00728       if (json_object_get_member (object, LABEL_ADAPTATION))
00729         {
00730           input->adaptation_ratio
00731             = json_object_get_float (object,
      LABEL_ADAPTATION, &error_code);
00732           if (error_code || input->adaptation_ratio < 0.
00733               || input->adaptation_ratio >= 1.)
00734             {
00735               input_error (_("Invalid adaptation probability"));
00736               goto exit_on_error;
00737             }
00738         }
00739       else
00740         {
00741           input_error (_("No adaptation probability"));
00742           goto exit_on_error;
00743         }
00744
00745       // Checking survivals
00746       i = input->mutation_ratio * input->nsimulations;
00747       i += input->reproduction_ratio * input->
      nsimulations;
00748       i += input->adaptation_ratio * input->
      nsimulations;
00749       if (i > input->nsimulations - 2)
00750         {
00751           input_error
00752             (_("No enough survival entities to reproduce the population"));
00753           goto exit_on_error;
00754         }
00755     }
00756   else
00757     {
00758       input_error (_("Unknown algorithm"));
00759       goto exit_on_error;
00760     }
00761
```

```
00762   if (input->algorithm == ALGORITHM_MONTE_CARLO
00763       || input->algorithm == ALGORITHM_SWEEP)
00764     {
00765
00766       // Obtaining iterations number
00767       input->niterations
00768         = json_object_get_uint (object, LABEL_NITERATIONS, &error_code
      );
00769       if (error_code == 1)
00770         input->niterations = 1;
00771       else if (error_code)
00772         {
00773           input_error (_("Bad iterations number"));
00774           goto exit_on_error;
00775         }
00776
00777       // Obtaining best number
00778       input->nbest
00779         = json_object_get_uint_with_default (object,
      LABEL_NBEST, 1,
00780                                              &error_code);
00781       if (error_code || !input->nbest)
00782         {
00783           input_error (_("Invalid best number"));
00784           goto exit_on_error;
00785         }
00786
00787       // Obtaining tolerance
00788       input->tolerance
00789         = json_object_get_float_with_default (object,
      LABEL_TOLERANCE, 0.,
00790                                             &error_code);
00791       if (error_code || input->tolerance < 0.)
00792         {
00793           input_error (_("Invalid tolerance"));
00794           goto exit_on_error;
00795         }
00796
00797       // Getting direction search method parameters
00798       if (json_object_get_member (object, LABEL_NSTEPS))
00799         {
00800           input->nsteps
00801             = json_object_get_uint (object, LABEL_NSTEPS, &error_code);
00802           if (error_code)
00803             {
00804               input_error (_("Invalid steps number"));
00805               goto exit_on_error;
00806             }
00807           buffer = json_object_get_string_member (object, LABEL_DIRECTION);
00808           if (!strcmp (buffer, LABEL_COORDINATES))
00809             input->direction = DIRECTION_METHOD_COORDINATES;
00810           else if (!strcmp (buffer, LABEL_RANDOM))
00811             {
00812               input->direction = DIRECTION_METHOD_RANDOM;
00813               input->nestimates
00814                 = json_object_get_uint (object,
      LABEL_NESTIMATES, &error_code);
00815               if (error_code || !input->nestimates)
00816                 {
00817                   input_error (_("Invalid estimates number"));
00818                   goto exit_on_error;
00819                 }
00820             }
00821           else
00822             {
00823               input_error
00824                 (_("Unknown method to estimate the direction search"));
00825               goto exit_on_error;
00826             }
00827           input->relaxation
00828             = json_object_get_float_with_default (object,
      LABEL_RELAXATION,
00829                                                   DEFAULT_RELAXATION,
00830                                                   &error_code);
00831           if (error_code || input->relaxation < 0. || input->
      relaxation > 2.)
00832             {
00833               input_error (_("Invalid relaxation parameter"));
00834               goto exit_on_error;
00835             }
00836         }
00837       else
00838         input->nsteps = 0;
00839     }
00840   // Obtaining the threshold
00841   input->threshold
00842     = json_object_get_float_with_default (object,
```

```
      LABEL_THRESHOLD, 0.,
00843                                           &error_code);
00844   if (error_code)
00845     {
00846       input_error (_("Invalid threshold"));
00847       goto exit_on_error;
00848     }
00849
00850   // Reading the experimental data
00851   array = json_object_get_array_member (object, LABEL_EXPERIMENTS);
00852   n = json_array_get_length (array);
00853   input->experiment = (Experiment *) g_malloc (n * sizeof (
      Experiment));
00854   for (i = 0; i < n; ++i)
00855     {
00856 #if DEBUG_INPUT
00857       fprintf (stderr, "input_open_json: nexperiments=%u\n",
00858                input->nexperiments);
00859 #endif
00860       child = json_array_get_element (array, i);
00861       if (!input->nexperiments)
00862         {
00863           if (!experiment_open_json (input->experiment, child, 0))
00864             goto exit_on_error;
00865         }
00866       else
00867         {
00868           if (!experiment_open_json (input->experiment +
      input->nexperiments,
00869                                      child, input->experiment->
      ninputs))
00870             goto exit_on_error;
00871         }
00872       ++input->nexperiments;
00873 #if DEBUG_INPUT
00874       fprintf (stderr, "input_open_json: nexperiments=%u\n",
00875                input->nexperiments);
00876 #endif
00877     }
00878   if (!input->nexperiments)
00879     {
00880       input_error (_("No optimization experiments"));
00881       goto exit_on_error;
00882     }
00883
00884   // Reading the variables data
00885   array = json_object_get_array_member (object, LABEL_VARIABLES);
00886   n = json_array_get_length (array);
00887   input->variable = (Variable *) g_malloc (n * sizeof (
      Variable));
00888   for (i = 0; i < n; ++i)
00889     {
00890 #if DEBUG_INPUT
00891       fprintf (stderr, "input_open_json: nvariables=%u\n", input->
      nvariables);
00892 #endif
00893       child = json_array_get_element (array, i);
00894       if (!variable_open_json (input->variable +
      input->nvariables, child,
00895                                input->algorithm, input->
      nsteps))
00896         goto exit_on_error;
00897       ++input->nvariables;
00898     }
00899   if (!input->nvariables)
00900     {
00901       input_error (_("No optimization variables"));
00902       goto exit_on_error;
00903     }
00904
00905   // Obtaining the error norm
00906   if (json_object_get_member (object, LABEL_NORM))
00907     {
00908       buffer = json_object_get_string_member (object, LABEL_NORM);
00909       if (!strcmp (buffer, LABEL_EUCLIDIAN))
00910         input->norm = ERROR_NORM_EUCLIDIAN;
00911       else if (!strcmp (buffer, LABEL_MAXIMUM))
00912         input->norm = ERROR_NORM_MAXIMUM;
00913       else if (!strcmp (buffer, LABEL_P))
00914         {
00915           input->norm = ERROR_NORM_P;
00916           input->p = json_object_get_float (object,
      LABEL_P, &error_code);
00917           if (!error_code)
00918             {
00919               input_error (_("Bad P parameter"));
00920               goto exit_on_error;
```

```
00921             }
00922         }
00923       else if (!strcmp (buffer, LABEL_TAXICAB))
00924         input->norm = ERROR_NORM_TAXICAB;
00925       else
00926         {
00927           input_error (_("Unknown error norm"));
00928           goto exit_on_error;
00929         }
00930     }
00931   else
00932     input->norm = ERROR_NORM_EUCLIDIAN;
00933
00934   // Closing the JSON document
00935   g_object_unref (parser);
00936
00937 #if DEBUG_INPUT
00938   fprintf (stderr, "input_open_json: end\n");
00939 #endif
00940   return 1;
00941
00942 exit_on_error:
00943   g_object_unref (parser);
00944 #if DEBUG_INPUT
00945   fprintf (stderr, "input_open_json: end\n");
00946 #endif
00947   return 0;
00948 }
```

Here is the call graph for this function:



4.9.3.4 input_open_xml()

```
int input_open_xml (
              xmlDoc * doc )
```

Function to open the input file in XML format.

Parameters

doc	xmlDoc struct.

Returns

1_on_success, 0_on_error.

Definition at line 139 of file input.c.

```
00140 {
```

```
00141   char buffer2[64];
00142   xmlNode *node, *child;
00143   xmlChar *buffer;
00144   int error_code;
00145   unsigned int i;
00146
00147 #if DEBUG_INPUT
00148   fprintf (stderr, "input_open_xml: start\n");
00149 #endif
00150
00151   // Resetting input data
00152   buffer = NULL;
00153   input->type = INPUT_TYPE_XML;
00154
00155   // Getting the root node
00156 #if DEBUG_INPUT
00157   fprintf (stderr, "input_open_xml: getting the root node\n");
00158 #endif
00159   node = xmlDocGetRootElement (doc);
00160   if (xmlStrcmp (node->name, (const xmlChar *) LABEL_OPTIMIZE))
00161     {
00162       input_error (_("Bad root XML node"));
00163       goto exit_on_error;
00164     }
00165
00166   // Getting result and variables file names
00167   if (!input->result)
00168     {
00169       input->result =
00170         (char *) xmlGetProp (node, (const xmlChar *) LABEL_RESULT_FILE);
00171       if (!input->result)
00172         input->result = (char *) xmlStrdup ((const xmlChar *)
      result_name);
00173     }
00174 #if DEBUG_INPUT
00175   fprintf (stderr, "input_open_xml: result file=%s\n", input->result);
00176 #endif
00177   if (!input->variables)
00178     {
00179       input->variables =
00180         (char *) xmlGetProp (node, (const xmlChar *) LABEL_VARIABLES_FILE);
00181       if (!input->variables)
00182         input->variables =
00183           (char *) xmlStrdup ((const xmlChar *) variables_name);
00184     }
00185 #if DEBUG_INPUT
00186   fprintf (stderr, "input_open_xml: variables file=%s\n", input->variables);
00187 #endif
00188
00189   // Opening simulator program name
00190   input->simulator =
00191     (char *) xmlGetProp (node, (const xmlChar *) LABEL_SIMULATOR);
00192   if (!input->simulator)
00193     {
00194       input_error (_("Bad simulator program"));
00195       goto exit_on_error;
00196     }
00197
00198   // Opening evaluator program name
00199   input->evaluator =
00200     (char *) xmlGetProp (node, (const xmlChar *) LABEL_EVALUATOR);
00201
00202   // Obtaining pseudo-random numbers generator seed
00203   input->seed
00204     = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_SEED,
00205                                       DEFAULT_RANDOM_SEED, &error_code);
00206   if (error_code)
00207     {
00208       input_error (_("Bad pseudo-random numbers generator seed"));
00209       goto exit_on_error;
00210     }
00211
00212   // Opening algorithm
00213   buffer = xmlGetProp (node, (const xmlChar *) LABEL_ALGORITHM);
00214   if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MONTE_CARLO))
00215     {
00216       input->algorithm = ALGORITHM_MONTE_CARLO;
00217
00218       // Obtaining simulations number
00219       input->nsimulations
00220         = xml_node_get_int (node, (const xmlChar *)
      LABEL_NSIMULATIONS,
00221                             &error_code);
00222       if (error_code)
00223         {
00224           input_error (_("Bad simulations number"));
```

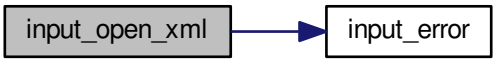
```
00225           goto exit_on_error;
00226         }
00227     }
00228   else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_SWEEP))
00229     input->algorithm = ALGORITHM_SWEEP;
00230   else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_GENETIC))
00231     {
00232       input->algorithm = ALGORITHM_GENETIC;
00233
00234       // Obtaining population
00235       if (xmlHasProp (node, (const xmlChar *) LABEL_NPOPULATION))
00236         {
00237           input->nsimulations
00238             = xml_node_get_uint (node, (const xmlChar *) LABEL_NPOPULATION,
00239                                  &error_code);
00240           if (error_code || input->nsimulations < 3)
00241             {
00242               input_error (_("Invalid population number"));
00243               goto exit_on_error;
00244             }
00245         }
00246       else
00247         {
00248           input_error (_("No population number"));
00249           goto exit_on_error;
00250         }
00251
00252       // Obtaining generations
00253       if (xmlHasProp (node, (const xmlChar *) LABEL_NGENERATIONS))
00254         {
00255           input->niterations
00256             = xml_node_get_uint (node, (const xmlChar *) LABEL_NGENERATIONS,
00257                                  &error_code);
00258           if (error_code || !input->niterations)
00259             {
00260               input_error (_("Invalid generations number"));
00261               goto exit_on_error;
00262             }
00263         }
00264       else
00265         {
00266           input_error (_("No generations number"));
00267           goto exit_on_error;
00268         }
00269
00270       // Obtaining mutation probability
00271       if (xmlHasProp (node, (const xmlChar *) LABEL_MUTATION))
00272         {
00273           input->mutation_ratio
00274             = xml_node_get_float (node, (const xmlChar *) LABEL_MUTATION,
00275                                   &error_code);
00276           if (error_code || input->mutation_ratio < 0.
00277               || input->mutation_ratio >= 1.)
00278             {
00279               input_error (_("Invalid mutation probability"));
00280               goto exit_on_error;
00281             }
00282         }
00283       else
00284         {
00285           input_error (_("No mutation probability"));
00286           goto exit_on_error;
00287         }
00288
00289       // Obtaining reproduction probability
00290       if (xmlHasProp (node, (const xmlChar *) LABEL_REPRODUCTION))
00291         {
00292           input->reproduction_ratio
00293             = xml_node_get_float (node, (const xmlChar *) LABEL_REPRODUCTION,
00294                                   &error_code);
00295           if (error_code || input->reproduction_ratio < 0.
00296               || input->reproduction_ratio >= 1.0)
00297             {
00298               input_error (_("Invalid reproduction probability"));
00299               goto exit_on_error;
00300             }
00301         }
00302       else
00303         {
00304           input_error (_("No reproduction probability"));
00305           goto exit_on_error;
00306         }
00307
00308       // Obtaining adaptation probability
00309       if (xmlHasProp (node, (const xmlChar *) LABEL_ADAPTATION))
00310         {
00311           input->adaptation_ratio
```

```
00312             = xml_node_get_float (node, (const xmlChar *) LABEL_ADAPTATION,
00313                                   &error_code);
00314           if (error_code || input->adaptation_ratio < 0.
00315               || input->adaptation_ratio >= 1.)
00316             {
00317               input_error (_("Invalid adaptation probability"));
00318               goto exit_on_error;
00319             }
00320         }
00321       else
00322         {
00323           input_error (_("No adaptation probability"));
00324           goto exit_on_error;
00325         }
00326
00327       // Checking survivals
00328       i = input->mutation_ratio * input->nsimulations;
00329       i += input->reproduction_ratio * input->
      nsimulations;
00330       i += input->adaptation_ratio * input->
      nsimulations;
00331       if (i > input->nsimulations - 2)
00332         {
00333           input_error
00334             (_("No enough survival entities to reproduce the population"));
00335           goto exit_on_error;
00336         }
00337     }
00338   else
00339     {
00340       input_error (_("Unknown algorithm"));
00341       goto exit_on_error;
00342     }
00343   xmlFree (buffer);
00344   buffer = NULL;
00345
00346   if (input->algorithm == ALGORITHM_MONTE_CARLO
00347       || input->algorithm == ALGORITHM_SWEEP)
00348     {
00349
00350       // Obtaining iterations number
00351       input->niterations
00352         = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NITERATIONS,
00353                              &error_code);
00354       if (error_code == 1)
00355         input->niterations = 1;
00356       else if (error_code)
00357         {
00358           input_error (_("Bad iterations number"));
00359           goto exit_on_error;
00360         }
00361
00362       // Obtaining best number
00363       input->nbest
00364         = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_NBEST,
00365                                           1, &error_code);
00366       if (error_code || !input->nbest)
00367         {
00368           input_error (_("Invalid best number"));
00369           goto exit_on_error;
00370         }
00371       if (input->nbest > input->nsimulations)
00372         {
00373           input_error (_("Best number higher than simulations number"));
00374           goto exit_on_error;
00375         }
00376
00377       // Obtaining tolerance
00378       input->tolerance
00379         = xml_node_get_float_with_default (node,
00380                                            (const xmlChar *) LABEL_TOLERANCE,
00381                                            0., &error_code);
00382       if (error_code || input->tolerance < 0.)
00383         {
00384           input_error (_("Invalid tolerance"));
00385           goto exit_on_error;
00386         }
00387
00388       // Getting direction search method parameters
00389       if (xmlHasProp (node, (const xmlChar *) LABEL_NSTEPS))
00390         {
00391           input->nsteps =
00392             xml_node_get_uint (node, (const xmlChar *) LABEL_NSTEPS,
00393                                &error_code);
00394           if (error_code)
```

```
00395             {
00396               input_error (_("Invalid steps number"));
00397               goto exit_on_error;
00398             }
00399 #if DEBUG_INPUT
00400           fprintf (stderr, "input_open_xml: nsteps=%u\n", input->nsteps);
00401 #endif
00402           buffer = xmlGetProp (node, (const xmlChar *) LABEL_DIRECTION);
00403           if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_COORDINATES))
00404             input->direction = DIRECTION_METHOD_COORDINATES;
00405           else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_RANDOM))
00406             {
00407               input->direction = DIRECTION_METHOD_RANDOM;
00408               input->nestimates
00409                 = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NESTIMATES,
00410                                      &error_code);
00411               if (error_code || !input->nestimates)
00412                 {
00413                   input_error (_("Invalid estimates number"));
00414                   goto exit_on_error;
00415                 }
00416             }
00417           else
00418             {
00419               input_error
00420                 (_("Unknown method to estimate the direction search"));
00421               goto exit_on_error;
00422             }
00423           xmlFree (buffer);
00424           buffer = NULL;
00425           input->relaxation
00426             = xml_node_get_float_with_default (node,
00427                                                (const xmlChar *)
00428                                                LABEL_RELAXATION,
00429                                                DEFAULT_RELAXATION, &error_code);
00430           if (error_code || input->relaxation < 0. || input->
      relaxation > 2.)
00431             {
00432               input_error (_("Invalid relaxation parameter"));
00433               goto exit_on_error;
00434             }
00435         }
00436       else
00437         input->nsteps = 0;
00438     }
00439   // Obtaining the threshold
00440   input->threshold =
00441     xml_node_get_float_with_default (node, (const xmlChar *)
      LABEL_THRESHOLD,
00442                                      0., &error_code);
00443   if (error_code)
00444     {
00445       input_error (_("Invalid threshold"));
00446       goto exit_on_error;
00447     }
00448
00449   // Reading the experimental data
00450   for (child = node->children; child; child = child->next)
00451     {
00452       if (xmlStrcmp (child->name, (const xmlChar *) LABEL_EXPERIMENT))
00453         break;
00454 #if DEBUG_INPUT
00455       fprintf (stderr, "input_open_xml: nexperiments=%u\n",
00456                input->nexperiments);
00457 #endif
00458       input->experiment = (Experiment *)
00459         g_realloc (input->experiment,
00460                    (1 + input->nexperiments) * sizeof (
      Experiment));
00461       if (!input->nexperiments)
00462         {
00463           if (!experiment_open_xml (input->experiment, child, 0))
00464             goto exit_on_error;
00465         }
00466       else
00467         {
00468           if (!experiment_open_xml (input->experiment +
      input->nexperiments,
00469                                     child, input->experiment->
      ninputs))
00470             goto exit_on_error;
00471         }
00472       ++input->nexperiments;
00473 #if DEBUG_INPUT
00474       fprintf (stderr, "input_open_xml: nexperiments=%u\n",
00475                input->nexperiments);
```

```
00476 #endif
00477     }
00478   if (!input->nexperiments)
00479     {
00480       input_error (_("No optimization experiments"));
00481       goto exit_on_error;
00482     }
00483   buffer = NULL;
00484
00485   // Reading the variables data
00486   for (; child; child = child->next)
00487     {
00488 #if DEBUG_INPUT
00489       fprintf (stderr, "input_open_xml: nvariables=%u\n", input->nvariables);
00490 #endif
00491       if (xmlStrcmp (child->name, (const xmlChar *) LABEL_VARIABLE))
00492         {
00493           snprintf (buffer2, 64, "%s %u: %s",
00494                     _("Variable"), input->nvariables + 1, _("bad XML node"));
00495           input_error (buffer2);
00496           goto exit_on_error;
00497         }
00498       input->variable = (Variable *)
00499         g_realloc (input->variable,
00500                    (1 + input->nvariables) * sizeof (Variable));
00501       if (!variable_open_xml (input->variable +
      input->nvariables, child,
00502                               input->algorithm, input->nsteps))
00503         goto exit_on_error;
00504       ++input->nvariables;
00505     }
00506   if (!input->nvariables)
00507     {
00508       input_error (_("No optimization variables"));
00509       goto exit_on_error;
00510     }
00511   buffer = NULL;
00512
00513   // Obtaining the error norm
00514   if (xmlHasProp (node, (const xmlChar *) LABEL_NORM))
00515     {
00516       buffer = xmlGetProp (node, (const xmlChar *) LABEL_NORM);
00517       if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_EUCLIDIAN))
00518         input->norm = ERROR_NORM_EUCLIDIAN;
00519       else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MAXIMUM))
00520         input->norm = ERROR_NORM_MAXIMUM;
00521       else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_P))
00522         {
00523           input->norm = ERROR_NORM_P;
00524           input->p
00525             = xml_node_get_float (node, (const xmlChar *) LABEL_P, &error_code);
00526           if (!error_code)
00527             {
00528               input_error (_("Bad P parameter"));
00529               goto exit_on_error;
00530             }
00531         }
00532       else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_TAXICAB))
00533         input->norm = ERROR_NORM_TAXICAB;
00534       else
00535         {
00536           input_error (_("Unknown error norm"));
00537           goto exit_on_error;
00538         }
00539       xmlFree (buffer);
00540     }
00541   else
00542     input->norm = ERROR_NORM_EUCLIDIAN;
00543
00544   // Closing the XML document
00545   xmlFreeDoc (doc);
00546
00547 #if DEBUG_INPUT
00548   fprintf (stderr, "input_open_xml: end\n");
00549 #endif
00550   return 1;
00551
00552 exit_on_error:
00553   xmlFree (buffer);
00554   xmlFreeDoc (doc);
00555 #if DEBUG_INPUT
00556   fprintf (stderr, "input_open_xml: end\n");
00557 #endif
00558   return 0;
00559 }
```

Here is the call graph for this function:



4.10 input.h

```
00001 /*
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
00007
00008 Copyright 2012-2017, AUTHORS.
00009
00010 Redistribution and use in source and binary forms, with or without modification,
00011 are permitted provided that the following conditions are met:
00012
00013   1. Redistributions of source code must retain the above copyright notice,
00014     this list of conditions and the following disclaimer.
00015
00016   2. Redistributions in binary form must reproduce the above copyright notice,
00017     this list of conditions and the following disclaimer in the
00018     documentation and/or other materials provided with the distribution.
00019
00020 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00021 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00022 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00023 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00024 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00025 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00026 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #ifndef INPUT__H
00039 #define INPUT__H 1
00040
00045 enum DirectionMethod
00046 {
00047   DIRECTION_METHOD_COORDINATES = 0,
00048   DIRECTION_METHOD_RANDOM = 1,
00049 };
00050
00055 enum ErrorNorm
00056 {
00057   ERROR_NORM_EUCLIDIAN = 0,
00059   ERROR_NORM_MAXIMUM = 1,
00061   ERROR_NORM_P = 2,
00063   ERROR_NORM_TAXICAB = 3
00065 };
00066
00071 typedef struct
00072 {
00073   Experiment *experiment;
00074   Variable *variable;
00075   char *result;
00076   char *variables;
00077   char *simulator;
00078   char *evaluator;
00080   char *directory;
00081   char *name;
00082   double tolerance;
00083   double mutation_ratio;
00084   double reproduction_ratio;
00085   double adaptation_ratio;
```

```
00086   double relaxation;
00087   double p;
00088   double threshold;
00089   unsigned long int seed;
00091   unsigned int nvariables;
00092   unsigned int nexperiments;
00093   unsigned int nsimulations;
00094   unsigned int algorithm;
00095   unsigned int nsteps;
00097   unsigned int direction;
00098   unsigned int nestimates;
00100   unsigned int niterations;
00101   unsigned int nbest;
00102   unsigned int norm;
00103   unsigned int type;
00104 } Input;
00105
00106 extern Input input[1];
00107 extern const char *result_name;
00108 extern const char *variables_name;
00109
00110 // Public functions
00111 void input_new ();
00112 void input_free ();
00113 void input_error (char *message);
00114 int input_open_xml (xmlDoc * doc);
00115 int input_open_json (JsonParser * parser);
00116 int input_open (char *filename);
00117
00118 #endif
```

4.11 interface.c File Reference

Source file to define the graphical interface functions.

```
#include "config.h"
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <math.h>
#include <gsl/gsl_rng.h>
#include <libxml/parser.h>
#include <libintl.h>
#include <glib.h>
#include <glib/gstdio.h>
#include <json-glib/json-glib.h>
#include <mpi.h>
#include <gio/gio.h>
#include <gtk/gtk.h>
#include "genetic/genetic.h"
#include "utils.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"
#include "optimize.h"
#include "interface.h"
```

Include dependency graph for interface.c:

Macros

- #define DEBUG_INTERFACE 0

  Macro to debug interface functions.
- #define INPUT_FILE "test-ga.xml"

  Macro to define the initial input file.

Functions

- void input_save_direction_xml (xmlNode *node)

  Function to save the direction search method data in a XML node.
- void input_save_direction_json (JsonNode *node)

  Function to save the direction search method data in a JSON node.
- void input_save_xml (xmlDoc *doc)

  Function to save the input file in XML format.
- void input_save_json (JsonGenerator *generator)

  Function to save the input file in JSON format.
- void input_save (char *filename)

  Function to save the input file.
- void options_new ()

  Function to open the options dialog.
- void running_new ()

  Function to open the running dialog.
- unsigned int window_get_algorithm ()

  Function to get the stochastic algorithm number.
- unsigned int window_get_direction ()

  Function to get the direction search method number.
- unsigned int window_get_norm ()

  Function to get the norm method number.
- void window_save_direction ()

  Function to save the direction search method data in the input file.
- int window_save ()

  Function to save the input file.
- void window_run ()

  Function to run a optimization.
- void window_help ()

  Function to show a help dialog.
- void window_about ()

  Function to show an about dialog.
- void window_update_direction ()

  Function to update direction search method widgets view in the main window.
- void window_update ()

  Function to update the main window view.
- void window_set_algorithm ()

  Function to avoid memory errors changing the algorithm.
- void window_set_experiment ()

  Function to set the experiment data in the main window.
- void window_remove_experiment ()

  Function to remove an experiment in the main window.
- void window_add_experiment ()

Function to add an experiment in the main window.

- void window_name_experiment ()

  Function to set the experiment name in the main window.
- void window_weight_experiment ()

  Function to update the experiment weight in the main window.
- void window_inputs_experiment ()

  Function to update the experiment input templates number in the main window.
- void window_template_experiment (void *data)

  Function to update the experiment i-th input template in the main window.
- void window_set_variable ()

  Function to set the variable data in the main window.
- void window_remove_variable ()

  Function to remove a variable in the main window.
- void window_add_variable ()

  Function to add a variable in the main window.
- void window_label_variable ()

  Function to set the variable label in the main window.
- void window_precision_variable ()

  Function to update the variable precision in the main window.
- void window_rangemin_variable ()

  Function to update the variable rangemin in the main window.
- void window_rangemax_variable ()

  Function to update the variable rangemax in the main window.
- void window_rangeminabs_variable ()

  Function to update the variable rangeminabs in the main window.
- void window_rangemaxabs_variable ()

  Function to update the variable rangemaxabs in the main window.
- void window_step_variable ()

  Function to update the variable step in the main window.
- void window_update_variable ()

  Function to update the variable data in the main window.
- int window_read (char *filename)

  Function to read the input data of a file.
- void window_open ()

  Function to open the input data.
- void window_new (GtkApplication *application)

  Function to open the main window.

Variables

- const char * logo [ ]

  Logo pixmap.
- Options options [1]

  Options struct to define the options dialog.
- Running running [1]

  Running struct to define the running dialog.
- Window window [1]

  Window struct to define the main interface window.

4.11.1 Detailed Description

Source file to define the graphical interface functions.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file interface.c.

4.11.2 Function Documentation

4.11.2.1 input_save()

```
void input_save (
              char * filename )
```

Function to save the input file.

Parameters

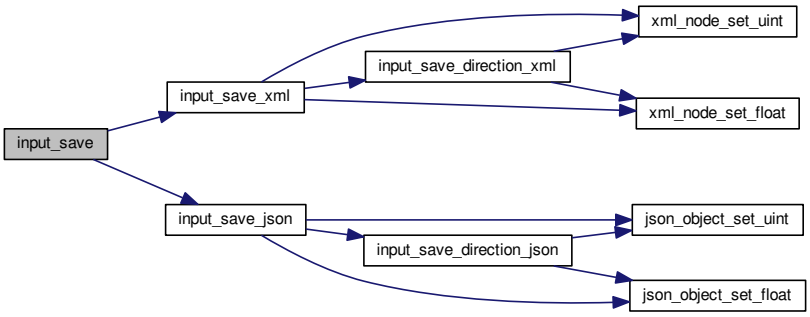
filename	Input file name.

Definition at line 575 of file interface.c.

```
00576 {
00577   xmlDoc *doc;
00578   JsonGenerator *generator;
00579 
00580 #if DEBUG_INTERFACE
00581   fprintf (stderr, "input_save: start\n");
00582 #endif
00583 
00584   // Getting the input file directory
00585   input->name = g_path_get_basename (filename);
00586   input->directory = g_path_get_dirname (filename);
00587 
00588   if (input->type == INPUT_TYPE_XML)
00589     {
00590       // Opening the input file
00591       doc = xmlNewDoc ((const xmlChar *) "1.0");
00592       input_save_xml (doc);
00593 
00594       // Saving the XML file
00595       xmlSaveFormatFile (filename, doc, 1);
00596 
00597       // Freeing memory
00598       xmlFreeDoc (doc);
00599     }
00600   else
00601     {
00602       // Opening the input file
```

```
00603       generator = json_generator_new ();
00604       json_generator_set_pretty (generator, TRUE);
00605       input_save_json (generator);
00606
00607       // Saving the JSON file
00608       json_generator_to_file (generator, filename, NULL);
00609
00610       // Freeing memory
00611       g_object_unref (generator);
00612     }
00613
00614 #if DEBUG_INTERFACE
00615   fprintf (stderr, "input_save: end\n");
00616 #endif
00617 }
```

Here is the call graph for this function:



4.11.2.2 input_save_direction_json()

```
void input_save_direction_json (
             JsonNode * node )
```

Function to save the direction search method data in a JSON node.

Parameters

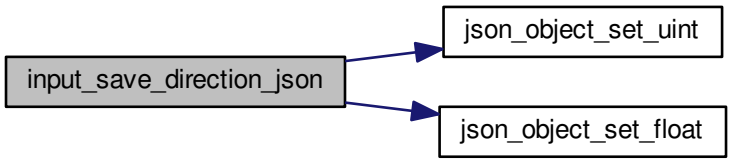
node	JSON node.

Definition at line 207 of file interface.c.

```
00208 {
00209   JsonObject *object;
00210 #if DEBUG_INTERFACE
00211   fprintf (stderr, "input_save_direction_json: start\n");
00212 #endif
00213   object = json_node_get_object (node);
00214   if (input->nsteps)
00215     {
00216       json_object_set_uint (object, LABEL_NSTEPS,
      input->nsteps);
00217       if (input->relaxation != DEFAULT_RELAXATION)
00218         json_object_set_float (object, LABEL_RELAXATION,
      input->relaxation);
```

```
00219       switch (input->direction)
00220         {
00221         case DIRECTION_METHOD_COORDINATES:
00222           json_object_set_string_member (object, LABEL_DIRECTION,
00223                                          LABEL_COORDINATES);
00224           break;
00225         default:
00226           json_object_set_string_member (object, LABEL_DIRECTION,
      LABEL_RANDOM);
00227           json_object_set_uint (object, LABEL_NESTIMATES,
      input->nestimates);
00228         }
00229     }
00230 #if DEBUG_INTERFACE
00231   fprintf (stderr, "input_save_direction_json: end\n");
00232 #endif
00233 }
```

Here is the call graph for this function:



4.11.2.3 input_save_direction_xml()

```
void input_save_direction_xml (
              xmlNode * node )
```

Function to save the direction search method data in a XML node.

Parameters

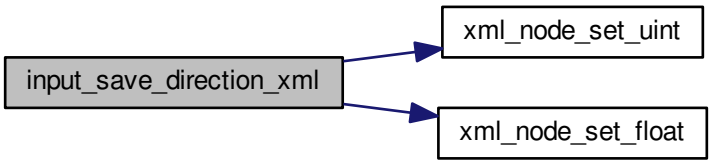
node	XML node.

Definition at line 171 of file interface.c.

```
00172 {
00173 #if DEBUG_INTERFACE
00174   fprintf (stderr, "input_save_direction_xml: start\n");
00175 #endif
00176   if (input->nsteps)
00177     {
00178       xml_node_set_uint (node, (const xmlChar *) LABEL_NSTEPS,
      input->nsteps);
00179       if (input->relaxation != DEFAULT_RELAXATION)
00180         xml_node_set_float (node, (const xmlChar *)
      LABEL_RELAXATION,
00181                             input->relaxation);
00182       switch (input->direction)
00183         {
```

```
00184         case DIRECTION_METHOD_COORDINATES:
00185           xmlSetProp (node, (const xmlChar *) LABEL_DIRECTION,
00186                       (const xmlChar *) LABEL_COORDINATES);
00187           break;
00188         default:
00189           xmlSetProp (node, (const xmlChar *) LABEL_DIRECTION,
00190                       (const xmlChar *) LABEL_RANDOM);
00191           xml_node_set_uint (node, (const xmlChar *)
      LABEL_NESTIMATES,
00192                              input->nestimates);
00193         }
00194     }
00195 #if DEBUG_INTERFACE
00196   fprintf (stderr, "input_save_direction_xml: end\n");
00197 #endif
00198 }
```

Here is the call graph for this function:



4.11.2.4 input_save_json()

```
void input_save_json (
              JsonGenerator * generator )
```

Function to save the input file in JSON format.

Parameters

generator	JsonGenerator struct.

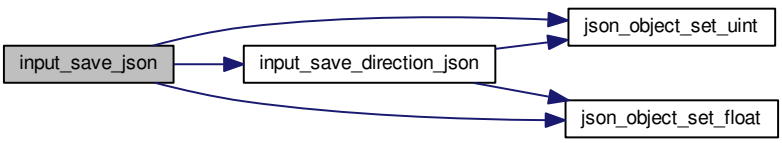
Definition at line 412 of file interface.c.

```
00413 {
00414   unsigned int i, j;
00415   char *buffer;
00416   JsonNode *node, *child;
00417   JsonObject *object;
00418   JsonArray *array;
00419   GFile *file, *file2;
00420
00421 #if DEBUG_INTERFACE
00422   fprintf (stderr, "input_save_json: start\n");
00423 #endif
00424
00425   // Setting root JSON node
00426   node = json_node_new (JSON_NODE_OBJECT);
00427   object = json_node_get_object (node);
```

```
00428   json_generator_set_root (generator, node);
00429
00430   // Adding properties to the root JSON node
00431   if (strcmp (input->result, result_name))
00432     json_object_set_string_member (object, LABEL_RESULT_FILE,
      input->result);
00433   if (strcmp (input->variables, variables_name))
00434     json_object_set_string_member (object, LABEL_VARIABLES_FILE,
00435                                    input->variables);
00436   file = g_file_new_for_path (input->directory);
00437   file2 = g_file_new_for_path (input->simulator);
00438   buffer = g_file_get_relative_path (file, file2);
00439   g_object_unref (file2);
00440   json_object_set_string_member (object, LABEL_SIMULATOR, buffer);
00441   g_free (buffer);
00442   if (input->evaluator)
00443     {
00444       file2 = g_file_new_for_path (input->evaluator);
00445       buffer = g_file_get_relative_path (file, file2);
00446       g_object_unref (file2);
00447       if (strlen (buffer))
00448         json_object_set_string_member (object, LABEL_EVALUATOR, buffer);
00449       g_free (buffer);
00450     }
00451   if (input->seed != DEFAULT_RANDOM_SEED)
00452     json_object_set_uint (object, LABEL_SEED,
      input->seed);
00453
00454   // Setting the algorithm
00455   buffer = (char *) g_slice_alloc (64);
00456   switch (input->algorithm)
00457     {
00458     case ALGORITHM_MONTE_CARLO:
00459       json_object_set_string_member (object, LABEL_ALGORITHM,
00460                                      LABEL_MONTE_CARLO);
00461       snprintf (buffer, 64, "%u", input->nsimulations);
00462       json_object_set_string_member (object, LABEL_NSIMULATIONS, buffer);
00463       snprintf (buffer, 64, "%u", input->niterations);
00464       json_object_set_string_member (object, LABEL_NITERATIONS, buffer);
00465       snprintf (buffer, 64, "%.3lg", input->tolerance);
00466       json_object_set_string_member (object, LABEL_TOLERANCE, buffer);
00467       snprintf (buffer, 64, "%u", input->nbest);
00468       json_object_set_string_member (object, LABEL_NBEST, buffer);
00469       input_save_direction_json (node);
00470       break;
00471     case ALGORITHM_SWEEP:
00472       json_object_set_string_member (object, LABEL_ALGORITHM,
      LABEL_SWEEP);
00473       snprintf (buffer, 64, "%u", input->niterations);
00474       json_object_set_string_member (object, LABEL_NITERATIONS, buffer);
00475       snprintf (buffer, 64, "%.3lg", input->tolerance);
00476       json_object_set_string_member (object, LABEL_TOLERANCE, buffer);
00477       snprintf (buffer, 64, "%u", input->nbest);
00478       json_object_set_string_member (object, LABEL_NBEST, buffer);
00479       input_save_direction_json (node);
00480       break;
00481     default:
00482       json_object_set_string_member (object, LABEL_ALGORITHM,
      LABEL_GENETIC);
00483       snprintf (buffer, 64, "%u", input->nsimulations);
00484       json_object_set_string_member (object, LABEL_NPOPULATION, buffer);
00485       snprintf (buffer, 64, "%u", input->niterations);
00486       json_object_set_string_member (object, LABEL_NGENERATIONS, buffer);
00487       snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
00488       json_object_set_string_member (object, LABEL_MUTATION, buffer);
00489       snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
00490       json_object_set_string_member (object, LABEL_REPRODUCTION, buffer);
00491       snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
00492       json_object_set_string_member (object, LABEL_ADAPTATION, buffer);
00493       break;
00494     }
00495   g_slice_free1 (64, buffer);
00496   if (input->threshold != 0.)
00497     json_object_set_float (object, LABEL_THRESHOLD,
      input->threshold);
00498
00499   // Setting the experimental data
00500   array = json_array_new ();
00501   for (i = 0; i < input->nexperiments; ++i)
00502     {
00503       child = json_node_new (JSON_NODE_OBJECT);
00504       object = json_node_get_object (child);
00505       json_object_set_string_member (object, LABEL_NAME,
00506                                      input->experiment[i].name);
00507       if (input->experiment[i].weight != 1.)
00508         json_object_set_float (object, LABEL_WEIGHT,
00509                                input->experiment[i].weight);
```

```
00510       for (j = 0; j < input->experiment->ninputs; ++j)
00511         json_object_set_string_member (object, stencil[j],
00512                                        input->experiment[i].
      stencil[j]);
00513       json_array_add_element (array, child);
00514     }
00515   json_object_set_array_member (object, LABEL_EXPERIMENTS, array);
00516
00517   // Setting the variables data
00518   array = json_array_new ();
00519   for (i = 0; i < input->nvariables; ++i)
00520     {
00521       child = json_node_new (JSON_NODE_OBJECT);
00522       object = json_node_get_object (child);
00523       json_object_set_string_member (object, LABEL_NAME,
00524                                      input->variable[i].name);
00525       json_object_set_float (object, LABEL_MINIMUM,
00526                              input->variable[i].rangemin);
00527       if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
00528         json_object_set_float (object,
      LABEL_ABSOLUTE_MINIMUM,
00529                                input->variable[i].rangeminabs);
00530       json_object_set_float (object, LABEL_MAXIMUM,
00531                              input->variable[i].rangemax);
00532       if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
00533         json_object_set_float (object,
      LABEL_ABSOLUTE_MAXIMUM,
00534                                input->variable[i].rangemaxabs);
00535       if (input->variable[i].precision !=
      DEFAULT_PRECISION)
00536         json_object_set_uint (object, LABEL_PRECISION,
00537                               input->variable[i].precision);
00538       if (input->algorithm == ALGORITHM_SWEEP)
00539         json_object_set_uint (object, LABEL_NSWEEPS,
00540                               input->variable[i].nsweeps);
00541       else if (input->algorithm == ALGORITHM_GENETIC)
00542         json_object_set_uint (object, LABEL_NBITS,
      input->variable[i].nbits);
00543       if (input->nsteps)
00544         json_object_set_float (object, LABEL_STEP,
      input->variable[i].step);
00545       json_array_add_element (array, child);
00546     }
00547   json_object_set_array_member (object, LABEL_VARIABLES, array);
00548
00549   // Saving the error norm
00550   switch (input->norm)
00551     {
00552     case ERROR_NORM_MAXIMUM:
00553       json_object_set_string_member (object, LABEL_NORM, LABEL_MAXIMUM);
00554       break;
00555     case ERROR_NORM_P:
00556       json_object_set_string_member (object, LABEL_NORM, LABEL_P);
00557       json_object_set_float (object, LABEL_P, input->
      p);
00558       break;
00559     case ERROR_NORM_TAXICAB:
00560       json_object_set_string_member (object, LABEL_NORM, LABEL_TAXICAB);
00561     }
00562
00563 #if DEBUG_INTERFACE
00564   fprintf (stderr, "input_save_json: end\n");
00565 #endif
00566 }
```

Here is the call graph for this function:



4.11.2.5 input_save_xml()

```
void input_save_xml (
              xmlDoc * doc )
```

Function to save the input file in XML format.

Parameters

doc	xmlDoc struct.

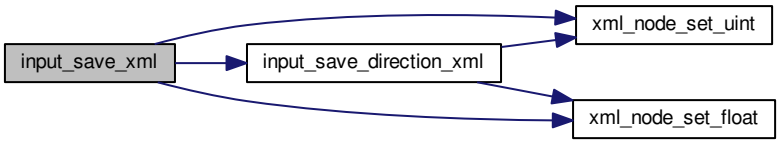
Definition at line 242 of file interface.c.

```
00243 {
00244   unsigned int i, j;
00245   char *buffer;
00246   xmlNode *node, *child;
00247   GFile *file, *file2;
00248
00249 #if DEBUG_INTERFACE
00250   fprintf (stderr, "input_save_xml: start\n");
00251 #endif
00252
00253   // Setting root XML node
00254   node = xmlNewDocNode (doc, 0, (const xmlChar *) LABEL_OPTIMIZE, 0);
00255   xmlDocSetRootElement (doc, node);
00256
00257   // Adding properties to the root XML node
00258   if (xmlStrcmp
00259       ((const xmlChar *) input->result, (const xmlChar *) result_name))
00260     xmlSetProp (node, (const xmlChar *) LABEL_RESULT_FILE,
00261                 (xmlChar *) input->result);
00262   if (xmlStrcmp
00263       ((const xmlChar *) input->variables, (const xmlChar *)
      variables_name))
00264     xmlSetProp (node, (const xmlChar *) LABEL_VARIABLES_FILE,
00265                 (xmlChar *) input->variables);
00266   file = g_file_new_for_path (input->directory);
00267   file2 = g_file_new_for_path (input->simulator);
00268   buffer = g_file_get_relative_path (file, file2);
00269   g_object_unref (file2);
00270   xmlSetProp (node, (const xmlChar *) LABEL_SIMULATOR, (xmlChar *) buffer);
00271   g_free (buffer);
00272   if (input->evaluator)
00273     {
00274       file2 = g_file_new_for_path (input->evaluator);
00275       buffer = g_file_get_relative_path (file, file2);
00276       g_object_unref (file2);
00277       if (xmlStrlen ((xmlChar *) buffer))
00278         xmlSetProp (node, (const xmlChar *) LABEL_EVALUATOR,
00279                     (xmlChar *) buffer);
00280       g_free (buffer);
00281     }
00282   if (input->seed != DEFAULT_RANDOM_SEED)
00283     xml_node_set_uint (node, (const xmlChar *) LABEL_SEED,
      input->seed);
00284
00285   // Setting the algorithm
00286   buffer = (char *) g_slice_alloc (64);
00287   switch (input->algorithm)
00288     {
00289     case ALGORITHM_MONTE_CARLO:
00290       xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
00291                   (const xmlChar *) LABEL_MONTE_CARLO);
00292       snprintf (buffer, 64, "%u", input->nsimulations);
00293       xmlSetProp (node, (const xmlChar *) LABEL_NSIMULATIONS,
00294                   (xmlChar *) buffer);
00295       snprintf (buffer, 64, "%u", input->niterations);
00296       xmlSetProp (node, (const xmlChar *) LABEL_NITERATIONS,
00297                   (xmlChar *) buffer);
00298       snprintf (buffer, 64, "%.31g", input->tolerance);
00299       xmlSetProp (node, (const xmlChar *) LABEL_TOLERANCE, (xmlChar *) buffer);
00300       snprintf (buffer, 64, "%u", input->nbest);
00301       xmlSetProp (node, (const xmlChar *) LABEL_NBEST, (xmlChar *) buffer);
00302       input_save_direction_xml (node);
00303       break;
00304     case ALGORITHM_SWEEP:
```

```
00305       xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
00306                   (const xmlChar *) LABEL_SWEEP);
00307       snprintf (buffer, 64, "%u", input->niterations);
00308       xmlSetProp (node, (const xmlChar *) LABEL_NITERATIONS,
00309                   (xmlChar *) buffer);
00310       snprintf (buffer, 64, "%.3lg", input->tolerance);
00311       xmlSetProp (node, (const xmlChar *) LABEL_TOLERANCE, (xmlChar *) buffer);
00312       snprintf (buffer, 64, "%u", input->nbest);
00313       xmlSetProp (node, (const xmlChar *) LABEL_NBEST, (xmlChar *) buffer);
00314       input_save_direction_xml (node);
00315       break;
00316     default:
00317       xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
00318                   (const xmlChar *) LABEL_GENETIC);
00319       snprintf (buffer, 64, "%u", input->nsimulations);
00320       xmlSetProp (node, (const xmlChar *) LABEL_NPOPULATION,
00321                   (xmlChar *) buffer);
00322       snprintf (buffer, 64, "%u", input->niterations);
00323       xmlSetProp (node, (const xmlChar *) LABEL_NGENERATIONS,
00324                   (xmlChar *) buffer);
00325       snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
00326       xmlSetProp (node, (const xmlChar *) LABEL_MUTATION, (xmlChar *) buffer);
00327       snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
00328       xmlSetProp (node, (const xmlChar *) LABEL_REPRODUCTION,
00329                   (xmlChar *) buffer);
00330       snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
00331       xmlSetProp (node, (const xmlChar *) LABEL_ADAPTATION, (xmlChar *) buffer);
00332       break;
00333     }
00334   g_slice_free1 (64, buffer);
00335   if (input->threshold != 0.)
00336     xml_node_set_float (node, (const xmlChar *)
      LABEL_THRESHOLD,
00337                         input->threshold);
00338
00339   // Setting the experimental data
00340   for (i = 0; i < input->nexperiments; ++i)
00341     {
00342       child = xmlNewChild (node, 0, (const xmlChar *) LABEL_EXPERIMENT, 0);
00343       xmlSetProp (child, (const xmlChar *) LABEL_NAME,
00344                   (xmlChar *) input->experiment[i].name);
00345       if (input->experiment[i].weight != 1.)
00346         xml_node_set_float (child, (const xmlChar *)
      LABEL_WEIGHT,
00347                             input->experiment[i].weight);
00348       for (j = 0; j < input->experiment->ninputs; ++j)
00349         xmlSetProp (child, (const xmlChar *) stencil[j],
00350                     (xmlChar *) input->experiment[i].stencil[j]);
00351     }
00352
00353   // Setting the variables data
00354   for (i = 0; i < input->nvariables; ++i)
00355     {
00356       child = xmlNewChild (node, 0, (const xmlChar *) LABEL_VARIABLE, 0);
00357       xmlSetProp (child, (const xmlChar *) LABEL_NAME,
00358                   (xmlChar *) input->variable[i].name);
00359       xml_node_set_float (child, (const xmlChar *)
      LABEL_MINIMUM,
00360                           input->variable[i].rangemin);
00361       if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
00362         xml_node_set_float (child, (const xmlChar *)
      LABEL_ABSOLUTE_MINIMUM,
00363                             input->variable[i].rangeminabs);
00364       xml_node_set_float (child, (const xmlChar *)
      LABEL_MAXIMUM,
00365                           input->variable[i].rangemax);
00366       if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
00367         xml_node_set_float (child, (const xmlChar *)
      LABEL_ABSOLUTE_MAXIMUM,
00368                             input->variable[i].rangemaxabs);
00369       if (input->variable[i].precision !=
      DEFAULT_PRECISION)
00370         xml_node_set_uint (child, (const xmlChar *)
      LABEL_PRECISION,
00371                            input->variable[i].precision);
00372       if (input->algorithm == ALGORITHM_SWEEP)
00373         xml_node_set_uint (child, (const xmlChar *)
      LABEL_NSWEEPS,
00374                            input->variable[i].nsweeps);
00375       else if (input->algorithm == ALGORITHM_GENETIC)
00376         xml_node_set_uint (child, (const xmlChar *) LABEL_NBITS,
00377                            input->variable[i].nbits);
00378       if (input->nsteps)
00379         xml_node_set_float (child, (const xmlChar *)
      LABEL_STEP,
00380                             input->variable[i].step);
00381     }
```

```
00382
00383   // Saving the error norm
00384   switch (input->norm)
00385     {
00386     case ERROR_NORM_MAXIMUM:
00387       xmlSetProp (node, (const xmlChar *) LABEL_NORM,
00388                   (const xmlChar *) LABEL_MAXIMUM);
00389       break;
00390     case ERROR_NORM_P:
00391       xmlSetProp (node, (const xmlChar *) LABEL_NORM,
00392                   (const xmlChar *) LABEL_P);
00393       xml_node_set_float (node, (const xmlChar *) LABEL_P,
      input->p);
00394       break;
00395     case ERROR_NORM_TAXICAB:
00396       xmlSetProp (node, (const xmlChar *) LABEL_NORM,
00397                   (const xmlChar *) LABEL_TAXICAB);
00398     }
00399
00400 #if DEBUG_INTERFACE
00401   fprintf (stderr, "input_save: end\n");
00402 #endif
00403 }
```

Here is the call graph for this function:



4.11.2.6 window_get_algorithm()

```
unsigned int window_get_algorithm ( )
```

Function to get the stochastic algorithm number.

Returns

Stochastic algorithm number.

Definition at line 725 of file interface.c.

```
00726 {
00727   unsigned int i;
00728 #if DEBUG_INTERFACE
00729   fprintf (stderr, "window_get_algorithm: start\n");
00730 #endif
00731   i = gtk_array_get_active (window->button_algorithm,
      NALGORITHMS);
00732 #if DEBUG_INTERFACE
00733   fprintf (stderr, "window_get_algorithm: %u\n", i);
00734   fprintf (stderr, "window_get_algorithm: end\n");
00735 #endif
00736   return i;
00737 }
```

Here is the call graph for this function:

4.11.2.7 window_get_direction()

```
unsigned int window_get_direction ( )
```

Function to get the direction search method number.

Returns

Direction search method number.

Definition at line 745 of file interface.c.

```
00746 {
00747   unsigned int i;
00748 #if DEBUG_INTERFACE
00749   fprintf (stderr, "window_get_direction: start\n");
00750 #endif
00751   i = gtk_array_get_active (window->button_direction,
      NDIRECTIONS);
00752 #if DEBUG_INTERFACE
00753   fprintf (stderr, "window_get_direction: %u\n", i);
00754   fprintf (stderr, "window_get_direction: end\n");
00755 #endif
00756   return i;
00757 }
```

Here is the call graph for this function:

4.11.2.8 window_get_norm()

```
unsigned int window_get_norm ( )
```

Function to get the norm method number.

Returns

Norm method number.

Definition at line 765 of file interface.c.

```
00766 {
00767   unsigned int i;
00768 #if DEBUG_INTERFACE
00769   fprintf (stderr, "window_get_norm: start\n");
00770 #endif
00771   i = gtk_array_get_active (window->button_norm,
      NNORMS);
00772 #if DEBUG_INTERFACE
00773   fprintf (stderr, "window_get_norm: %u\n", i);
00774   fprintf (stderr, "window_get_norm: end\n");
00775 #endif
00776   return i;
00777 }
```

Here is the call graph for this function:

4.11.2.9 window_new()

```
void window_new (
             GtkApplication * application )
```

Function to open the main window.

Parameters

application	GtkApplication struct.

Definition at line 2081 of file interface.c.

```
02082 {
```

```
02083   unsigned int i;
02084   char *buffer, *buffer2, buffer3[64];
02085   char *label_algorithm[NALGORITHMS] = {
02086     "_Monte-Carlo", _("_Sweep"), _("_Genetic")
02087   };
02088   char *tip_algorithm[NALGORITHMS] = {
02089     _("Monte-Carlo brute force algorithm"),
02090     _("Sweep brute force algorithm"),
02091     _("Genetic algorithm")
02092   };
02093   char *label_direction[NDIRECTIONS] = {
02094     _("_Coordinates descent"), _("_Random")
02095   };
02096   char *tip_direction[NDIRECTIONS] = {
02097     _("Coordinates direction estimate method"),
02098     _("Random direction estimate method")
02099   };
02100   char *label_norm[NNORMS] = { "L2", "L", "Lp", "L1" };
02101   char *tip_norm[NNORMS] = {
02102     _("Euclidean error norm (L2)"),
02103     _("Maximum error norm (L)"),
02104     _("P error norm (Lp)"),
02105     _("Taxicab error norm (L1)")
02106   };
02107
02108 #if DEBUG_INTERFACE
02109   fprintf (stderr, "window_new: start\n");
02110 #endif
02111
02112   // Creating the window
02113   window->window = main_window
02114     = (GtkWindow *) gtk_application_window_new (application);
02115
02116   // Finish when closing the window
02117   g_signal_connect_swapped (window->window, "delete-event",
02118                             G_CALLBACK (g_application_quit),
02119                             G_APPLICATION (application));
02120
02121   // Setting the window title
02122   gtk_window_set_title (window->window, "MPCOTool");
02123
02124   // Creating the open button
02125   window->button_open = (GtkToolButton *) gtk_tool_button_new
02126     (gtk_image_new_from_icon_name ("document-open",
02127                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Open"));
02128   g_signal_connect (window->button_open, "clicked", window_open, NULL);
02129
02130   // Creating the save button
02131   window->button_save = (GtkToolButton *) gtk_tool_button_new
02132     (gtk_image_new_from_icon_name ("document-save",
02133                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Save"));
02134   g_signal_connect (window->button_save, "clicked", (GCallback)
      window_save,
02135                     NULL);
02136
02137   // Creating the run button
02138   window->button_run = (GtkToolButton *) gtk_tool_button_new
02139     (gtk_image_new_from_icon_name ("system-run",
02140                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Run"));
02141   g_signal_connect (window->button_run, "clicked", window_run, NULL);
02142
02143   // Creating the options button
02144   window->button_options = (GtkToolButton *) gtk_tool_button_new
02145     (gtk_image_new_from_icon_name ("preferences-system",
02146                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Options"));
02147   g_signal_connect (window->button_options, "clicked",
      options_new, NULL);
02148
02149   // Creating the help button
02150   window->button_help = (GtkToolButton *) gtk_tool_button_new
02151     (gtk_image_new_from_icon_name ("help-browser",
02152                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Help"));
02153   g_signal_connect (window->button_help, "clicked", window_help, NULL);
02154
02155   // Creating the about button
02156   window->button_about = (GtkToolButton *) gtk_tool_button_new
02157     (gtk_image_new_from_icon_name ("help-about",
02158                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("About"));
02159   g_signal_connect (window->button_about, "clicked",
      window_about, NULL);
02160
02161   // Creating the exit button
02162   window->button_exit = (GtkToolButton *) gtk_tool_button_new
02163     (gtk_image_new_from_icon_name ("application-exit",
02164                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Exit"));
02165   g_signal_connect_swapped (window->button_exit, "clicked",
02166                             G_CALLBACK (g_application_quit),
```

```
02167                             G_APPLICATION (application));
02168
02169   // Creating the buttons bar
02170   window->bar_buttons = (GtkToolbar *) gtk_toolbar_new ();
02171   gtk_toolbar_insert
02172     (window->bar_buttons, GTK_TOOL_ITEM (window->
      button_open), 0);
02173   gtk_toolbar_insert
02174     (window->bar_buttons, GTK_TOOL_ITEM (window->
      button_save), 1);
02175   gtk_toolbar_insert
02176     (window->bar_buttons, GTK_TOOL_ITEM (window->
      button_run), 2);
02177   gtk_toolbar_insert
02178     (window->bar_buttons, GTK_TOOL_ITEM (window->
      button_options), 3);
02179   gtk_toolbar_insert
02180     (window->bar_buttons, GTK_TOOL_ITEM (window->
      button_help), 4);
02181   gtk_toolbar_insert
02182     (window->bar_buttons, GTK_TOOL_ITEM (window->
      button_about), 5);
02183   gtk_toolbar_insert
02184     (window->bar_buttons, GTK_TOOL_ITEM (window->
      button_exit), 6);
02185   gtk_toolbar_set_style (window->bar_buttons, GTK_TOOLBAR_BOTH);
02186
02187   // Creating the simulator program label and entry
02188   window->label_simulator = (GtkLabel *) gtk_label_new (_("Simulator program"));
02189   window->button_simulator = (GtkFileChooserButton *)
02190     gtk_file_chooser_button_new (_("Simulator program"),
02191                                  GTK_FILE_CHOOSER_ACTION_OPEN);
02192   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_simulator),
02193                                _("Simulator program executable file"));
02194   gtk_widget_set_hexpand (GTK_WIDGET (window->button_simulator), TRUE);
02195
02196   // Creating the evaluator program label and entry
02197   window->check_evaluator = (GtkCheckButton *)
02198     gtk_check_button_new_with_mnemonic (_("_Evaluator program"));
02199   g_signal_connect (window->check_evaluator, "toggled",
      window_update, NULL);
02200   window->button_evaluator = (GtkFileChooserButton *)
02201     gtk_file_chooser_button_new (_("Evaluator program"),
02202                                  GTK_FILE_CHOOSER_ACTION_OPEN);
02203   gtk_widget_set_tooltip_text
02204     (GTK_WIDGET (window->button_evaluator),
02205      _("Optional evaluator program executable file"));
02206
02207   // Creating the results files labels and entries
02208   window->label_result = (GtkLabel *) gtk_label_new (_("Result file"));
02209   window->entry_result = (GtkEntry *) gtk_entry_new ();
02210   gtk_widget_set_tooltip_text
02211     (GTK_WIDGET (window->entry_result), _("Best results file"));
02212   window->label_variables = (GtkLabel *) gtk_label_new (_("Variables file"));
02213   window->entry_variables = (GtkEntry *) gtk_entry_new ();
02214   gtk_widget_set_tooltip_text
02215     (GTK_WIDGET (window->entry_variables), _("All simulated results file"));
02216
02217   // Creating the files grid and attaching widgets
02218   window->grid_files = (GtkGrid *) gtk_grid_new ();
02219   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      label_simulator),
02220                    0, 0, 1, 1);
02221   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      button_simulator),
02222                    1, 0, 1, 1);
02223   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      check_evaluator),
02224                    0, 1, 1, 1);
02225   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      button_evaluator),
02226                    1, 1, 1, 1);
02227   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      label_result),
02228                    0, 2, 1, 1);
02229   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      entry_result),
02230                    1, 2, 1, 1);
02231   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      label_variables),
02232                    0, 3, 1, 1);
02233   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      entry_variables),
02234                    1, 3, 1, 1);
02235
02236   // Creating the algorithm properties
02237   window->label_simulations = (GtkLabel *) gtk_label_new
```

```
02238     (_("Simulations number"));
02239   window->spin_simulations
02240     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
02241   gtk_widget_set_tooltip_text
02242     (GTK_WIDGET (window->spin_simulations),
02243      _("Number of simulations to perform for each iteration"));
02244   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_simulations), TRUE);
02245   window->label_iterations = (GtkLabel *)
02246     gtk_label_new (_("Iterations number"));
02247   window->spin_iterations
02248     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
02249   gtk_widget_set_tooltip_text
02250     (GTK_WIDGET (window->spin_iterations), _("Number of iterations"));
02251   g_signal_connect
02252     (window->spin_iterations, "value-changed",
      window_update, NULL);
02253   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_iterations), TRUE);
02254   window->label_tolerance = (GtkLabel *) gtk_label_new (_("Tolerance"));
02255   window->spin_tolerance =
02256     (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02257   gtk_widget_set_tooltip_text
02258     (GTK_WIDGET (window->spin_tolerance),
02259      _("Tolerance to set the variable interval on the next iteration"));
02260   window->label_bests = (GtkLabel *) gtk_label_new (_("Bests number"));
02261   window->spin_bests
02262     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
02263   gtk_widget_set_tooltip_text
02264     (GTK_WIDGET (window->spin_bests),
02265      _("Number of best simulations used to set the variable interval "
02266        "on the next iteration"));
02267   window->label_population
02268     = (GtkLabel *) gtk_label_new (_("Population number"));
02269   window->spin_population
02270     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
02271   gtk_widget_set_tooltip_text
02272     (GTK_WIDGET (window->spin_population),
02273      _("Number of population for the genetic algorithm"));
02274   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_population), TRUE);
02275   window->label_generations
02276     = (GtkLabel *) gtk_label_new (_("Generations number"));
02277   window->spin_generations
02278     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
02279   gtk_widget_set_tooltip_text
02280     (GTK_WIDGET (window->spin_generations),
02281      _("Number of generations for the genetic algorithm"));
02282   window->label_mutation = (GtkLabel *) gtk_label_new (_("Mutation ratio"));
02283   window->spin_mutation
02284     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02285   gtk_widget_set_tooltip_text
02286     (GTK_WIDGET (window->spin_mutation),
02287      _("Ratio of mutation for the genetic algorithm"));
02288   window->label_reproduction
02289     = (GtkLabel *) gtk_label_new (_("Reproduction ratio"));
02290   window->spin_reproduction
02291     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02292   gtk_widget_set_tooltip_text
02293     (GTK_WIDGET (window->spin_reproduction),
02294      _("Ratio of reproduction for the genetic algorithm"));
02295   window->label_adaptation = (GtkLabel *) gtk_label_new (_("Adaptation ratio"));
02296   window->spin_adaptation
02297     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02298   gtk_widget_set_tooltip_text
02299     (GTK_WIDGET (window->spin_adaptation),
02300      _("Ratio of adaptation for the genetic algorithm"));
02301   window->label_threshold = (GtkLabel *) gtk_label_new (_("Threshold"));
02302   window->spin_threshold = (GtkSpinButton *)
02303     gtk_spin_button_new_with_range (-G_MAXDOUBLE, G_MAXDOUBLE,
02304                                     precision[DEFAULT_PRECISION]);
02305   gtk_widget_set_tooltip_text
02306     (GTK_WIDGET (window->spin_threshold),
02307      _("Threshold in the objective function to finish the simulations"));
02308   window->scrolled_threshold =
02309     (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02310   gtk_container_add (GTK_CONTAINER (window->scrolled_threshold),
02311                      GTK_WIDGET (window->spin_threshold));
02312 //  gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_threshold), TRUE);
02313 //  gtk_widget_set_halign (GTK_WIDGET (window->scrolled_threshold),
02314 //                         GTK_ALIGN_FILL);
02315
02316   // Creating the direction search method properties
02317   window->check_direction = (GtkCheckButton *)
02318     gtk_check_button_new_with_mnemonic (_("_Direction search method"));
02319   g_signal_connect (window->check_direction, "clicked",
      window_update, NULL);
02320   window->grid_direction = (GtkGrid *) gtk_grid_new ();
02321   window->button_direction[0] = (GtkRadioButton *)
02322     gtk_radio_button_new_with_mnemonic (NULL, label_direction[0]);
```

```
02323   gtk_grid_attach (window->grid_direction,
02324                    GTK_WIDGET (window->button_direction[0]), 0, 0, 1, 1);
02325   g_signal_connect (window->button_direction[0], "clicked",
      window_update,
02326                     NULL);
02327   for (i = 0; ++i < NDIRECTIONS;)
02328     {
02329       window->button_direction[i] = (GtkRadioButton *)
02330         gtk_radio_button_new_with_mnemonic
02331         (gtk_radio_button_get_group (window->button_direction[0]),
02332          label_direction[i]);
02333       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_direction[i]),
02334                                    tip_direction[i]);
02335       gtk_grid_attach (window->grid_direction,
02336                        GTK_WIDGET (window->button_direction[i]), 0, i, 1, 1);
02337       g_signal_connect (window->button_direction[i], "clicked",
02338                         window_update, NULL);
02339     }
02340   window->label_steps = (GtkLabel *) gtk_label_new (_("Steps number"));
02341   window->spin_steps = (GtkSpinButton *)
02342     gtk_spin_button_new_with_range (1., 1.e12, 1.);
02343   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_steps), TRUE);
02344   window->label_estimates
02345     = (GtkLabel *) gtk_label_new (_("Direction estimates number"));
02346   window->spin_estimates = (GtkSpinButton *)
02347     gtk_spin_button_new_with_range (1., 1.e3, 1.);
02348   window->label_relaxation
02349     = (GtkLabel *) gtk_label_new (_("Relaxation parameter"));
02350   window->spin_relaxation = (GtkSpinButton *)
02351     gtk_spin_button_new_with_range (0., 2., 0.001);
02352   gtk_grid_attach (window->grid_direction, GTK_WIDGET (
      window->label_steps),
02353                    0, NDIRECTIONS, 1, 1);
02354   gtk_grid_attach (window->grid_direction, GTK_WIDGET (
      window->spin_steps),
02355                    1, NDIRECTIONS, 1, 1);
02356   gtk_grid_attach (window->grid_direction,
02357                    GTK_WIDGET (window->label_estimates), 0, NDIRECTIONS + 1,
02358                    1, 1);
02359   gtk_grid_attach (window->grid_direction,
02360                    GTK_WIDGET (window->spin_estimates), 1, NDIRECTIONS + 1, 1,
02361                    1);
02362   gtk_grid_attach (window->grid_direction,
02363                    GTK_WIDGET (window->label_relaxation), 0, NDIRECTIONS + 2,
02364                    1, 1);
02365   gtk_grid_attach (window->grid_direction,
02366                    GTK_WIDGET (window->spin_relaxation), 1, NDIRECTIONS + 2,
02367                    1, 1);
02368
02369   // Creating the array of algorithms
02370   window->grid_algorithm = (GtkGrid *) gtk_grid_new ();
02371   window->button_algorithm[0] = (GtkRadioButton *)
02372     gtk_radio_button_new_with_mnemonic (NULL, label_algorithm[0]);
02373   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[0]),
02374                                tip_algorithm[0]);
02375   gtk_grid_attach (window->grid_algorithm,
02376                    GTK_WIDGET (window->button_algorithm[0]), 0, 0, 1, 1);
02377   g_signal_connect (window->button_algorithm[0], "clicked",
02378                     window_set_algorithm, NULL);
02379   for (i = 0; ++i < NALGORITHMS;)
02380     {
02381       window->button_algorithm[i] = (GtkRadioButton *)
02382         gtk_radio_button_new_with_mnemonic
02383         (gtk_radio_button_get_group (window->button_algorithm[0]),
02384          label_algorithm[i]);
02385       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[i]),
02386                                    tip_algorithm[i]);
02387       gtk_grid_attach (window->grid_algorithm,
02388                        GTK_WIDGET (window->button_algorithm[i]), 0, i, 1, 1);
02389       g_signal_connect (window->button_algorithm[i], "clicked",
02390                         window_set_algorithm, NULL);
02391     }
02392   gtk_grid_attach (window->grid_algorithm,
02393                    GTK_WIDGET (window->label_simulations), 0,
02394                    NALGORITHMS, 1, 1);
02395   gtk_grid_attach (window->grid_algorithm,
02396                    GTK_WIDGET (window->spin_simulations), 1, NALGORITHMS, 1, 1);
02397   gtk_grid_attach (window->grid_algorithm,
02398                    GTK_WIDGET (window->label_iterations), 0, NALGORITHMS + 1,
02399                    1, 1);
02400   gtk_grid_attach (window->grid_algorithm,
02401                    GTK_WIDGET (window->spin_iterations), 1, NALGORITHMS + 1,
02402                    1, 1);
02403   gtk_grid_attach (window->grid_algorithm,
02404                    GTK_WIDGET (window->label_tolerance), 0, NALGORITHMS + 2,
02405                    1, 1);
02406   gtk_grid_attach (window->grid_algorithm,
```

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02407                   GTK_WIDGET (window->spin_tolerance), 1, NALGORITHMS + 2, 1,
02408                   1);
02409   gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (
      window->label_bests),
02410                   0, NALGORITHMS + 3, 1, 1);
02411   gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (
      window->spin_bests), 1,
02412                   NALGORITHMS + 3, 1, 1);
02413   gtk_grid_attach (window->grid_algorithm,
02414                   GTK_WIDGET (window->label_population), 0, NALGORITHMS + 4,
02415                   1, 1);
02416   gtk_grid_attach (window->grid_algorithm,
02417                   GTK_WIDGET (window->spin_population), 1, NALGORITHMS + 4,
02418                   1, 1);
02419   gtk_grid_attach (window->grid_algorithm,
02420                   GTK_WIDGET (window->label_generations), 0, NALGORITHMS + 5,
02421                   1, 1);
02422   gtk_grid_attach (window->grid_algorithm,
02423                   GTK_WIDGET (window->spin_generations), 1, NALGORITHMS + 5,
02424                   1, 1);
02425   gtk_grid_attach (window->grid_algorithm,
02426                   GTK_WIDGET (window->label_mutation), 0, NALGORITHMS + 6, 1,
02427                   1);
02428   gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (
      window->spin_mutation),
02429                   1, NALGORITHMS + 6, 1, 1);
02430   gtk_grid_attach (window->grid_algorithm,
02431                   GTK_WIDGET (window->label_reproduction), 0,
02432                   NALGORITHMS + 7, 1, 1);
02433   gtk_grid_attach (window->grid_algorithm,
02434                   GTK_WIDGET (window->spin_reproduction), 1, NALGORITHMS + 7,
02435                   1, 1);
02436   gtk_grid_attach (window->grid_algorithm,
02437                   GTK_WIDGET (window->label_adaptation), 0, NALGORITHMS + 8,
02438                   1, 1);
02439   gtk_grid_attach (window->grid_algorithm,
02440                   GTK_WIDGET (window->spin_adaptation), 1, NALGORITHMS + 8,
02441                   1, 1);
02442   gtk_grid_attach (window->grid_algorithm,
02443                   GTK_WIDGET (window->check_direction), 0, NALGORITHMS + 9,
02444                   2, 1);
02445   gtk_grid_attach (window->grid_algorithm,
02446                   GTK_WIDGET (window->grid_direction), 0, NALGORITHMS + 10,
02447                   2, 1);
02448   gtk_grid_attach (window->grid_algorithm,
02449                   GTK_WIDGET (window->label_threshold), 0, NALGORITHMS + 11,
02450                   1, 1);
02451   gtk_grid_attach (window->grid_algorithm,
02452                   GTK_WIDGET (window->scrolled_threshold), 1,
02453                   NALGORITHMS + 11, 1, 1);
02454   window->frame_algorithm = (GtkFrame *) gtk_frame_new (_("Algorithm"));
02455   gtk_container_add (GTK_CONTAINER (window->frame_algorithm),
02456                      GTK_WIDGET (window->grid_algorithm));
02457
02458   // Creating the variable widgets
02459   window->combo_variable = (GtkComboBoxText *) gtk_combo_box_text_new ();
02460   gtk_widget_set_tooltip_text
02461     (GTK_WIDGET (window->combo_variable), _("Variables selector"));
02462   window->id_variable = g_signal_connect
02463     (window->combo_variable, "changed", window_set_variable, NULL);
02464   window->button_add_variable
02465     = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
02466                                                    GTK_ICON_SIZE_BUTTON);
02467   g_signal_connect
02468     (window->button_add_variable, "clicked",
      window_add_variable, NULL);
02469   gtk_widget_set_tooltip_text
02470     (GTK_WIDGET (window->button_add_variable), _("Add variable"));
02471   window->button_remove_variable
02472     = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
02473                                                    GTK_ICON_SIZE_BUTTON);
02474   g_signal_connect
02475     (window->button_remove_variable, "clicked",
      window_remove_variable, NULL);
02476   gtk_widget_set_tooltip_text
02477     (GTK_WIDGET (window->button_remove_variable), _("Remove variable"));
02478   window->label_variable = (GtkLabel *) gtk_label_new (_("Name"));
02479   window->entry_variable = (GtkEntry *) gtk_entry_new ();
02480   gtk_widget_set_tooltip_text
02481     (GTK_WIDGET (window->entry_variable), _("Variable name"));
02482   gtk_widget_set_hexpand (GTK_WIDGET (window->entry_variable), TRUE);
02483   window->id_variable_label = g_signal_connect
02484     (window->entry_variable, "changed",
      window_label_variable, NULL);
02485   window->label_min = (GtkLabel *) gtk_label_new (_("Minimum"));
02486   window->spin_min = (GtkSpinButton *) gtk_spin_button_new_with_range
02487     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
```

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02488   gtk_widget_set_tooltip_text
02489     (GTK_WIDGET (window->spin_min), _("Minimum initial value of the variable"));
02490   window->scrolled_min
02491     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02492   gtk_container_add (GTK_CONTAINER (window->scrolled_min),
02493                      GTK_WIDGET (window->spin_min));
02494   g_signal_connect (window->spin_min, "value-changed",
02495                     window_rangemin_variable, NULL);
02496   window->label_max = (GtkLabel *) gtk_label_new (_("Maximum"));
02497   window->spin_max = (GtkSpinButton *) gtk_spin_button_new_with_range
02498     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02499   gtk_widget_set_tooltip_text
02500     (GTK_WIDGET (window->spin_max), _("Maximum initial value of the variable"));
02501   window->scrolled_max
02502     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02503   gtk_container_add (GTK_CONTAINER (window->scrolled_max),
02504                      GTK_WIDGET (window->spin_max));
02505   g_signal_connect (window->spin_max, "value-changed",
02506                     window_rangemax_variable, NULL);
02507   window->check_minabs = (GtkCheckButton *)
02508     gtk_check_button_new_with_mnemonic (_("_Absolute minimum"));
02509   g_signal_connect (window->check_minabs, "toggled",
      window_update, NULL);
02510   window->spin_minabs = (GtkSpinButton *) gtk_spin_button_new_with_range
02511     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02512   gtk_widget_set_tooltip_text
02513     (GTK_WIDGET (window->spin_minabs),
02514      _("Minimum allowed value of the variable"));
02515   window->scrolled_minabs
02516     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02517   gtk_container_add (GTK_CONTAINER (window->scrolled_minabs),
02518                      GTK_WIDGET (window->spin_minabs));
02519   g_signal_connect (window->spin_minabs, "value-changed",
02520                     window_rangeminabs_variable, NULL);
02521   window->check_maxabs = (GtkCheckButton *)
02522     gtk_check_button_new_with_mnemonic (_("_Absolute maximum"));
02523   g_signal_connect (window->check_maxabs, "toggled",
      window_update, NULL);
02524   window->spin_maxabs = (GtkSpinButton *) gtk_spin_button_new_with_range
02525     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02526   gtk_widget_set_tooltip_text
02527     (GTK_WIDGET (window->spin_maxabs),
02528      _("Maximum allowed value of the variable"));
02529   window->scrolled_maxabs
02530     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02531   gtk_container_add (GTK_CONTAINER (window->scrolled_maxabs),
02532                      GTK_WIDGET (window->spin_maxabs));
02533   g_signal_connect (window->spin_maxabs, "value-changed",
02534                     window_rangemaxabs_variable, NULL);
02535   window->label_precision = (GtkLabel *) gtk_label_new (_("Precision digits"));
02536   window->spin_precision = (GtkSpinButton *)
02537     gtk_spin_button_new_with_range (0., (gdouble) DEFAULT_PRECISION, 1.);
02538   gtk_widget_set_tooltip_text
02539     (GTK_WIDGET (window->spin_precision),
02540      _("Number of precision floating point digits\n"
02541        "0 is for integer numbers"));
02542   g_signal_connect (window->spin_precision, "value-changed",
02543                     window_precision_variable, NULL);
02544   window->label_sweeps = (GtkLabel *) gtk_label_new (_("Sweeps number"));
02545   window->spin_sweeps =
02546     (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
02547   gtk_widget_set_tooltip_text (GTK_WIDGET (window->spin_sweeps),
02548                                _("Number of steps sweeping the variable"));
02549   g_signal_connect (window->spin_sweeps, "value-changed",
02550                     window_update_variable, NULL);
02551   window->label_bits = (GtkLabel *) gtk_label_new (_("Bits number"));
02552   window->spin_bits
02553     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
02554   gtk_widget_set_tooltip_text
02555     (GTK_WIDGET (window->spin_bits),
02556      _("Number of bits to encode the variable"));
02557   g_signal_connect
02558     (window->spin_bits, "value-changed", window_update_variable, NULL)
    ;
02559   window->label_step = (GtkLabel *) gtk_label_new (_("Step size"));
02560   window->spin_step = (GtkSpinButton *) gtk_spin_button_new_with_range
02561     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02562   gtk_widget_set_tooltip_text
02563     (GTK_WIDGET (window->spin_step),
02564      _("Initial step size for the direction search method"));
02565   window->scrolled_step
02566     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02567   gtk_container_add (GTK_CONTAINER (window->scrolled_step),
02568                      GTK_WIDGET (window->spin_step));
02569   g_signal_connect
02570     (window->spin_step, "value-changed", window_step_variable, NULL);
02571   window->grid_variable = (GtkGrid *) gtk_grid_new ();
```

```
02572   gtk_grid_attach (window->grid_variable,
02573                    GTK_WIDGET (window->combo_variable), 0, 0, 2, 1);
02574   gtk_grid_attach (window->grid_variable,
02575                    GTK_WIDGET (window->button_add_variable), 2, 0, 1, 1);
02576   gtk_grid_attach (window->grid_variable,
02577                    GTK_WIDGET (window->button_remove_variable), 3, 0, 1, 1);
02578   gtk_grid_attach (window->grid_variable,
02579                    GTK_WIDGET (window->label_variable), 0, 1, 1, 1);
02580   gtk_grid_attach (window->grid_variable,
02581                    GTK_WIDGET (window->entry_variable), 1, 1, 3, 1);
02582   gtk_grid_attach (window->grid_variable,
02583                    GTK_WIDGET (window->label_min), 0, 2, 1, 1);
02584   gtk_grid_attach (window->grid_variable,
02585                    GTK_WIDGET (window->scrolled_min), 1, 2, 3, 1);
02586   gtk_grid_attach (window->grid_variable,
02587                    GTK_WIDGET (window->label_max), 0, 3, 1, 1);
02588   gtk_grid_attach (window->grid_variable,
02589                    GTK_WIDGET (window->scrolled_max), 1, 3, 3, 1);
02590   gtk_grid_attach (window->grid_variable,
02591                    GTK_WIDGET (window->check_minabs), 0, 4, 1, 1);
02592   gtk_grid_attach (window->grid_variable,
02593                    GTK_WIDGET (window->scrolled_minabs), 1, 4, 3, 1);
02594   gtk_grid_attach (window->grid_variable,
02595                    GTK_WIDGET (window->check_maxabs), 0, 5, 1, 1);
02596   gtk_grid_attach (window->grid_variable,
02597                    GTK_WIDGET (window->scrolled_maxabs), 1, 5, 3, 1);
02598   gtk_grid_attach (window->grid_variable,
02599                    GTK_WIDGET (window->label_precision), 0, 6, 1, 1);
02600   gtk_grid_attach (window->grid_variable,
02601                    GTK_WIDGET (window->spin_precision), 1, 6, 3, 1);
02602   gtk_grid_attach (window->grid_variable,
02603                    GTK_WIDGET (window->label_sweeps), 0, 7, 1, 1);
02604   gtk_grid_attach (window->grid_variable,
02605                    GTK_WIDGET (window->spin_sweeps), 1, 7, 3, 1);
02606   gtk_grid_attach (window->grid_variable,
02607                    GTK_WIDGET (window->label_bits), 0, 8, 1, 1);
02608   gtk_grid_attach (window->grid_variable,
02609                    GTK_WIDGET (window->spin_bits), 1, 8, 3, 1);
02610   gtk_grid_attach (window->grid_variable,
02611                    GTK_WIDGET (window->label_step), 0, 9, 1, 1);
02612   gtk_grid_attach (window->grid_variable,
02613                    GTK_WIDGET (window->scrolled_step), 1, 9, 3, 1);
02614   window->frame_variable = (GtkFrame *) gtk_frame_new (_("Variable"));
02615   gtk_container_add (GTK_CONTAINER (window->frame_variable),
02616                      GTK_WIDGET (window->grid_variable));
02617
02618   // Creating the experiment widgets
02619   window->combo_experiment = (GtkComboBoxText *) gtk_combo_box_text_new ();
02620   gtk_widget_set_tooltip_text (GTK_WIDGET (window->combo_experiment),
02621                                _("Experiment selector"));
02622   window->id_experiment = g_signal_connect
02623     (window->combo_experiment, "changed",
    window_set_experiment, NULL);
02624   window->button_add_experiment
02625     = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
02626                                                    GTK_ICON_SIZE_BUTTON);
02627   g_signal_connect
02628     (window->button_add_experiment, "clicked",
    window_add_experiment, NULL);
02629   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_experiment),
02630                                _("Add experiment"));
02631   window->button_remove_experiment
02632     = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
02633                                                    GTK_ICON_SIZE_BUTTON);
02634   g_signal_connect (window->button_remove_experiment, "clicked",
02635                     window_remove_experiment, NULL);
02636   gtk_widget_set_tooltip_text (GTK_WIDGET (window->
    button_remove_experiment),
02637                                _("Remove experiment"));
02638   window->label_experiment
02639     = (GtkLabel *) gtk_label_new (_("Experimental data file"));
02640   window->button_experiment = (GtkFileChooserButton *)
02641     gtk_file_chooser_button_new (_("Experimental data file"),
02642                                  GTK_FILE_CHOOSER_ACTION_OPEN);
02643   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_experiment),
02644                                _("Experimental data file"));
02645   window->id_experiment_name
02646     = g_signal_connect (window->button_experiment, "selection-changed",
02647                         window_name_experiment, NULL);
02648   gtk_widget_set_hexpand (GTK_WIDGET (window->button_experiment), TRUE);
02649   window->label_weight = (GtkLabel *) gtk_label_new (_("Weight"));
02650   window->spin_weight
02651     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02652   gtk_widget_set_tooltip_text
02653     (GTK_WIDGET (window->spin_weight),
02654      _("Weight factor to build the objective function"));
02655   g_signal_connect
```

```
02656     (window->spin_weight, "value-changed",
      window_weight_experiment, NULL);
02657   window->grid_experiment = (GtkGrid *) gtk_grid_new ();
02658   gtk_grid_attach (window->grid_experiment,
02659                    GTK_WIDGET (window->combo_experiment), 0, 0, 2, 1);
02660   gtk_grid_attach (window->grid_experiment,
02661                    GTK_WIDGET (window->button_add_experiment), 2, 0, 1, 1);
02662   gtk_grid_attach (window->grid_experiment,
02663                    GTK_WIDGET (window->button_remove_experiment), 3, 0, 1, 1)
      ;
02664   gtk_grid_attach (window->grid_experiment,
02665                    GTK_WIDGET (window->label_experiment), 0, 1, 1, 1);
02666   gtk_grid_attach (window->grid_experiment,
02667                    GTK_WIDGET (window->button_experiment), 1, 1, 3, 1);
02668   gtk_grid_attach (window->grid_experiment,
02669                    GTK_WIDGET (window->label_weight), 0, 2, 1, 1);
02670   gtk_grid_attach (window->grid_experiment,
02671                    GTK_WIDGET (window->spin_weight), 1, 2, 3, 1);
02672   for (i = 0; i < MAX_NINPUTS; ++i)
02673     {
02674       snprintf (buffer3, 64, "%s %u", _("Input template"), i + 1);
02675       window->check_template[i] = (GtkCheckButton *)
02676         gtk_check_button_new_with_label (buffer3);
02677       window->id_template[i]
02678         = g_signal_connect (window->check_template[i], "toggled",
02679                             window_inputs_experiment, NULL);
02680       gtk_grid_attach (window->grid_experiment,
02681                        GTK_WIDGET (window->check_template[i]), 0, 3 + i, 1, 1);
02682       window->button_template[i] =
02683         (GtkFileChooserButton *)
02684         gtk_file_chooser_button_new (_("Input template"),
02685                                      GTK_FILE_CHOOSER_ACTION_OPEN);
02686       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_template[i]),
02687                                    _("Experimental input template file"));
02688       window->id_input[i] =
02689         g_signal_connect_swapped (window->button_template[i],
02690                                   "selection-changed",
02691                                   (GCallback) window_template_experiment,
02692                                   (void *) (size_t) i);
02693       gtk_grid_attach (window->grid_experiment,
02694                        GTK_WIDGET (window->button_template[i]), 1, 3 + i, 3, 1);
02695     }
02696   window->frame_experiment = (GtkFrame *) gtk_frame_new (_("Experiment"));
02697   gtk_container_add (GTK_CONTAINER (window->frame_experiment),
02698                      GTK_WIDGET (window->grid_experiment));
02699
02700   // Creating the error norm widgets
02701   window->frame_norm = (GtkFrame *) gtk_frame_new (_("Error norm"));
02702   window->grid_norm = (GtkGrid *) gtk_grid_new ();
02703   gtk_container_add (GTK_CONTAINER (window->frame_norm),
02704                      GTK_WIDGET (window->grid_norm));
02705   window->button_norm[0] = (GtkRadioButton *)
02706     gtk_radio_button_new_with_mnemonic (NULL, label_norm[0]);
02707   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[0]),
02708                                tip_norm[0]);
02709   gtk_grid_attach (window->grid_norm,
02710                    GTK_WIDGET (window->button_norm[0]), 0, 0, 1, 1);
02711   g_signal_connect (window->button_norm[0], "clicked",
      window_update, NULL);
02712   for (i = 0; ++i < NNORMS;)
02713     {
02714       window->button_norm[i] = (GtkRadioButton *)
02715         gtk_radio_button_new_with_mnemonic
02716         (gtk_radio_button_get_group (window->button_norm[0]), label_norm[i]);
02717       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[i]),
02718                                    tip_norm[i]);
02719       gtk_grid_attach (window->grid_norm,
02720                        GTK_WIDGET (window->button_norm[i]), 0, i, 1, 1);
02721       g_signal_connect (window->button_norm[i], "clicked",
      window_update, NULL);
02722     }
02723   window->label_p = (GtkLabel *) gtk_label_new (_("P parameter"));
02724   gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->
      label_p), 1, 1, 1, 1);
02725   window->spin_p =
02726     (GtkSpinButton *) gtk_spin_button_new_with_range (-G_MAXDOUBLE,
02727                                                       G_MAXDOUBLE, 0.01);
02728   gtk_widget_set_tooltip_text (GTK_WIDGET (window->spin_p),
02729                                _("P parameter for the P error norm"));
02730   window->scrolled_p =
02731     (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02732   gtk_container_add (GTK_CONTAINER (window->scrolled_p),
02733                      GTK_WIDGET (window->spin_p));
02734   gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_p), TRUE);
02735   gtk_widget_set_halign (GTK_WIDGET (window->scrolled_p), GTK_ALIGN_FILL);
02736   gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->
      scrolled_p),
```

```
02737                   1, 2, 1, 2);
02738
02739   // Creating the grid and attaching the widgets to the grid
02740   window->grid = (GtkGrid *) gtk_grid_new ();
02741   gtk_grid_attach (window->grid, GTK_WIDGET (window->bar_buttons), 0, 0, 3, 1);
02742   gtk_grid_attach (window->grid, GTK_WIDGET (window->grid_files), 0, 1, 1, 1);
02743   gtk_grid_attach (window->grid,
02744                    GTK_WIDGET (window->frame_algorithm), 0, 2, 1, 1);
02745   gtk_grid_attach (window->grid,
02746                    GTK_WIDGET (window->frame_variable), 1, 2, 1, 1);
02747   gtk_grid_attach (window->grid,
02748                    GTK_WIDGET (window->frame_experiment), 2, 2, 1, 1);
02749   gtk_grid_attach (window->grid, GTK_WIDGET (window->frame_norm), 1, 1, 2, 1);
02750   gtk_container_add (GTK_CONTAINER (window->window), GTK_WIDGET (
      window->grid));
02751
02752   // Setting the window logo
02753   window->logo = gdk_pixbuf_new_from_xpm_data (logo);
02754   gtk_window_set_icon (window->window, window->logo);
02755
02756   // Showing the window
02757   gtk_widget_show_all (GTK_WIDGET (window->window));
02758
02759   // In GTK+ 3.16 and 3.18 the default scrolled size is wrong
02760 #if GTK_MINOR_VERSION >= 16
02761   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_min), -1, 40);
02762   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_max), -1, 40);
02763   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_minabs), -1, 40);
02764   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_maxabs), -1, 40);
02765   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_step), -1, 40);
02766   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_p), -1, 40);
02767   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_threshold), -1, 40);
02768 #endif
02769
02770   // Reading initial example
02771   input_new ();
02772   buffer2 = g_get_current_dir ();
02773   buffer = g_build_filename (buffer2, "..", "tests", "test1", INPUT_FILE, NULL);
02774   g_free (buffer2);
02775   window_read (buffer);
02776   g_free (buffer);
02777
02778 #if DEBUG_INTERFACE
02779   fprintf (stderr, "window_new: start\n");
02780 #endif
02781 }
```

4.11.2.10 window_read()

```
int window_read (
             char * filename )
```

Function to read the input data of a file.

Parameters

filename	File name.

Returns

1 on succes, 0 on error.

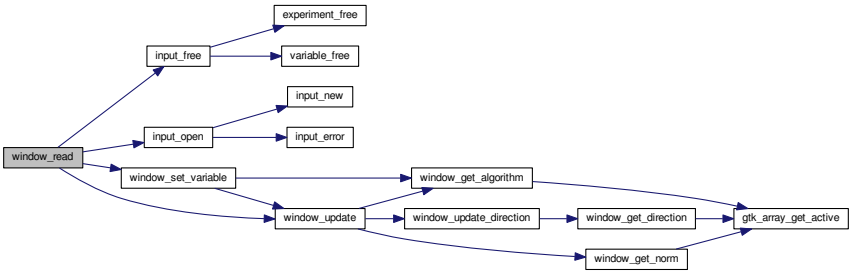
Definition at line 1877 of file interface.c.

```
01878 {
01879   unsigned int i;
01880   char *buffer;
```

```
01881 #if DEBUG_INTERFACE
01882   fprintf (stderr, "window_read: start\n");
01883 #endif
01884
01885   // Reading new input file
01886   input_free ();
01887     input->result = input->variables = NULL;
01888   if (!input_open (filename))
01889     {
01890 #if DEBUG_INTERFACE
01891       fprintf (stderr, "window_read: end\n");
01892 #endif
01893       return 0;
01894     }
01895
01896   // Setting GTK+ widgets data
01897   gtk_entry_set_text (window->entry_result, input->result);
01898   gtk_entry_set_text (window->entry_variables, input->
      variables);
01899   buffer = g_build_filename (input->directory, input->
      simulator, NULL);
01900   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01901                                  (window->button_simulator), buffer);
01902   g_free (buffer);
01903   gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
01904                                 (size_t) input->evaluator);
01905   if (input->evaluator)
01906     {
01907       buffer = g_build_filename (input->directory, input->
      evaluator, NULL);
01908       gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01909                                      (window->button_evaluator), buffer);
01910       g_free (buffer);
01911     }
01912   gtk_toggle_button_set_active
01913     (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
      algorithm]), TRUE);
01914   switch (input->algorithm)
01915     {
01916     case ALGORITHM_MONTE_CARLO:
01917       gtk_spin_button_set_value (window->spin_simulations,
01918                                  (gdouble) input->nsimulations);
01919     case ALGORITHM_SWEEP:
01920       gtk_spin_button_set_value (window->spin_iterations,
01921                                  (gdouble) input->niterations);
01922       gtk_spin_button_set_value (window->spin_bests, (gdouble)
      input->nbest);
01923       gtk_spin_button_set_value (window->spin_tolerance,
      input->tolerance);
01924       gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON
01925                                     (window->check_direction),
      input->nsteps);
01926       if (input->nsteps)
01927         {
01928           gtk_toggle_button_set_active
01929             (GTK_TOGGLE_BUTTON (window->button_direction
01930                                 [input->direction]), TRUE);
01931           gtk_spin_button_set_value (window->spin_steps,
01932                                      (gdouble) input->nsteps);
01933           gtk_spin_button_set_value (window->spin_relaxation,
01934                                      (gdouble) input->relaxation);
01935           switch (input->direction)
01936             {
01937             case DIRECTION_METHOD_RANDOM:
01938               gtk_spin_button_set_value (window->spin_estimates,
01939                                          (gdouble) input->nestimates);
01940             }
01941         }
01942       break;
01943     default:
01944       gtk_spin_button_set_value (window->spin_population,
01945                                  (gdouble) input->nsimulations);
01946       gtk_spin_button_set_value (window->spin_generations,
01947                                  (gdouble) input->niterations);
01948       gtk_spin_button_set_value (window->spin_mutation, input->
      mutation_ratio);
01949       gtk_spin_button_set_value (window->spin_reproduction,
01950                                  input->reproduction_ratio);
01951       gtk_spin_button_set_value (window->spin_adaptation,
01952                                  input->adaptation_ratio);
01953     }
01954   gtk_toggle_button_set_active
01955     (GTK_TOGGLE_BUTTON (window->button_norm[input->norm]), TRUE);
01956   gtk_spin_button_set_value (window->spin_p, input->p);
01957   gtk_spin_button_set_value (window->spin_threshold, input->
      threshold);
01958   g_signal_handler_block (window->combo_experiment, window->
```

```
      id_experiment);
01959   g_signal_handler_block (window->button_experiment,
01960                           window->id_experiment_name);
01961   gtk_combo_box_text_remove_all (window->combo_experiment);
01962   for (i = 0; i < input->nexperiments; ++i)
01963     gtk_combo_box_text_append_text (window->combo_experiment,
01964                                     input->experiment[i].name);
01965   g_signal_handler_unblock
01966     (window->button_experiment, window->
      id_experiment_name);
01967   g_signal_handler_unblock (window->combo_experiment,
      window->id_experiment);
01968   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
01969   g_signal_handler_block (window->combo_variable, window->
      id_variable);
01970   g_signal_handler_block (window->entry_variable, window->
      id_variable_label);
01971   gtk_combo_box_text_remove_all (window->combo_variable);
01972   for (i = 0; i < input->nvariables; ++i)
01973     gtk_combo_box_text_append_text (window->combo_variable,
01974                                     input->variable[i].name);
01975   g_signal_handler_unblock (window->entry_variable, window->
      id_variable_label);
01976   g_signal_handler_unblock (window->combo_variable, window->
      id_variable);
01977   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
01978   window_set_variable ();
01979   window_update ();
01980
01981 #if DEBUG_INTERFACE
01982   fprintf (stderr, "window_read: end\n");
01983 #endif
01984   return 1;
01985 }
```

Here is the call graph for this function:



4.11.2.11 window_save()

```
int window_save ( )
```

Function to save the input file.

Returns

1 on OK, 0 on Cancel.

Definition at line 818 of file interface.c.

```
00819 {
00820   GtkFileChooserDialog *dlg;
00821   GtkFileFilter *filter1, *filter2;
00822   char *buffer;
00823
00824 #if DEBUG_INTERFACE
00825   fprintf (stderr, "window_save: start\n");
00826 #endif
00827
00828   // Opening the saving dialog
00829   dlg = (GtkFileChooserDialog *)
00830     gtk_file_chooser_dialog_new (_("Save file"),
00831                                  window->window,
00832                                  GTK_FILE_CHOOSER_ACTION_SAVE,
00833                                  _("_Cancel"), GTK_RESPONSE_CANCEL,
00834                                  _("_OK"), GTK_RESPONSE_OK, NULL);
00835   gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
00836   buffer = g_build_filename (input->directory, input->name, NULL);
00837   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER (dlg), buffer);
00838   g_free (buffer);
00839
00840   // Adding XML filter
00841   filter1 = (GtkFileFilter *) gtk_file_filter_new ();
00842   gtk_file_filter_set_name (filter1, "XML");
00843   gtk_file_filter_add_pattern (filter1, "*.xml");
00844   gtk_file_filter_add_pattern (filter1, "*.XML");
00845   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter1);
00846
00847   // Adding JSON filter
00848   filter2 = (GtkFileFilter *) gtk_file_filter_new ();
00849   gtk_file_filter_set_name (filter2, "JSON");
00850   gtk_file_filter_add_pattern (filter2, "*.json");
00851   gtk_file_filter_add_pattern (filter2, "*.JSON");
00852   gtk_file_filter_add_pattern (filter2, "*.js");
00853   gtk_file_filter_add_pattern (filter2, "*.JS");
00854   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter2);
00855
00856   if (input->type == INPUT_TYPE_XML)
00857     gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter1);
00858   else
00859     gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter2);
00860
00861   // If OK response then saving
00862   if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
00863     {
00864       // Setting input file type
00865       filter1 = gtk_file_chooser_get_filter (GTK_FILE_CHOOSER (dlg));
00866       buffer = (char *) gtk_file_filter_get_name (filter1);
00867       if (!strcmp (buffer, "XML"))
00868         input->type = INPUT_TYPE_XML;
00869       else
00870         input->type = INPUT_TYPE_JSON;
00871
00872       // Adding properties to the root XML node
00873       input->simulator = gtk_file_chooser_get_filename
00874         (GTK_FILE_CHOOSER (window->button_simulator));
00875       if (gtk_toggle_button_get_active
00876           (GTK_TOGGLE_BUTTON (window->check_evaluator)))
00877         input->evaluator = gtk_file_chooser_get_filename
00878           (GTK_FILE_CHOOSER (window->button_evaluator));
00879       else
00880         input->evaluator = NULL;
00881       if (input->type == INPUT_TYPE_XML)
00882         {
00883           input->result
00884             = (char *) xmlStrdup ((const xmlChar *)
00885                                   gtk_entry_get_text (window->entry_result));
00886           input->variables
00887             = (char *) xmlStrdup ((const xmlChar *)
00888                                   gtk_entry_get_text (window->
      entry_variables));
00889         }
00890       else
00891         {
00892           input->result = g_strdup (gtk_entry_get_text (window->
      entry_result));
00893           input->variables =
00894             g_strdup (gtk_entry_get_text (window->entry_variables));
00895         }
00896
00897       // Setting the algorithm
00898       switch (window_get_algorithm ())
00899         {
00900         case ALGORITHM_MONTE_CARLO:
00901           input->algorithm = ALGORITHM_MONTE_CARLO;
00902           input->nsimulations
00903             = gtk_spin_button_get_value_as_int (window->spin_simulations);
```

```
00904           input->niterations
00905             = gtk_spin_button_get_value_as_int (window->spin_iterations);
00906           input->tolerance = gtk_spin_button_get_value (window->
      spin_tolerance);
00907           input->nbest = gtk_spin_button_get_value_as_int (window->
      spin_bests);
00908           window_save_direction ();
00909           break;
00910         case ALGORITHM_SWEEP:
00911           input->algorithm = ALGORITHM_SWEEP;
00912           input->niterations
00913             = gtk_spin_button_get_value_as_int (window->spin_iterations);
00914           input->tolerance = gtk_spin_button_get_value (window->
      spin_tolerance);
00915           input->nbest = gtk_spin_button_get_value_as_int (window->
      spin_bests);
00916           window_save_direction ();
00917           break;
00918         default:
00919           input->algorithm = ALGORITHM_GENETIC;
00920           input->nsimulations
00921             = gtk_spin_button_get_value_as_int (window->spin_population);
00922           input->niterations
00923             = gtk_spin_button_get_value_as_int (window->spin_generations);
00924           input->mutation_ratio
00925             = gtk_spin_button_get_value (window->spin_mutation);
00926           input->reproduction_ratio
00927             = gtk_spin_button_get_value (window->spin_reproduction);
00928           input->adaptation_ratio
00929             = gtk_spin_button_get_value (window->spin_adaptation);
00930           break;
00931         }
00932       input->norm = window_get_norm ();
00933       input->p = gtk_spin_button_get_value (window->spin_p);
00934       input->threshold = gtk_spin_button_get_value (window->
      spin_threshold);
00935
00936       // Saving the XML file
00937       buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
00938       input_save (buffer);
00939
00940       // Closing and freeing memory
00941       g_free (buffer);
00942       gtk_widget_destroy (GTK_WIDGET (dlg));
00943 #if DEBUG_INTERFACE
00944       fprintf (stderr, "window_save: end\n");
00945 #endif
00946       return 1;
00947     }
00948
00949   // Closing and freeing memory
00950   gtk_widget_destroy (GTK_WIDGET (dlg));
00951 #if DEBUG_INTERFACE
00952   fprintf (stderr, "window_save: end\n");
00953 #endif
00954   return 0;
00955 }
```

4.11.2.12 window_template_experiment()

```
void window_template_experiment (
             void * data )
```

Function to update the experiment i-th input template in the main window.

Parameters

data	Callback data (i-th input template).

Definition at line 1521 of file interface.c.

```
01522 {
01523   unsigned int i, j;
01524   char *buffer;
01525   GFile *file1, *file2;
01526 #if DEBUG_INTERFACE
01527   fprintf (stderr, "window_template_experiment: start\n");
01528 #endif
01529   i = (size_t) data;
01530   j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01531   file1
01532     = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
01533   file2 = g_file_new_for_path (input->directory);
01534   buffer = g_file_get_relative_path (file2, file1);
01535   if (input->type == INPUT_TYPE_XML)
01536     input->experiment[j].stencil[i] = (char *) xmlStrdup ((xmlChar *) buffer);
01537   else
01538     input->experiment[j].stencil[i] = g_strdup (buffer);
01539   g_free (buffer);
01540   g_object_unref (file2);
01541   g_object_unref (file1);
01542 #if DEBUG_INTERFACE
01543   fprintf (stderr, "window_template_experiment: end\n");
01544 #endif
01545 }
```

4.12 interface.c

```
00001 /*
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
00007
00008 Copyright 2012-2017, AUTHORS.
00009
00010 Redistribution and use in source and binary forms, with or without modification,
00011 are permitted provided that the following conditions are met:
00012
00013     1. Redistributions of source code must retain the above copyright notice,
00014        this list of conditions and the following disclaimer.
00015
00016     2. Redistributions in binary form must reproduce the above copyright notice,
00017        this list of conditions and the following disclaimer in the
00018        documentation and/or other materials provided with the distribution.
00019
00020 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00021 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00022 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00023 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00024 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00025 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00026 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #define _GNU_SOURCE
00039 #include "config.h"
00040 #include <stdio.h>
00041 #include <stdlib.h>
00042 #include <string.h>
00043 #include <math.h>
00044 #include <gsl/gsl_rng.h>
00045 #include <libxml/parser.h>
00046 #include <libintl.h>
00047 #include <glib.h>
00048 #include <glib/gstdio.h>
00049 #include <json-glib/json-glib.h>
00050 #ifdef G_OS_WIN32
00051 #include <windows.h>
00052 #endif
00053 #if HAVE_MPI
00054 #include <mpi.h>
00055 #endif
00056 #include <gio/gio.h>
00057 #include <gtk/gtk.h>
00058 #include "genetic/genetic.h"
00059 #include "utils.h"
00060 #include "experiment.h"
00061 #include "variable.h"
```

```
00062 #include "input.h"
00063 #include "optimize.h"
00064 #include "interface.h"
00065
00066 #define DEBUG_INTERFACE 0
00067
00068
00072 #ifdef G_OS_WIN32
00073 #define INPUT_FILE "test-ga-win.xml"
00074 #else
00075 #define INPUT_FILE "test-ga.xml"
00076 #endif
00077
00078 const char *logo[] = {
00079   "32 32 3 1",
00080   "     c None",
00081   ".    c #0000FF",
00082   "+    c #FF0000",
00083   "                                ",
00084   "                                ",
00085   "                                ",
00086   "      .       .       .       . ",
00087   "      .       .       .       . ",
00088   "      .       .       .       . ",
00089   "      .       .       .       . ",
00090   "      .       .      +++      . ",
00091   "      .       .     +++++     . ",
00092   "      .       .     +++++     . ",
00093   "      .       .     +++++     . ",
00094   "     +++      .      +++     +++ ",
00095   "    +++++     .       .     +++++ ",
00096   "    +++++     .       .     +++++ ",
00097   "    +++++     .       .     +++++ ",
00098   "     +++      .       .      +++ ",
00099   "      .       .       .       . ",
00100   "      .      +++      .       . ",
00101   "      .     +++++     .       . ",
00102   "      .     +++++     .       . ",
00103   "      .     +++++     .       . ",
00104   "      .      +++      .       . ",
00105   "      .       .       .       . ",
00106   "      .       .       .       . ",
00107   "      .       .       .       . ",
00108   "      .       .       .       . ",
00109   "      .       .       .       . ",
00110   "      .       .       .       . ",
00111   "      .       .       .       . ",
00112   "                                ",
00113   "                                ",
00114   "                                "
00115 };
00116
00117 /*
00118 const char * logo[] = {
00119 "32 32 3 1",
00120 "     c #FFFFFFFFFFFF",
00121 ".    c #00000000FFFF",
00122 "X    c #FFFF00000000",
00123 "                                ",
00124 "                                ",
00125 "                                ",
00126 "      .       .       .       . ",
00127 "      .       .       .       . ",
00128 "      .       .       .       . ",
00129 "      .       .       .       . ",
00130 "      .       .      XXX      . ",
00131 "      .       .     XXXXX     . ",
00132 "      .       .     XXXXX     . ",
00133 "      .       .     XXXXX     . ",
00134 "     XXX      .      XXX     XXX ",
00135 "    XXXXX     .       .     XXXXX ",
00136 "    XXXXX     .       .     XXXXX ",
00137 "    XXXXX     .       .     XXXXX ",
00138 "     XXX      .       .      XXX ",
00139 "      .       .       .       . ",
00140 "      .      XXX      .       . ",
00141 "      .     XXXXX     .       . ",
00142 "      .     XXXXX     .       . ",
00143 "      .     XXXXX     .       . ",
00144 "      .      XXX      .       . ",
00145 "      .       .       .       . ",
00146 "      .       .       .       . ",
00147 "      .       .       .       . ",
00148 "      .       .       .       . ",
00149 "      .       .       .       . ",
00150 "      .       .       .       . ",
00151 "      .       .       .       . ",
```

```
00152 "                                 ",
00153 "                                 ",
00154 "                                 "};
00155 */
00156
00157 Options options[1];
00159 Running running[1];
00161 Window window[1];
00163
00170 void
00171 input_save_direction_xml (xmlNode * node)
00172 {
00173 #if DEBUG_INTERFACE
00174   fprintf (stderr, "input_save_direction_xml: start\n");
00175 #endif
00176   if (input->nsteps)
00177     {
00178       xml_node_set_uint (node, (const xmlChar *) LABEL_NSTEPS,
      input->nsteps);
00179       if (input->relaxation != DEFAULT_RELAXATION)
00180         xml_node_set_float (node, (const xmlChar *)
      LABEL_RELAXATION,
00181                             input->relaxation);
00182       switch (input->direction)
00183         {
00184         case DIRECTION_METHOD_COORDINATES:
00185           xmlSetProp (node, (const xmlChar *) LABEL_DIRECTION,
00186                       (const xmlChar *) LABEL_COORDINATES);
00187           break;
00188         default:
00189           xmlSetProp (node, (const xmlChar *) LABEL_DIRECTION,
00190                       (const xmlChar *) LABEL_RANDOM);
00191           xml_node_set_uint (node, (const xmlChar *)
      LABEL_NESTIMATES,
00192                              input->nestimates);
00193         }
00194     }
00195 #if DEBUG_INTERFACE
00196   fprintf (stderr, "input_save_direction_xml: end\n");
00197 #endif
00198 }
00199
00206 void
00207 input_save_direction_json (JsonNode * node)
00208 {
00209   JsonObject *object;
00210 #if DEBUG_INTERFACE
00211   fprintf (stderr, "input_save_direction_json: start\n");
00212 #endif
00213   object = json_node_get_object (node);
00214   if (input->nsteps)
00215     {
00216       json_object_set_uint (object, LABEL_NSTEPS,
      input->nsteps);
00217       if (input->relaxation != DEFAULT_RELAXATION)
00218         json_object_set_float (object, LABEL_RELAXATION,
      input->relaxation);
00219       switch (input->direction)
00220         {
00221         case DIRECTION_METHOD_COORDINATES:
00222           json_object_set_string_member (object, LABEL_DIRECTION,
00223                                          LABEL_COORDINATES);
00224           break;
00225         default:
00226           json_object_set_string_member (object, LABEL_DIRECTION,
      LABEL_RANDOM);
00227           json_object_set_uint (object, LABEL_NESTIMATES,
      input->nestimates);
00228         }
00229     }
00230 #if DEBUG_INTERFACE
00231   fprintf (stderr, "input_save_direction_json: end\n");
00232 #endif
00233 }
00234
00241 void
00242 input_save_xml (xmlDoc * doc)
00243 {
00244   unsigned int i, j;
00245   char *buffer;
00246   xmlNode *node, *child;
00247   GFile *file, *file2;
00248
00249 #if DEBUG_INTERFACE
00250   fprintf (stderr, "input_save_xml: start\n");
00251 #endif
00252
```

```
00253   // Setting root XML node
00254   node = xmlNewDocNode (doc, 0, (const xmlChar *) LABEL_OPTIMIZE, 0);
00255   xmlDocSetRootElement (doc, node);
00256
00257   // Adding properties to the root XML node
00258   if (xmlStrcmp
00259       ((const xmlChar *) input->result, (const xmlChar *) result_name))
00260     xmlSetProp (node, (const xmlChar *) LABEL_RESULT_FILE,
00261                 (xmlChar *) input->result);
00262   if (xmlStrcmp
00263       ((const xmlChar *) input->variables, (const xmlChar *)
      variables_name))
00264     xmlSetProp (node, (const xmlChar *) LABEL_VARIABLES_FILE,
00265                 (xmlChar *) input->variables);
00266   file = g_file_new_for_path (input->directory);
00267   file2 = g_file_new_for_path (input->simulator);
00268   buffer = g_file_get_relative_path (file, file2);
00269   g_object_unref (file2);
00270   xmlSetProp (node, (const xmlChar *) LABEL_SIMULATOR, (xmlChar *) buffer);
00271   g_free (buffer);
00272   if (input->evaluator)
00273     {
00274       file2 = g_file_new_for_path (input->evaluator);
00275       buffer = g_file_get_relative_path (file, file2);
00276       g_object_unref (file2);
00277       if (xmlStrlen ((xmlChar *) buffer))
00278         xmlSetProp (node, (const xmlChar *) LABEL_EVALUATOR,
00279                     (xmlChar *) buffer);
00280       g_free (buffer);
00281     }
00282   if (input->seed != DEFAULT_RANDOM_SEED)
00283     xml_node_set_uint (node, (const xmlChar *) LABEL_SEED,
      input->seed);
00284
00285   // Setting the algorithm
00286   buffer = (char *) g_slice_alloc (64);
00287   switch (input->algorithm)
00288     {
00289     case ALGORITHM_MONTE_CARLO:
00290       xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
00291                   (const xmlChar *) LABEL_MONTE_CARLO);
00292       snprintf (buffer, 64, "%u", input->nsimulations);
00293       xmlSetProp (node, (const xmlChar *) LABEL_NSIMULATIONS,
00294                   (xmlChar *) buffer);
00295       snprintf (buffer, 64, "%u", input->niterations);
00296       xmlSetProp (node, (const xmlChar *) LABEL_NITERATIONS,
00297                   (xmlChar *) buffer);
00298       snprintf (buffer, 64, "%.3lg", input->tolerance);
00299       xmlSetProp (node, (const xmlChar *) LABEL_TOLERANCE, (xmlChar *) buffer);
00300       snprintf (buffer, 64, "%u", input->nbest);
00301       xmlSetProp (node, (const xmlChar *) LABEL_NBEST, (xmlChar *) buffer);
00302       input_save_direction_xml (node);
00303       break;
00304     case ALGORITHM_SWEEP:
00305       xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
00306                   (const xmlChar *) LABEL_SWEEP);
00307       snprintf (buffer, 64, "%u", input->niterations);
00308       xmlSetProp (node, (const xmlChar *) LABEL_NITERATIONS,
00309                   (xmlChar *) buffer);
00310       snprintf (buffer, 64, "%.3lg", input->tolerance);
00311       xmlSetProp (node, (const xmlChar *) LABEL_TOLERANCE, (xmlChar *) buffer);
00312       snprintf (buffer, 64, "%u", input->nbest);
00313       xmlSetProp (node, (const xmlChar *) LABEL_NBEST, (xmlChar *) buffer);
00314       input_save_direction_xml (node);
00315       break;
00316     default:
00317       xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
00318                   (const xmlChar *) LABEL_GENETIC);
00319       snprintf (buffer, 64, "%u", input->nsimulations);
00320       xmlSetProp (node, (const xmlChar *) LABEL_NPOPULATION,
00321                   (xmlChar *) buffer);
00322       snprintf (buffer, 64, "%u", input->niterations);
00323       xmlSetProp (node, (const xmlChar *) LABEL_NGENERATIONS,
00324                   (xmlChar *) buffer);
00325       snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
00326       xmlSetProp (node, (const xmlChar *) LABEL_MUTATION, (xmlChar *) buffer);
00327       snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
00328       xmlSetProp (node, (const xmlChar *) LABEL_REPRODUCTION,
00329                   (xmlChar *) buffer);
00330       snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
00331       xmlSetProp (node, (const xmlChar *) LABEL_ADAPTATION, (xmlChar *) buffer);
00332       break;
00333     }
00334   g_slice_free1 (64, buffer);
00335   if (input->threshold != 0.)
00336     xml_node_set_float (node, (const xmlChar *)
      LABEL_THRESHOLD,
```

```
00337                         input->threshold);
00338
00339   // Setting the experimental data
00340   for (i = 0; i < input->nexperiments; ++i)
00341     {
00342       child = xmlNewChild (node, 0, (const xmlChar *) LABEL_EXPERIMENT, 0);
00343       xmlSetProp (child, (const xmlChar *) LABEL_NAME,
00344                   (xmlChar *) input->experiment[i].name);
00345       if (input->experiment[i].weight != 1.)
00346         xml_node_set_float (child, (const xmlChar *)
      LABEL_WEIGHT,
00347                             input->experiment[i].weight);
00348       for (j = 0; j < input->experiment->ninputs; ++j)
00349         xmlSetProp (child, (const xmlChar *) stencil[j],
00350                     (xmlChar *) input->experiment[i].stencil[j]);
00351     }
00352
00353   // Setting the variables data
00354   for (i = 0; i < input->nvariables; ++i)
00355     {
00356       child = xmlNewChild (node, 0, (const xmlChar *) LABEL_VARIABLE, 0);
00357       xmlSetProp (child, (const xmlChar *) LABEL_NAME,
00358                   (xmlChar *) input->variable[i].name);
00359       xml_node_set_float (child, (const xmlChar *)
      LABEL_MINIMUM,
00360                           input->variable[i].rangemin);
00361       if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
00362         xml_node_set_float (child, (const xmlChar *)
      LABEL_ABSOLUTE_MINIMUM,
00363                             input->variable[i].rangeminabs);
00364       xml_node_set_float (child, (const xmlChar *)
      LABEL_MAXIMUM,
00365                           input->variable[i].rangemax);
00366       if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
00367         xml_node_set_float (child, (const xmlChar *)
      LABEL_ABSOLUTE_MAXIMUM,
00368                             input->variable[i].rangemaxabs);
00369       if (input->variable[i].precision !=
      DEFAULT_PRECISION)
00370         xml_node_set_uint (child, (const xmlChar *)
      LABEL_PRECISION,
00371                            input->variable[i].precision);
00372       if (input->algorithm == ALGORITHM_SWEEP)
00373         xml_node_set_uint (child, (const xmlChar *)
      LABEL_NSWEEPS,
00374                            input->variable[i].nsweeps);
00375       else if (input->algorithm == ALGORITHM_GENETIC)
00376         xml_node_set_uint (child, (const xmlChar *) LABEL_NBITS,
00377                            input->variable[i].nbits);
00378       if (input->nsteps)
00379         xml_node_set_float (child, (const xmlChar *)
      LABEL_STEP,
00380                             input->variable[i].step);
00381     }
00382
00383   // Saving the error norm
00384   switch (input->norm)
00385     {
00386     case ERROR_NORM_MAXIMUM:
00387       xmlSetProp (node, (const xmlChar *) LABEL_NORM,
00388                   (const xmlChar *) LABEL_MAXIMUM);
00389       break;
00390     case ERROR_NORM_P:
00391       xmlSetProp (node, (const xmlChar *) LABEL_NORM,
00392                   (const xmlChar *) LABEL_P);
00393       xml_node_set_float (node, (const xmlChar *) LABEL_P,
      input->p);
00394       break;
00395     case ERROR_NORM_TAXICAB:
00396       xmlSetProp (node, (const xmlChar *) LABEL_NORM,
00397                   (const xmlChar *) LABEL_TAXICAB);
00398     }
00399
00400 #if DEBUG_INTERFACE
00401   fprintf (stderr, "input_save: end\n");
00402 #endif
00403 }
00404
00411 void
00412 input_save_json (JsonGenerator * generator)
00413 {
00414   unsigned int i, j;
00415   char *buffer;
00416   JsonNode *node, *child;
00417   JsonObject *object;
00418   JsonArray *array;
00419   GFile *file, *file2;
```

```
00420
00421 #if DEBUG_INTERFACE
00422   fprintf (stderr, "input_save_json: start\n");
00423 #endif
00424
00425   // Setting root JSON node
00426   node = json_node_new (JSON_NODE_OBJECT);
00427   object = json_node_get_object (node);
00428   json_generator_set_root (generator, node);
00429
00430   // Adding properties to the root JSON node
00431   if (strcmp (input->result, result_name))
00432     json_object_set_string_member (object, LABEL_RESULT_FILE,
      input->result);
00433   if (strcmp (input->variables, variables_name))
00434     json_object_set_string_member (object, LABEL_VARIABLES_FILE,
00435                                    input->variables);
00436   file = g_file_new_for_path (input->directory);
00437   file2 = g_file_new_for_path (input->simulator);
00438   buffer = g_file_get_relative_path (file, file2);
00439   g_object_unref (file2);
00440   json_object_set_string_member (object, LABEL_SIMULATOR, buffer);
00441   g_free (buffer);
00442   if (input->evaluator)
00443     {
00444       file2 = g_file_new_for_path (input->evaluator);
00445       buffer = g_file_get_relative_path (file, file2);
00446       g_object_unref (file2);
00447       if (strlen (buffer))
00448         json_object_set_string_member (object, LABEL_EVALUATOR, buffer);
00449       g_free (buffer);
00450     }
00451   if (input->seed != DEFAULT_RANDOM_SEED)
00452     json_object_set_uint (object, LABEL_SEED,
      input->seed);
00453
00454   // Setting the algorithm
00455   buffer = (char *) g_slice_alloc (64);
00456   switch (input->algorithm)
00457     {
00458     case ALGORITHM_MONTE_CARLO:
00459       json_object_set_string_member (object, LABEL_ALGORITHM,
00460                                      LABEL_MONTE_CARLO);
00461       snprintf (buffer, 64, "%u", input->nsimulations);
00462       json_object_set_string_member (object, LABEL_NSIMULATIONS, buffer);
00463       snprintf (buffer, 64, "%u", input->niterations);
00464       json_object_set_string_member (object, LABEL_NITERATIONS, buffer);
00465       snprintf (buffer, 64, "%.3lg", input->tolerance);
00466       json_object_set_string_member (object, LABEL_TOLERANCE, buffer);
00467       snprintf (buffer, 64, "%u", input->nbest);
00468       json_object_set_string_member (object, LABEL_NBEST, buffer);
00469       input_save_direction_json (node);
00470       break;
00471     case ALGORITHM_SWEEP:
00472       json_object_set_string_member (object, LABEL_ALGORITHM,
      LABEL_SWEEP);
00473       snprintf (buffer, 64, "%u", input->niterations);
00474       json_object_set_string_member (object, LABEL_NITERATIONS, buffer);
00475       snprintf (buffer, 64, "%.3lg", input->tolerance);
00476       json_object_set_string_member (object, LABEL_TOLERANCE, buffer);
00477       snprintf (buffer, 64, "%u", input->nbest);
00478       json_object_set_string_member (object, LABEL_NBEST, buffer);
00479       input_save_direction_json (node);
00480       break;
00481     default:
00482       json_object_set_string_member (object, LABEL_ALGORITHM,
      LABEL_GENETIC);
00483       snprintf (buffer, 64, "%u", input->nsimulations);
00484       json_object_set_string_member (object, LABEL_NPOPULATION, buffer);
00485       snprintf (buffer, 64, "%u", input->niterations);
00486       json_object_set_string_member (object, LABEL_NGENERATIONS, buffer);
00487       snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
00488       json_object_set_string_member (object, LABEL_MUTATION, buffer);
00489       snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
00490       json_object_set_string_member (object, LABEL_REPRODUCTION, buffer);
00491       snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
00492       json_object_set_string_member (object, LABEL_ADAPTATION, buffer);
00493       break;
00494     }
00495   g_slice_free1 (64, buffer);
00496   if (input->threshold != 0.)
00497     json_object_set_float (object, LABEL_THRESHOLD,
      input->threshold);
00498
00499   // Setting the experimental data
00500   array = json_array_new ();
00501   for (i = 0; i < input->nexperiments; ++i)
```

```
00502     {
00503       child = json_node_new (JSON_NODE_OBJECT);
00504       object = json_node_get_object (child);
00505       json_object_set_string_member (object, LABEL_NAME,
00506                                      input->experiment[i].name);
00507       if (input->experiment[i].weight != 1.)
00508         json_object_set_float (object, LABEL_WEIGHT,
00509                                input->experiment[i].weight);
00510       for (j = 0; j < input->experiment->ninputs; ++j)
00511         json_object_set_string_member (object, stencil[j],
00512                                        input->experiment[i].
      stencil[j]);
00513       json_array_add_element (array, child);
00514     }
00515   json_object_set_array_member (object, LABEL_EXPERIMENTS, array);
00516
00517   // Setting the variables data
00518   array = json_array_new ();
00519   for (i = 0; i < input->nvariables; ++i)
00520     {
00521       child = json_node_new (JSON_NODE_OBJECT);
00522       object = json_node_get_object (child);
00523       json_object_set_string_member (object, LABEL_NAME,
00524                                      input->variable[i].name);
00525       json_object_set_float (object, LABEL_MINIMUM,
00526                              input->variable[i].rangemin);
00527       if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
00528         json_object_set_float (object,
      LABEL_ABSOLUTE_MINIMUM,
00529                                input->variable[i].rangeminabs);
00530       json_object_set_float (object, LABEL_MAXIMUM,
00531                              input->variable[i].rangemax);
00532       if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
00533         json_object_set_float (object,
      LABEL_ABSOLUTE_MAXIMUM,
00534                                input->variable[i].rangemaxabs);
00535       if (input->variable[i].precision !=
      DEFAULT_PRECISION)
00536         json_object_set_uint (object, LABEL_PRECISION,
00537                               input->variable[i].precision);
00538       if (input->algorithm == ALGORITHM_SWEEP)
00539         json_object_set_uint (object, LABEL_NSWEEPS,
00540                               input->variable[i].nsweeps);
00541       else if (input->algorithm == ALGORITHM_GENETIC)
00542         json_object_set_uint (object, LABEL_NBITS,
      input->variable[i].nbits);
00543       if (input->nsteps)
00544         json_object_set_float (object, LABEL_STEP,
      input->variable[i].step);
00545       json_array_add_element (array, child);
00546     }
00547   json_object_set_array_member (object, LABEL_VARIABLES, array);
00548
00549   // Saving the error norm
00550   switch (input->norm)
00551     {
00552     case ERROR_NORM_MAXIMUM:
00553       json_object_set_string_member (object, LABEL_NORM, LABEL_MAXIMUM);
00554       break;
00555     case ERROR_NORM_P:
00556       json_object_set_string_member (object, LABEL_NORM, LABEL_P);
00557       json_object_set_float (object, LABEL_P, input->
      p);
00558       break;
00559     case ERROR_NORM_TAXICAB:
00560       json_object_set_string_member (object, LABEL_NORM, LABEL_TAXICAB);
00561     }
00562
00563 #if DEBUG_INTERFACE
00564   fprintf (stderr, "input_save_json: end\n");
00565 #endif
00566 }
00567
00574 void
00575 input_save (char *filename)
00576 {
00577   xmlDoc *doc;
00578   JsonGenerator *generator;
00579
00580 #if DEBUG_INTERFACE
00581   fprintf (stderr, "input_save: start\n");
00582 #endif
00583
00584   // Getting the input file directory
00585   input->name = g_path_get_basename (filename);
00586   input->directory = g_path_get_dirname (filename);
00587
```

```
00588   if (input->type == INPUT_TYPE_XML)
00589     {
00590       // Opening the input file
00591       doc = xmlNewDoc ((const xmlChar *) "1.0");
00592       input_save_xml (doc);
00593
00594       // Saving the XML file
00595       xmlSaveFormatFile (filename, doc, 1);
00596
00597       // Freeing memory
00598       xmlFreeDoc (doc);
00599     }
00600   else
00601     {
00602       // Opening the input file
00603       generator = json_generator_new ();
00604       json_generator_set_pretty (generator, TRUE);
00605       input_save_json (generator);
00606
00607       // Saving the JSON file
00608       json_generator_to_file (generator, filename, NULL);
00609
00610       // Freeing memory
00611       g_object_unref (generator);
00612     }
00613
00614 #if DEBUG_INTERFACE
00615   fprintf (stderr, "input_save: end\n");
00616 #endif
00617 }
00618
00623 void
00624 options_new ()
00625 {
00626 #if DEBUG_INTERFACE
00627   fprintf (stderr, "options_new: start\n");
00628 #endif
00629   options->label_seed = (GtkLabel *)
00630     gtk_label_new (_("Pseudo-random numbers generator seed"));
00631   options->spin_seed = (GtkSpinButton *)
00632     gtk_spin_button_new_with_range (0., (gdouble) G_MAXULONG, 1.);
00633   gtk_widget_set_tooltip_text
00634     (GTK_WIDGET (options->spin_seed),
00635      _("Seed to init the pseudo-random numbers generator"));
00636   gtk_spin_button_set_value (options->spin_seed, (gdouble) input->
      seed);
00637   options->label_threads = (GtkLabel *)
00638     gtk_label_new (_("Threads number for the stochastic algorithm"));
00639   options->spin_threads
00640     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
00641   gtk_widget_set_tooltip_text
00642     (GTK_WIDGET (options->spin_threads),
00643      _("Number of threads to perform the calibration/optimization for "
00644        "the stochastic algorithm"));
00645   gtk_spin_button_set_value (options->spin_threads, (gdouble)
      nthreads);
00646   options->label_direction = (GtkLabel *)
00647     gtk_label_new (_("Threads number for the direction search method"));
00648   options->spin_direction =
00649     (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
00650   gtk_widget_set_tooltip_text (GTK_WIDGET (options->spin_direction),
00651                                _
00652                                ("Number of threads to perform the calibration/optimization for "
00653                                 "the direction search method"));
00654   gtk_spin_button_set_value (options->spin_direction,
00655                              (gdouble) nthreads_direction);
00656   options->grid = (GtkGrid *) gtk_grid_new ();
00657   gtk_grid_attach (options->grid, GTK_WIDGET (options->label_seed), 0, 0, 1, 1);
00658   gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_seed), 1, 0, 1, 1);
00659   gtk_grid_attach (options->grid, GTK_WIDGET (options->label_threads), 0, 1,
00660                    1, 1);
00661   gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_threads), 1, 1, 1,
00662                    1);
00663   gtk_grid_attach (options->grid, GTK_WIDGET (options->label_direction), 0, 2,
00664                    1, 1);
00665   gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_direction), 1, 2,
00666                    1, 1);
00667   gtk_widget_show_all (GTK_WIDGET (options->grid));
00668   options->dialog = (GtkDialog *)
00669     gtk_dialog_new_with_buttons (_("Options"),
00670                                  window->window,
00671                                  GTK_DIALOG_MODAL,
00672                                  _("_OK"), GTK_RESPONSE_OK,
00673                                  _("_Cancel"), GTK_RESPONSE_CANCEL, NULL);
00674   gtk_container_add
00675     (GTK_CONTAINER (gtk_dialog_get_content_area (options->dialog)),
00676      GTK_WIDGET (options->grid));
```

```
00677   if (gtk_dialog_run (options->dialog) == GTK_RESPONSE_OK)
00678     {
00679       input->seed
00680         = (unsigned long int) gtk_spin_button_get_value (options->spin_seed);
00681       nthreads = gtk_spin_button_get_value_as_int (options->spin_threads);
00682       nthreads_direction
00683         = gtk_spin_button_get_value_as_int (options->spin_direction);
00684     }
00685   gtk_widget_destroy (GTK_WIDGET (options->dialog));
00686 #if DEBUG_INTERFACE
00687   fprintf (stderr, "options_new: end\n");
00688 #endif
00689 }
00690
00695 void
00696 running_new ()
00697 {
00698 #if DEBUG_INTERFACE
00699   fprintf (stderr, "running_new: start\n");
00700 #endif
00701   running->label = (GtkLabel *) gtk_label_new (_("Calculating ..."));
00702   running->spinner = (GtkSpinner *) gtk_spinner_new ();
00703   running->grid = (GtkGrid *) gtk_grid_new ();
00704   gtk_grid_attach (running->grid, GTK_WIDGET (running->label), 0, 0, 1, 1);
00705   gtk_grid_attach (running->grid, GTK_WIDGET (running->spinner), 0, 1, 1, 1);
00706   running->dialog = (GtkDialog *)
00707     gtk_dialog_new_with_buttons (_("Calculating"),
00708                                  window->window, GTK_DIALOG_MODAL, NULL, NULL);
00709   gtk_container_add (GTK_CONTAINER
00710                      (gtk_dialog_get_content_area (running->dialog)),
00711                      GTK_WIDGET (running->grid));
00712   gtk_spinner_start (running->spinner);
00713   gtk_widget_show_all (GTK_WIDGET (running->dialog));
00714 #if DEBUG_INTERFACE
00715   fprintf (stderr, "running_new: end\n");
00716 #endif
00717 }
00718
00724 unsigned int
00725 window_get_algorithm ()
00726 {
00727   unsigned int i;
00728 #if DEBUG_INTERFACE
00729   fprintf (stderr, "window_get_algorithm: start\n");
00730 #endif
00731   i = gtk_array_get_active (window->button_algorithm,
      NALGORITHMS);
00732 #if DEBUG_INTERFACE
00733   fprintf (stderr, "window_get_algorithm: %u\n", i);
00734   fprintf (stderr, "window_get_algorithm: end\n");
00735 #endif
00736   return i;
00737 }
00738
00744 unsigned int
00745 window_get_direction ()
00746 {
00747   unsigned int i;
00748 #if DEBUG_INTERFACE
00749   fprintf (stderr, "window_get_direction: start\n");
00750 #endif
00751   i = gtk_array_get_active (window->button_direction,
      NDIRECTIONS);
00752 #if DEBUG_INTERFACE
00753   fprintf (stderr, "window_get_direction: %u\n", i);
00754   fprintf (stderr, "window_get_direction: end\n");
00755 #endif
00756   return i;
00757 }
00758
00764 unsigned int
00765 window_get_norm ()
00766 {
00767   unsigned int i;
00768 #if DEBUG_INTERFACE
00769   fprintf (stderr, "window_get_norm: start\n");
00770 #endif
00771   i = gtk_array_get_active (window->button_norm,
      NNORMS);
00772 #if DEBUG_INTERFACE
00773   fprintf (stderr, "window_get_norm: %u\n", i);
00774   fprintf (stderr, "window_get_norm: end\n");
00775 #endif
00776   return i;
00777 }
00778
00783 void
```

```
00784 window_save_direction ()
00785 {
00786 #if DEBUG_INTERFACE
00787   fprintf (stderr, "window_save_direction: start\n");
00788 #endif
00789   if (gtk_toggle_button_get_active
00790       (GTK_TOGGLE_BUTTON (window->check_direction)))
00791     {
00792       input->nsteps = gtk_spin_button_get_value_as_int (window->
      spin_steps);
00793       input->relaxation = gtk_spin_button_get_value (window->
      spin_relaxation);
00794       switch (window_get_direction ())
00795         {
00796         case DIRECTION_METHOD_COORDINATES:
00797           input->direction = DIRECTION_METHOD_COORDINATES;
00798           break;
00799         default:
00800           input->direction = DIRECTION_METHOD_RANDOM;
00801           input->nestimates
00802             = gtk_spin_button_get_value_as_int (window->spin_estimates);
00803         }
00804     }
00805   else
00806     input->nsteps = 0;
00807 #if DEBUG_INTERFACE
00808   fprintf (stderr, "window_save_direction: end\n");
00809 #endif
00810 }
00811
00817 int
00818 window_save ()
00819 {
00820   GtkFileChooserDialog *dlg;
00821   GtkFileFilter *filter1, *filter2;
00822   char *buffer;
00823
00824 #if DEBUG_INTERFACE
00825   fprintf (stderr, "window_save: start\n");
00826 #endif
00827
00828   // Opening the saving dialog
00829   dlg = (GtkFileChooserDialog *)
00830     gtk_file_chooser_dialog_new (_("Save file"),
00831                                  window->window,
00832                                  GTK_FILE_CHOOSER_ACTION_SAVE,
00833                                  _("_Cancel"), GTK_RESPONSE_CANCEL,
00834                                  _("_OK"), GTK_RESPONSE_OK, NULL);
00835   gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
00836   buffer = g_build_filename (input->directory, input->name, NULL);
00837   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER (dlg), buffer);
00838   g_free (buffer);
00839
00840   // Adding XML filter
00841   filter1 = (GtkFileFilter *) gtk_file_filter_new ();
00842   gtk_file_filter_set_name (filter1, "XML");
00843   gtk_file_filter_add_pattern (filter1, "*.xml");
00844   gtk_file_filter_add_pattern (filter1, "*.XML");
00845   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter1);
00846
00847   // Adding JSON filter
00848   filter2 = (GtkFileFilter *) gtk_file_filter_new ();
00849   gtk_file_filter_set_name (filter2, "JSON");
00850   gtk_file_filter_add_pattern (filter2, "*.json");
00851   gtk_file_filter_add_pattern (filter2, "*.JSON");
00852   gtk_file_filter_add_pattern (filter2, "*.js");
00853   gtk_file_filter_add_pattern (filter2, "*.JS");
00854   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter2);
00855
00856   if (input->type == INPUT_TYPE_XML)
00857     gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter1);
00858   else
00859     gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter2);
00860
00861   // If OK response then saving
00862   if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
00863     {
00864       // Setting input file type
00865       filter1 = gtk_file_chooser_get_filter (GTK_FILE_CHOOSER (dlg));
00866       buffer = (char *) gtk_file_filter_get_name (filter1);
00867       if (!strcmp (buffer, "XML"))
00868         input->type = INPUT_TYPE_XML;
00869       else
00870         input->type = INPUT_TYPE_JSON;
00871
00872       // Adding properties to the root XML node
00873       input->simulator = gtk_file_chooser_get_filename
```

```
00874         (GTK_FILE_CHOOSER (window->button_simulator));
00875       if (gtk_toggle_button_get_active
00876           (GTK_TOGGLE_BUTTON (window->check_evaluator)))
00877         input->evaluator = gtk_file_chooser_get_filename
00878           (GTK_FILE_CHOOSER (window->button_evaluator));
00879       else
00880         input->evaluator = NULL;
00881       if (input->type == INPUT_TYPE_XML)
00882         {
00883           input->result
00884             = (char *) xmlStrdup ((const xmlChar *)
00885                                   gtk_entry_get_text (window->entry_result));
00886           input->variables
00887             = (char *) xmlStrdup ((const xmlChar *)
00888                                   gtk_entry_get_text (window->entry_variables));
00889         }
00890       else
00891         {
00892           input->result = g_strdup (gtk_entry_get_text (window->
      entry_result));
00893           input->variables =
00894             g_strdup (gtk_entry_get_text (window->entry_variables));
00895         }
00896
00897       // Setting the algorithm
00898       switch (window_get_algorithm ())
00899         {
00900         case ALGORITHM_MONTE_CARLO:
00901           input->algorithm = ALGORITHM_MONTE_CARLO;
00902           input->nsimulations
00903             = gtk_spin_button_get_value_as_int (window->spin_simulations);
00904           input->niterations
00905             = gtk_spin_button_get_value_as_int (window->spin_iterations);
00906           input->tolerance = gtk_spin_button_get_value (window->
      spin_tolerance);
00907           input->nbest = gtk_spin_button_get_value_as_int (window->
      spin_bests);
00908           window_save_direction ();
00909           break;
00910         case ALGORITHM_SWEEP:
00911           input->algorithm = ALGORITHM_SWEEP;
00912           input->niterations
00913             = gtk_spin_button_get_value_as_int (window->spin_iterations);
00914           input->tolerance = gtk_spin_button_get_value (window->
      spin_tolerance);
00915           input->nbest = gtk_spin_button_get_value_as_int (window->
      spin_bests);
00916           window_save_direction ();
00917           break;
00918         default:
00919           input->algorithm = ALGORITHM_GENETIC;
00920           input->nsimulations
00921             = gtk_spin_button_get_value_as_int (window->spin_population);
00922           input->niterations
00923             = gtk_spin_button_get_value_as_int (window->spin_generations);
00924           input->mutation_ratio
00925             = gtk_spin_button_get_value (window->spin_mutation);
00926           input->reproduction_ratio
00927             = gtk_spin_button_get_value (window->spin_reproduction);
00928           input->adaptation_ratio
00929             = gtk_spin_button_get_value (window->spin_adaptation);
00930           break;
00931         }
00932       input->norm = window_get_norm ();
00933       input->p = gtk_spin_button_get_value (window->spin_p);
00934       input->threshold = gtk_spin_button_get_value (window->
      spin_threshold);
00935
00936       // Saving the XML file
00937       buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
00938       input_save (buffer);
00939
00940       // Closing and freeing memory
00941       g_free (buffer);
00942       gtk_widget_destroy (GTK_WIDGET (dlg));
00943 #if DEBUG_INTERFACE
00944       fprintf (stderr, "window_save: end\n");
00945 #endif
00946       return 1;
00947     }
00948
00949   // Closing and freeing memory
00950   gtk_widget_destroy (GTK_WIDGET (dlg));
00951 #if DEBUG_INTERFACE
00952   fprintf (stderr, "window_save: end\n");
00953 #endif
00954   return 0;
```

```
00955 }
00956
00961 void
00962 window_run ()
00963 {
00964   unsigned int i;
00965   char *msg, *msg2, buffer[64], buffer2[64];
00966 #if DEBUG_INTERFACE
00967   fprintf (stderr, "window_run: start\n");
00968 #endif
00969   if (!window_save ())
00970     {
00971 #if DEBUG_INTERFACE
00972       fprintf (stderr, "window_run: end\n");
00973 #endif
00974       return;
00975     }
00976   running_new ();
00977   while (gtk_events_pending ())
00978     gtk_main_iteration ();
00979   optimize_open ();
00980 #if DEBUG_INTERFACE
00981   fprintf (stderr, "window_run: closing running dialog\n");
00982 #endif
00983   gtk_spinner_stop (running->spinner);
00984   gtk_widget_destroy (GTK_WIDGET (running->dialog));
00985 #if DEBUG_INTERFACE
00986   fprintf (stderr, "window_run: displaying results\n");
00987 #endif
00988   snprintf (buffer, 64, "error = %.15le\n", optimize->error_old[0]);
00989   msg2 = g_strdup (buffer);
00990   for (i = 0; i < optimize->nvariables; ++i, msg2 = msg)
00991     {
00992       snprintf (buffer, 64, "%s = %s\n",
00993                 input->variable[i].name, format[input->
      variable[i].precision]);
00994       snprintf (buffer2, 64, buffer, optimize->value_old[i]);
00995       msg = g_strconcat (msg2, buffer2, NULL);
00996       g_free (msg2);
00997     }
00998   snprintf (buffer, 64, "%s = %.6lg s", _("Calculation time"),
00999             optimize->calculation_time);
01000   msg = g_strconcat (msg2, buffer, NULL);
01001   g_free (msg2);
01002   show_message (_("Best result"), msg, INFO_TYPE);
01003   g_free (msg);
01004 #if DEBUG_INTERFACE
01005   fprintf (stderr, "window_run: freeing memory\n");
01006 #endif
01007   optimize_free ();
01008 #if DEBUG_INTERFACE
01009   fprintf (stderr, "window_run: end\n");
01010 #endif
01011 }
01012
01017 void
01018 window_help ()
01019 {
01020   char *buffer, *buffer2;
01021 #if DEBUG_INTERFACE
01022   fprintf (stderr, "window_help: start\n");
01023 #endif
01024   buffer2 = g_build_filename (window->application_directory, "..", "manuals",
01025                               _("user-manual.pdf"), NULL);
01026   buffer = g_filename_to_uri (buffer2, NULL, NULL);
01027   g_free (buffer2);
01028 #if GTK_MINOR_VERSION >= 22
01029   gtk_show_uri_on_window (window->window, buffer, GDK_CURRENT_TIME, NULL);
01030 #else
01031   gtk_show_uri (NULL, buffer, GDK_CURRENT_TIME, NULL);
01032 #endif
01033 #if DEBUG_INTERFACE
01034   fprintf (stderr, "window_help: uri=%s\n", buffer);
01035 #endif
01036   g_free (buffer);
01037 #if DEBUG_INTERFACE
01038   fprintf (stderr, "window_help: end\n");
01039 #endif
01040 }
01041
01046 void
01047 window_about ()
01048 {
01049   static const gchar *authors[] = {
01050     "Javier Burguete Tolosa <jburguete@eead.csic.es>",
01051     "Borja Latorre Garcés <borja.latorre@csic.es>",
01052     NULL
```

```
01053   };
01054 #if DEBUG_INTERFACE
01055   fprintf (stderr, "window_about: start\n");
01056 #endif
01057   gtk_show_about_dialog
01058     (window->window,
01059      "program_name", "MPCOTool",
01060      "comments",
01061      _("The Multi-Purposes Calibration and Optimization Tool.\n"
01062        "A software to perform calibrations or optimizations of empirical"
01063        " parameters"),
01064      "authors", authors,
01065      "translator-credits",
01066      "Javier Burguete Tolosa <jburguete@eead.csic.es> "
01067      "(english, french and spanish)\n"
01068      "Uğur Çayoğlu (german)",
01069      "version", "3.4.4",
01070      "copyright", "Copyright 2012-2017 Javier Burguete Tolosa",
01071      "logo", window->logo,
01072      "website", "https://github.com/jburguete/mpcotool",
01073      "license-type", GTK_LICENSE_BSD, NULL);
01074 #if DEBUG_INTERFACE
01075   fprintf (stderr, "window_about: end\n");
01076 #endif
01077 }
01078
01084 void
01085 window_update_direction ()
01086 {
01087 #if DEBUG_INTERFACE
01088   fprintf (stderr, "window_update_direction: start\n");
01089 #endif
01090   gtk_widget_show (GTK_WIDGET (window->check_direction));
01091   if (gtk_toggle_button_get_active
01092       (GTK_TOGGLE_BUTTON (window->check_direction)))
01093     {
01094       gtk_widget_show (GTK_WIDGET (window->grid_direction));
01095       gtk_widget_show (GTK_WIDGET (window->label_step));
01096       gtk_widget_show (GTK_WIDGET (window->spin_step));
01097     }
01098   switch (window_get_direction ())
01099     {
01100     case DIRECTION_METHOD_COORDINATES:
01101       gtk_widget_hide (GTK_WIDGET (window->label_estimates));
01102       gtk_widget_hide (GTK_WIDGET (window->spin_estimates));
01103       break;
01104     default:
01105       gtk_widget_show (GTK_WIDGET (window->label_estimates));
01106       gtk_widget_show (GTK_WIDGET (window->spin_estimates));
01107     }
01108 #if DEBUG_INTERFACE
01109   fprintf (stderr, "window_update_direction: end\n");
01110 #endif
01111 }
01112
01117 void
01118 window_update ()
01119 {
01120   unsigned int i;
01121 #if DEBUG_INTERFACE
01122   fprintf (stderr, "window_update: start\n");
01123 #endif
01124   gtk_widget_set_sensitive
01125     (GTK_WIDGET (window->button_evaluator),
01126      gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
01127                                    (window->check_evaluator)));
01128   gtk_widget_hide (GTK_WIDGET (window->label_simulations));
01129   gtk_widget_hide (GTK_WIDGET (window->spin_simulations));
01130   gtk_widget_hide (GTK_WIDGET (window->label_iterations));
01131   gtk_widget_hide (GTK_WIDGET (window->spin_iterations));
01132   gtk_widget_hide (GTK_WIDGET (window->label_tolerance));
01133   gtk_widget_hide (GTK_WIDGET (window->spin_tolerance));
01134   gtk_widget_hide (GTK_WIDGET (window->label_bests));
01135   gtk_widget_hide (GTK_WIDGET (window->spin_bests));
01136   gtk_widget_hide (GTK_WIDGET (window->label_population));
01137   gtk_widget_hide (GTK_WIDGET (window->spin_population));
01138   gtk_widget_hide (GTK_WIDGET (window->label_generations));
01139   gtk_widget_hide (GTK_WIDGET (window->spin_generations));
01140   gtk_widget_hide (GTK_WIDGET (window->label_mutation));
01141   gtk_widget_hide (GTK_WIDGET (window->spin_mutation));
01142   gtk_widget_hide (GTK_WIDGET (window->label_reproduction));
01143   gtk_widget_hide (GTK_WIDGET (window->spin_reproduction));
01144   gtk_widget_hide (GTK_WIDGET (window->label_adaptation));
01145   gtk_widget_hide (GTK_WIDGET (window->spin_adaptation));
01146   gtk_widget_hide (GTK_WIDGET (window->label_sweeps));
01147   gtk_widget_hide (GTK_WIDGET (window->spin_sweeps));
01148   gtk_widget_hide (GTK_WIDGET (window->label_bits));
```

```
01149   gtk_widget_hide (GTK_WIDGET (window->spin_bits));
01150   gtk_widget_hide (GTK_WIDGET (window->check_direction));
01151   gtk_widget_hide (GTK_WIDGET (window->grid_direction));
01152   gtk_widget_hide (GTK_WIDGET (window->label_step));
01153   gtk_widget_hide (GTK_WIDGET (window->spin_step));
01154   gtk_widget_hide (GTK_WIDGET (window->label_p));
01155   gtk_widget_hide (GTK_WIDGET (window->spin_p));
01156   i = gtk_spin_button_get_value_as_int (window->spin_iterations);
01157   switch (window_get_algorithm ())
01158     {
01159     case ALGORITHM_MONTE_CARLO:
01160       gtk_widget_show (GTK_WIDGET (window->label_simulations));
01161       gtk_widget_show (GTK_WIDGET (window->spin_simulations));
01162       gtk_widget_show (GTK_WIDGET (window->label_iterations));
01163       gtk_widget_show (GTK_WIDGET (window->spin_iterations));
01164       if (i > 1)
01165         {
01166           gtk_widget_show (GTK_WIDGET (window->label_tolerance));
01167           gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
01168           gtk_widget_show (GTK_WIDGET (window->label_bests));
01169           gtk_widget_show (GTK_WIDGET (window->spin_bests));
01170         }
01171       window_update_direction ();
01172       break;
01173     case ALGORITHM_SWEEP:
01174       gtk_widget_show (GTK_WIDGET (window->label_iterations));
01175       gtk_widget_show (GTK_WIDGET (window->spin_iterations));
01176       if (i > 1)
01177         {
01178           gtk_widget_show (GTK_WIDGET (window->label_tolerance));
01179           gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
01180           gtk_widget_show (GTK_WIDGET (window->label_bests));
01181           gtk_widget_show (GTK_WIDGET (window->spin_bests));
01182         }
01183       gtk_widget_show (GTK_WIDGET (window->label_sweeps));
01184       gtk_widget_show (GTK_WIDGET (window->spin_sweeps));
01185       gtk_widget_show (GTK_WIDGET (window->check_direction));
01186       window_update_direction ();
01187       break;
01188     default:
01189       gtk_widget_show (GTK_WIDGET (window->label_population));
01190       gtk_widget_show (GTK_WIDGET (window->spin_population));
01191       gtk_widget_show (GTK_WIDGET (window->label_generations));
01192       gtk_widget_show (GTK_WIDGET (window->spin_generations));
01193       gtk_widget_show (GTK_WIDGET (window->label_mutation));
01194       gtk_widget_show (GTK_WIDGET (window->spin_mutation));
01195       gtk_widget_show (GTK_WIDGET (window->label_reproduction));
01196       gtk_widget_show (GTK_WIDGET (window->spin_reproduction));
01197       gtk_widget_show (GTK_WIDGET (window->label_adaptation));
01198       gtk_widget_show (GTK_WIDGET (window->spin_adaptation));
01199       gtk_widget_show (GTK_WIDGET (window->label_bits));
01200       gtk_widget_show (GTK_WIDGET (window->spin_bits));
01201     }
01202   gtk_widget_set_sensitive
01203     (GTK_WIDGET (window->button_remove_experiment),
    input->nexperiments > 1);
01204   gtk_widget_set_sensitive
01205     (GTK_WIDGET (window->button_remove_variable), input->
    nvariables > 1);
01206   for (i = 0; i < input->experiment->ninputs; ++i)
01207     {
01208       gtk_widget_show (GTK_WIDGET (window->check_template[i]));
01209       gtk_widget_show (GTK_WIDGET (window->button_template[i]));
01210       gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 0);
01211       gtk_widget_set_sensitive (GTK_WIDGET (window->button_template[i]), 1);
01212       g_signal_handler_block
01213         (window->check_template[i], window->id_template[i]);
01214       g_signal_handler_block (window->button_template[i], window->
    id_input[i]);
01215       gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON
01216                                     (window->check_template[i]), 1);
01217       g_signal_handler_unblock (window->button_template[i],
01218                                 window->id_input[i]);
01219       g_signal_handler_unblock (window->check_template[i],
01220                                 window->id_template[i]);
01221     }
01222   if (i > 0)
01223     {
01224       gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i - 1]), 1);
01225       gtk_widget_set_sensitive (GTK_WIDGET (window->button_template[i - 1]),
01226                                 gtk_toggle_button_get_active
01227                                 GTK_TOGGLE_BUTTON (window->check_template
01228                                                    [i - 1]));
01229     }
01230   if (i < MAX_NINPUTS)
01231     {
01232       gtk_widget_show (GTK_WIDGET (window->check_template[i]));
```

```
01233       gtk_widget_show (GTK_WIDGET (window->button_template[i]));
01234       gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 1);
01235       gtk_widget_set_sensitive
01236         (GTK_WIDGET (window->button_template[i]),
01237          gtk_toggle_button_get_active
01238          GTK_TOGGLE_BUTTON (window->check_template[i]));
01239       g_signal_handler_block
01240         (window->check_template[i], window->id_template[i]);
01241       g_signal_handler_block (window->button_template[i], window->
      id_input[i]);
01242       gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON
01243                                     (window->check_template[i]), 0);
01244       g_signal_handler_unblock (window->button_template[i],
01245                                 window->id_input[i]);
01246       g_signal_handler_unblock (window->check_template[i],
01247                                 window->id_template[i]);
01248     }
01249   while (++i < MAX_NINPUTS)
01250     {
01251       gtk_widget_hide (GTK_WIDGET (window->check_template[i]));
01252       gtk_widget_hide (GTK_WIDGET (window->button_template[i]));
01253     }
01254   gtk_widget_set_sensitive
01255     (GTK_WIDGET (window->spin_minabs),
01256      gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (window->check_minabs)));
01257   gtk_widget_set_sensitive
01258     (GTK_WIDGET (window->spin_maxabs),
01259      gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (window->check_maxabs)));
01260   if (window_get_norm () == ERROR_NORM_P)
01261     {
01262       gtk_widget_show (GTK_WIDGET (window->label_p));
01263       gtk_widget_show (GTK_WIDGET (window->spin_p));
01264     }
01265 #if DEBUG_INTERFACE
01266   fprintf (stderr, "window_update: end\n");
01267 #endif
01268 }
01269
01274 void
01275 window_set_algorithm ()
01276 {
01277   int i;
01278 #if DEBUG_INTERFACE
01279   fprintf (stderr, "window_set_algorithm: start\n");
01280 #endif
01281   i = window_get_algorithm ();
01282   switch (i)
01283     {
01284     case ALGORITHM_SWEEP:
01285       i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01286       if (i < 0)
01287         i = 0;
01288       gtk_spin_button_set_value (window->spin_sweeps,
01289                                  (gdouble) input->variable[i].
      nsweeps);
01290       break;
01291     case ALGORITHM_GENETIC:
01292       i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01293       if (i < 0)
01294         i = 0;
01295       gtk_spin_button_set_value (window->spin_bits,
01296                                  (gdouble) input->variable[i].nbits);
01297     }
01298   window_update ();
01299 #if DEBUG_INTERFACE
01300   fprintf (stderr, "window_set_algorithm: end\n");
01301 #endif
01302 }
01303
01308 void
01309 window_set_experiment ()
01310 {
01311   unsigned int i, j;
01312   char *buffer1, *buffer2;
01313 #if DEBUG_INTERFACE
01314   fprintf (stderr, "window_set_experiment: start\n");
01315 #endif
01316   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01317   gtk_spin_button_set_value (window->spin_weight, input->
      experiment[i].weight);
01318   buffer1 = gtk_combo_box_text_get_active_text (window->combo_experiment);
01319   buffer2 = g_build_filename (input->directory, buffer1, NULL);
01320   g_free (buffer1);
01321   g_signal_handler_block
01322     (window->button_experiment, window->id_experiment_name);
01323   gtk_file_chooser_set_filename
01324     (GTK_FILE_CHOOSER (window->button_experiment), buffer2);
```

```
01325   g_signal_handler_unblock
01326     (window->button_experiment, window->id_experiment_name);
01327   g_free (buffer2);
01328   for (j = 0; j < input->experiment->ninputs; ++j)
01329     {
01330       g_signal_handler_block (window->button_template[j], window->
      id_input[j]);
01331       buffer2 =
01332         g_build_filename (input->directory, input->experiment[i].
      stencil[j],
01333                           NULL);
01334       gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01335                                      (window->button_template[j]), buffer2);
01336       g_free (buffer2);
01337       g_signal_handler_unblock
01338         (window->button_template[j], window->id_input[j]);
01339     }
01340 #if DEBUG_INTERFACE
01341   fprintf (stderr, "window_set_experiment: end\n");
01342 #endif
01343 }
01344
01349 void
01350 window_remove_experiment ()
01351 {
01352   unsigned int i, j;
01353 #if DEBUG_INTERFACE
01354   fprintf (stderr, "window_remove_experiment: start\n");
01355 #endif
01356   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01357   g_signal_handler_block (window->combo_experiment, window->
      id_experiment);
01358   gtk_combo_box_text_remove (window->combo_experiment, i);
01359   g_signal_handler_unblock (window->combo_experiment, window->
      id_experiment);
01360   experiment_free (input->experiment + i, input->
      type);
01361   --input->nexperiments;
01362   for (j = i; j < input->nexperiments; ++j)
01363     memcpy (input->experiment + j, input->experiment + j + 1,
01364             sizeof (Experiment));
01365   j = input->nexperiments - 1;
01366   if (i > j)
01367     i = j;
01368   for (j = 0; j < input->experiment->ninputs; ++j)
01369     g_signal_handler_block (window->button_template[j], window->
      id_input[j]);
01370   g_signal_handler_block
01371     (window->button_experiment, window->id_experiment_name);
01372   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
01373   g_signal_handler_unblock
01374     (window->button_experiment, window->id_experiment_name);
01375   for (j = 0; j < input->experiment->ninputs; ++j)
01376     g_signal_handler_unblock (window->button_template[j], window->
      id_input[j]);
01377   window_update ();
01378 #if DEBUG_INTERFACE
01379   fprintf (stderr, "window_remove_experiment: end\n");
01380 #endif
01381 }
01382
01387 void
01388 window_add_experiment ()
01389 {
01390   unsigned int i, j;
01391 #if DEBUG_INTERFACE
01392   fprintf (stderr, "window_add_experiment: start\n");
01393 #endif
01394   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01395   g_signal_handler_block (window->combo_experiment, window->
      id_experiment);
01396   gtk_combo_box_text_insert_text
01397     (window->combo_experiment, i, input->experiment[i].
      name);
01398   g_signal_handler_unblock (window->combo_experiment, window->
      id_experiment);
01399   input->experiment = (Experiment *) g_realloc
01400     (input->experiment, (input->nexperiments + 1) * sizeof (
      Experiment));
01401   for (j = input->nexperiments - 1; j > i; --j)
01402     memcpy (input->experiment + j + 1, input->experiment + j,
01403             sizeof (Experiment));
01404   input->experiment[j + 1].weight = input->experiment[j].
      weight;
01405   input->experiment[j + 1].ninputs = input->
      experiment[j].ninputs;
01406   if (input->type == INPUT_TYPE_XML)
```

```
01407     {
01408       input->experiment[j + 1].name
01409         = (char *) xmlStrdup ((xmlChar *) input->experiment[j].
      name);
01410       for (j = 0; j < input->experiment->ninputs; ++j)
01411         input->experiment[i + 1].stencil[j]
01412           = (char *) xmlStrdup ((xmlChar *) input->experiment[i].
      stencil[j]);
01413     }
01414   else
01415     {
01416       input->experiment[j + 1].name = g_strdup (input->
      experiment[j].name);
01417       for (j = 0; j < input->experiment->ninputs; ++j)
01418         input->experiment[i + 1].stencil[j]
01419           = g_strdup (input->experiment[i].stencil[j]);
01420     }
01421   ++input->nexperiments;
01422   for (j = 0; j < input->experiment->ninputs; ++j)
01423     g_signal_handler_block (window->button_template[j], window->
      id_input[j]);
01424   g_signal_handler_block
01425     (window->button_experiment, window->id_experiment_name);
01426   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i + 1);
01427   g_signal_handler_unblock
01428     (window->button_experiment, window->id_experiment_name);
01429   for (j = 0; j < input->experiment->ninputs; ++j)
01430     g_signal_handler_unblock (window->button_template[j], window->
      id_input[j]);
01431   window_update ();
01432 #if DEBUG_INTERFACE
01433   fprintf (stderr, "window_add_experiment: end\n");
01434 #endif
01435 }
01436
01441 void
01442 window_name_experiment ()
01443 {
01444   unsigned int i;
01445   char *buffer;
01446   GFile *file1, *file2;
01447 #if DEBUG_INTERFACE
01448   fprintf (stderr, "window_name_experiment: start\n");
01449 #endif
01450   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01451   file1
01452     = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_experiment));
01453   file2 = g_file_new_for_path (input->directory);
01454   buffer = g_file_get_relative_path (file2, file1);
01455   g_signal_handler_block (window->combo_experiment, window->
      id_experiment);
01456   gtk_combo_box_text_remove (window->combo_experiment, i);
01457   gtk_combo_box_text_insert_text (window->combo_experiment, i, buffer);
01458   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
01459   g_signal_handler_unblock (window->combo_experiment, window->
      id_experiment);
01460   g_free (buffer);
01461   g_object_unref (file2);
01462   g_object_unref (file1);
01463 #if DEBUG_INTERFACE
01464   fprintf (stderr, "window_name_experiment: end\n");
01465 #endif
01466 }
01467
01472 void
01473 window_weight_experiment ()
01474 {
01475   unsigned int i;
01476 #if DEBUG_INTERFACE
01477   fprintf (stderr, "window_weight_experiment: start\n");
01478 #endif
01479   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01480   input->experiment[i].weight = gtk_spin_button_get_value (window->
      spin_weight);
01481 #if DEBUG_INTERFACE
01482   fprintf (stderr, "window_weight_experiment: end\n");
01483 #endif
01484 }
01485
01491 void
01492 window_inputs_experiment ()
01493 {
01494   unsigned int j;
01495 #if DEBUG_INTERFACE
01496   fprintf (stderr, "window_inputs_experiment: start\n");
01497 #endif
01498   j = input->experiment->ninputs - 1;
```

```
01499   if (j
01500       && !gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
01501                                         (window->check_template[j])))
01502     --input->experiment->ninputs;
01503   if (input->experiment->ninputs < MAX_NINPUTS
01504       && gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
01505                                        (window->check_template[j])))
01506     ++input->experiment->ninputs;
01507   window_update ();
01508 #if DEBUG_INTERFACE
01509   fprintf (stderr, "window_inputs_experiment: end\n");
01510 #endif
01511 }
01512
01520 void
01521 window_template_experiment (void *data)
01522 {
01523   unsigned int i, j;
01524   char *buffer;
01525   GFile *file1, *file2;
01526 #if DEBUG_INTERFACE
01527   fprintf (stderr, "window_template_experiment: start\n");
01528 #endif
01529   i = (size_t) data;
01530   j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01531   file1
01532     = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
01533   file2 = g_file_new_for_path (input->directory);
01534   buffer = g_file_get_relative_path (file2, file1);
01535   if (input->type == INPUT_TYPE_XML)
01536     input->experiment[j].stencil[i] = (char *) xmlStrdup ((xmlChar *) buffer);
01537   else
01538     input->experiment[j].stencil[i] = g_strdup (buffer);
01539   g_free (buffer);
01540   g_object_unref (file2);
01541   g_object_unref (file1);
01542 #if DEBUG_INTERFACE
01543   fprintf (stderr, "window_template_experiment: end\n");
01544 #endif
01545 }
01546
01551 void
01552 window_set_variable ()
01553 {
01554   unsigned int i;
01555 #if DEBUG_INTERFACE
01556   fprintf (stderr, "window_set_variable: start\n");
01557 #endif
01558   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01559   g_signal_handler_block (window->entry_variable, window->
    id_variable_label);
01560   gtk_entry_set_text (window->entry_variable, input->variable[i].
    name);
01561   g_signal_handler_unblock (window->entry_variable, window->
    id_variable_label);
01562   gtk_spin_button_set_value (window->spin_min, input->variable[i].
    rangemin);
01563   gtk_spin_button_set_value (window->spin_max, input->variable[i].
    rangemax);
01564   if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
01565     {
01566       gtk_spin_button_set_value (window->spin_minabs,
01567                                  input->variable[i].rangeminabs);
01568       gtk_toggle_button_set_active
01569         (GTK_TOGGLE_BUTTON (window->check_minabs), 1);
01570     }
01571   else
01572     {
01573       gtk_spin_button_set_value (window->spin_minabs, -G_MAXDOUBLE);
01574       gtk_toggle_button_set_active
01575         (GTK_TOGGLE_BUTTON (window->check_minabs), 0);
01576     }
01577   if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
01578     {
01579       gtk_spin_button_set_value (window->spin_maxabs,
01580                                  input->variable[i].rangemaxabs);
01581       gtk_toggle_button_set_active
01582         (GTK_TOGGLE_BUTTON (window->check_maxabs), 1);
01583     }
01584   else
01585     {
01586       gtk_spin_button_set_value (window->spin_maxabs, G_MAXDOUBLE);
01587       gtk_toggle_button_set_active
01588         (GTK_TOGGLE_BUTTON (window->check_maxabs), 0);
01589     }
01590   gtk_spin_button_set_value (window->spin_precision,
01591                              input->variable[i].precision);
```

```
01592   gtk_spin_button_set_value (window->spin_steps, (gdouble) input->
      nsteps);
01593   if (input->nsteps)
01594     gtk_spin_button_set_value (window->spin_step, input->variable[i].
      step);
01595 #if DEBUG_INTERFACE
01596   fprintf (stderr, "window_set_variable: precision[%u]=%u\n", i,
01597            input->variable[i].precision);
01598 #endif
01599   switch (window_get_algorithm ())
01600     {
01601     case ALGORITHM_SWEEP:
01602       gtk_spin_button_set_value (window->spin_sweeps,
01603                                  (gdouble) input->variable[i].
      nsweeps);
01604 #if DEBUG_INTERFACE
01605       fprintf (stderr, "window_set_variable: nsweeps[%u]=%u\n", i,
01606                input->variable[i].nsweeps);
01607 #endif
01608       break;
01609     case ALGORITHM_GENETIC:
01610       gtk_spin_button_set_value (window->spin_bits,
01611                                  (gdouble) input->variable[i].nbits);
01612 #if DEBUG_INTERFACE
01613       fprintf (stderr, "window_set_variable: nbits[%u]=%u\n", i,
01614                input->variable[i].nbits);
01615 #endif
01616       break;
01617     }
01618   window_update ();
01619 #if DEBUG_INTERFACE
01620   fprintf (stderr, "window_set_variable: end\n");
01621 #endif
01622 }
01623
01628 void
01629 window_remove_variable ()
01630 {
01631   unsigned int i, j;
01632 #if DEBUG_INTERFACE
01633   fprintf (stderr, "window_remove_variable: start\n");
01634 #endif
01635   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01636   g_signal_handler_block (window->combo_variable, window->
      id_variable);
01637   gtk_combo_box_text_remove (window->combo_variable, i);
01638   g_signal_handler_unblock (window->combo_variable, window->
      id_variable);
01639   xmlFree (input->variable[i].name);
01640   --input->nvariables;
01641   for (j = i; j < input->nvariables; ++j)
01642     memcpy (input->variable + j, input->variable + j + 1, sizeof (
      Variable));
01643   j = input->nvariables - 1;
01644   if (i > j)
01645     i = j;
01646   g_signal_handler_block (window->entry_variable, window->
      id_variable_label);
01647   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
01648   g_signal_handler_unblock (window->entry_variable, window->
      id_variable_label);
01649   window_update ();
01650 #if DEBUG_INTERFACE
01651   fprintf (stderr, "window_remove_variable: end\n");
01652 #endif
01653 }
01654
01659 void
01660 window_add_variable ()
01661 {
01662   unsigned int i, j;
01663 #if DEBUG_INTERFACE
01664   fprintf (stderr, "window_add_variable: start\n");
01665 #endif
01666   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01667   g_signal_handler_block (window->combo_variable, window->
      id_variable);
01668   gtk_combo_box_text_insert_text (window->combo_variable, i,
01669                                   input->variable[i].name);
01670   g_signal_handler_unblock (window->combo_variable, window->
      id_variable);
01671   input->variable = (Variable *) g_realloc
01672     (input->variable, (input->nvariables + 1) * sizeof (
      Variable));
01673   for (j = input->nvariables - 1; j > i; --j)
01674     memcpy (input->variable + j + 1, input->variable + j, sizeof (
      Variable));
```

```
01675   memcpy (input->variable + j + 1, input->variable + j, sizeof (
      Variable));
01676   if (input->type == INPUT_TYPE_XML)
01677     input->variable[j + 1].name
01678       = (char *) xmlStrdup ((xmlChar *) input->variable[j].name);
01679   else
01680     input->variable[j + 1].name = g_strdup (input->
      variable[j].name);
01681   ++input->nvariables;
01682   g_signal_handler_block (window->entry_variable, window->
      id_variable_label);
01683   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i + 1);
01684   g_signal_handler_unblock (window->entry_variable, window->
      id_variable_label);
01685   window_update ();
01686 #if DEBUG_INTERFACE
01687   fprintf (stderr, "window_add_variable: end\n");
01688 #endif
01689 }
01690
01695 void
01696 window_label_variable ()
01697 {
01698   unsigned int i;
01699   const char *buffer;
01700 #if DEBUG_INTERFACE
01701   fprintf (stderr, "window_label_variable: start\n");
01702 #endif
01703   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01704   buffer = gtk_entry_get_text (window->entry_variable);
01705   g_signal_handler_block (window->combo_variable, window->
      id_variable);
01706   gtk_combo_box_text_remove (window->combo_variable, i);
01707   gtk_combo_box_text_insert_text (window->combo_variable, i, buffer);
01708   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
01709   g_signal_handler_unblock (window->combo_variable, window->
      id_variable);
01710 #if DEBUG_INTERFACE
01711   fprintf (stderr, "window_label_variable: end\n");
01712 #endif
01713 }
01714
01719 void
01720 window_precision_variable ()
01721 {
01722   unsigned int i;
01723 #if DEBUG_INTERFACE
01724   fprintf (stderr, "window_precision_variable: start\n");
01725 #endif
01726   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01727   input->variable[i].precision
01728     = (unsigned int) gtk_spin_button_get_value_as_int (window->spin_precision);
01729   gtk_spin_button_set_digits (window->spin_min, input->variable[i].
      precision);
01730   gtk_spin_button_set_digits (window->spin_max, input->variable[i].
      precision);
01731   gtk_spin_button_set_digits (window->spin_minabs,
01732                               input->variable[i].precision);
01733   gtk_spin_button_set_digits (window->spin_maxabs,
01734                               input->variable[i].precision);
01735 #if DEBUG_INTERFACE
01736   fprintf (stderr, "window_precision_variable: end\n");
01737 #endif
01738 }
01739
01744 void
01745 window_rangemin_variable ()
01746 {
01747   unsigned int i;
01748 #if DEBUG_INTERFACE
01749   fprintf (stderr, "window_rangemin_variable: start\n");
01750 #endif
01751   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01752   input->variable[i].rangemin = gtk_spin_button_get_value (window->
      spin_min);
01753 #if DEBUG_INTERFACE
01754   fprintf (stderr, "window_rangemin_variable: end\n");
01755 #endif
01756 }
01757
01762 void
01763 window_rangemax_variable ()
01764 {
01765   unsigned int i;
01766 #if DEBUG_INTERFACE
01767   fprintf (stderr, "window_rangemax_variable: start\n");
01768 #endif
```

```
01769   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01770   input->variable[i].rangemax = gtk_spin_button_get_value (window->
      spin_max);
01771 #if DEBUG_INTERFACE
01772   fprintf (stderr, "window_rangemax_variable: end\n");
01773 #endif
01774 }
01775
01780 void
01781 window_rangeminabs_variable ()
01782 {
01783   unsigned int i;
01784 #if DEBUG_INTERFACE
01785   fprintf (stderr, "window_rangeminabs_variable: start\n");
01786 #endif
01787   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01788   input->variable[i].rangeminabs
01789     = gtk_spin_button_get_value (window->spin_minabs);
01790 #if DEBUG_INTERFACE
01791   fprintf (stderr, "window_rangeminabs_variable: end\n");
01792 #endif
01793 }
01794
01799 void
01800 window_rangemaxabs_variable ()
01801 {
01802   unsigned int i;
01803 #if DEBUG_INTERFACE
01804   fprintf (stderr, "window_rangemaxabs_variable: start\n");
01805 #endif
01806   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01807   input->variable[i].rangemaxabs
01808     = gtk_spin_button_get_value (window->spin_maxabs);
01809 #if DEBUG_INTERFACE
01810   fprintf (stderr, "window_rangemaxabs_variable: end\n");
01811 #endif
01812 }
01813
01818 void
01819 window_step_variable ()
01820 {
01821   unsigned int i;
01822 #if DEBUG_INTERFACE
01823   fprintf (stderr, "window_step_variable: start\n");
01824 #endif
01825   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01826   input->variable[i].step = gtk_spin_button_get_value (window->
      spin_step);
01827 #if DEBUG_INTERFACE
01828   fprintf (stderr, "window_step_variable: end\n");
01829 #endif
01830 }
01831
01836 void
01837 window_update_variable ()
01838 {
01839   int i;
01840 #if DEBUG_INTERFACE
01841   fprintf (stderr, "window_update_variable: start\n");
01842 #endif
01843   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01844   if (i < 0)
01845     i = 0;
01846   switch (window_get_algorithm ())
01847     {
01848     case ALGORITHM_SWEEP:
01849       input->variable[i].nsweeps
01850         = gtk_spin_button_get_value_as_int (window->spin_sweeps);
01851 #if DEBUG_INTERFACE
01852       fprintf (stderr, "window_update_variable: nsweeps[%d]=%u\n", i,
01853                input->variable[i].nsweeps);
01854 #endif
01855       break;
01856     case ALGORITHM_GENETIC:
01857       input->variable[i].nbits
01858         = gtk_spin_button_get_value_as_int (window->spin_bits);
01859 #if DEBUG_INTERFACE
01860       fprintf (stderr, "window_update_variable: nbits[%d]=%u\n", i,
01861                input->variable[i].nbits);
01862 #endif
01863     }
01864 #if DEBUG_INTERFACE
01865   fprintf (stderr, "window_update_variable: end\n");
01866 #endif
01867 }
01868
01876 int
```

```
01877 window_read (char *filename)
01878 {
01879   unsigned int i;
01880   char *buffer;
01881 #if DEBUG_INTERFACE
01882   fprintf (stderr, "window_read: start\n");
01883 #endif
01884
01885   // Reading new input file
01886   input_free ();
01887     input->result = input->variables = NULL;
01888   if (!input_open (filename))
01889     {
01890 #if DEBUG_INTERFACE
01891       fprintf (stderr, "window_read: end\n");
01892 #endif
01893       return 0;
01894     }
01895
01896   // Setting GTK+ widgets data
01897   gtk_entry_set_text (window->entry_result, input->result);
01898   gtk_entry_set_text (window->entry_variables, input->
      variables);
01899   buffer = g_build_filename (input->directory, input->
      simulator, NULL);
01900   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01901                                  (window->button_simulator), buffer);
01902   g_free (buffer);
01903   gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
01904                                 (size_t) input->evaluator);
01905   if (input->evaluator)
01906     {
01907       buffer = g_build_filename (input->directory, input->
      evaluator, NULL);
01908       gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01909                                      (window->button_evaluator), buffer);
01910       g_free (buffer);
01911     }
01912   gtk_toggle_button_set_active
01913     (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
      algorithm]), TRUE);
01914   switch (input->algorithm)
01915     {
01916     case ALGORITHM_MONTE_CARLO:
01917       gtk_spin_button_set_value (window->spin_simulations,
01918                                  (gdouble) input->nsimulations);
01919     case ALGORITHM_SWEEP:
01920       gtk_spin_button_set_value (window->spin_iterations,
01921                                  (gdouble) input->niterations);
01922       gtk_spin_button_set_value (window->spin_bests, (gdouble) input->
      nbest);
01923       gtk_spin_button_set_value (window->spin_tolerance, input->
      tolerance);
01924       gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON
01925                                     (window->check_direction),
      input->nsteps);
01926       if (input->nsteps)
01927         {
01928           gtk_toggle_button_set_active
01929             (GTK_TOGGLE_BUTTON (window->button_direction
01930                                 [input->direction]), TRUE);
01931           gtk_spin_button_set_value (window->spin_steps,
01932                                      (gdouble) input->nsteps);
01933           gtk_spin_button_set_value (window->spin_relaxation,
01934                                      (gdouble) input->relaxation);
01935           switch (input->direction)
01936             {
01937             case DIRECTION_METHOD_RANDOM:
01938               gtk_spin_button_set_value (window->spin_estimates,
01939                                          (gdouble) input->nestimates);
01940             }
01941         }
01942       break;
01943     default:
01944       gtk_spin_button_set_value (window->spin_population,
01945                                  (gdouble) input->nsimulations);
01946       gtk_spin_button_set_value (window->spin_generations,
01947                                  (gdouble) input->niterations);
01948       gtk_spin_button_set_value (window->spin_mutation, input->
      mutation_ratio);
01949       gtk_spin_button_set_value (window->spin_reproduction,
01950                                  input->reproduction_ratio);
01951       gtk_spin_button_set_value (window->spin_adaptation,
01952                                  input->adaptation_ratio);
01953     }
01954   gtk_toggle_button_set_active
01955     (GTK_TOGGLE_BUTTON (window->button_norm[input->norm]), TRUE);
```

```
01956   gtk_spin_button_set_value (window->spin_p, input->p);
01957   gtk_spin_button_set_value (window->spin_threshold, input->
      threshold);
01958   g_signal_handler_block (window->combo_experiment, window->
      id_experiment);
01959   g_signal_handler_block (window->button_experiment,
01960                           window->id_experiment_name);
01961   gtk_combo_box_text_remove_all (window->combo_experiment);
01962   for (i = 0; i < input->nexperiments; ++i)
01963     gtk_combo_box_text_append_text (window->combo_experiment,
01964                                     input->experiment[i].name);
01965   g_signal_handler_unblock
01966     (window->button_experiment, window->id_experiment_name);
01967   g_signal_handler_unblock (window->combo_experiment, window->
      id_experiment);
01968   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
01969   g_signal_handler_block (window->combo_variable, window->
      id_variable);
01970   g_signal_handler_block (window->entry_variable, window->
      id_variable_label);
01971   gtk_combo_box_text_remove_all (window->combo_variable);
01972   for (i = 0; i < input->nvariables; ++i)
01973     gtk_combo_box_text_append_text (window->combo_variable,
01974                                     input->variable[i].name);
01975   g_signal_handler_unblock (window->entry_variable, window->
      id_variable_label);
01976   g_signal_handler_unblock (window->combo_variable, window->
      id_variable);
01977   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
01978   window_set_variable ();
01979   window_update ();
01980
01981 #if DEBUG_INTERFACE
01982   fprintf (stderr, "window_read: end\n");
01983 #endif
01984   return 1;
01985 }
01986
01991 void
01992 window_open ()
01993 {
01994   GtkFileChooserDialog *dlg;
01995   GtkFileFilter *filter;
01996   char *buffer, *directory, *name;
01997
01998 #if DEBUG_INTERFACE
01999   fprintf (stderr, "window_open: start\n");
02000 #endif
02001
02002   // Saving a backup of the current input file
02003   directory = g_strdup (input->directory);
02004   name = g_strdup (input->name);
02005
02006   // Opening dialog
02007   dlg = (GtkFileChooserDialog *)
02008     gtk_file_chooser_dialog_new (_("Open input file"),
02009                                  window->window,
02010                                  GTK_FILE_CHOOSER_ACTION_OPEN,
02011                                  _("_Cancel"), GTK_RESPONSE_CANCEL,
02012                                  _("_OK"), GTK_RESPONSE_OK, NULL);
02013
02014   // Adding XML filter
02015   filter = (GtkFileFilter *) gtk_file_filter_new ();
02016   gtk_file_filter_set_name (filter, "XML");
02017   gtk_file_filter_add_pattern (filter, "*.xml");
02018   gtk_file_filter_add_pattern (filter, "*.XML");
02019   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter);
02020
02021   // Adding JSON filter
02022   filter = (GtkFileFilter *) gtk_file_filter_new ();
02023   gtk_file_filter_set_name (filter, "JSON");
02024   gtk_file_filter_add_pattern (filter, "*.json");
02025   gtk_file_filter_add_pattern (filter, "*.JSON");
02026   gtk_file_filter_add_pattern (filter, "*.js");
02027   gtk_file_filter_add_pattern (filter, "*.JS");
02028   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter);
02029
02030   // If OK saving
02031   while (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
02032     {
02033
02034       // Traying to open the input file
02035       buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
02036       if (!window_read (buffer))
02037         {
02038 #if DEBUG_INTERFACE
02039           fprintf (stderr, "window_open: error reading input file\n");
```

```
02040 #endif
02041           g_free (buffer);
02042
02043           // Reading backup file on error
02044           buffer = g_build_filename (directory, name, NULL);
02045                    input->result = input->variables = NULL;
02046           if (!input_open (buffer))
02047             {
02048
02049               // Closing on backup file reading error
02050 #if DEBUG_INTERFACE
02051               fprintf (stderr, "window_read: error reading backup file\n");
02052 #endif
02053               g_free (buffer);
02054               break;
02055             }
02056           g_free (buffer);
02057         }
02058       else
02059         {
02060           g_free (buffer);
02061           break;
02062         }
02063     }
02064
02065   // Freeing and closing
02066   g_free (name);
02067   g_free (directory);
02068   gtk_widget_destroy (GTK_WIDGET (dlg));
02069 #if DEBUG_INTERFACE
02070   fprintf (stderr, "window_open: end\n");
02071 #endif
02072 }
02073
02080 void
02081 window_new (GtkApplication * application)
02082 {
02083   unsigned int i;
02084   char *buffer, *buffer2, buffer3[64];
02085   char *label_algorithm[NALGORITHMS] = {
02086     "_Monte-Carlo", _("_Sweep"), _("_Genetic")
02087   };
02088   char *tip_algorithm[NALGORITHMS] = {
02089     _("Monte-Carlo brute force algorithm"),
02090     _("Sweep brute force algorithm"),
02091     _("Genetic algorithm")
02092   };
02093   char *label_direction[NDIRECTIONS] = {
02094     _("_Coordinates descent"), _("_Random")
02095   };
02096   char *tip_direction[NDIRECTIONS] = {
02097     _("Coordinates direction estimate method"),
02098     _("Random direction estimate method")
02099   };
02100   char *label_norm[NNORMS] = { "L2", "L", "Lp", "L1" };
02101   char *tip_norm[NNORMS] = {
02102     _("Euclidean error norm (L2)"),
02103     _("Maximum error norm (L)"),
02104     _("P error norm (Lp)"),
02105     _("Taxicab error norm (L1)")
02106   };
02107
02108 #if DEBUG_INTERFACE
02109   fprintf (stderr, "window_new: start\n");
02110 #endif
02111
02112   // Creating the window
02113   window->window = main_window
02114     = (GtkWindow *) gtk_application_window_new (application);
02115
02116   // Finish when closing the window
02117   g_signal_connect_swapped (window->window, "delete-event",
02118                             G_CALLBACK (g_application_quit),
02119                             G_APPLICATION (application));
02120
02121   // Setting the window title
02122   gtk_window_set_title (window->window, "MPCOTool");
02123
02124   // Creating the open button
02125   window->button_open = (GtkToolButton *) gtk_tool_button_new
02126     (gtk_image_new_from_icon_name ("document-open",
02127                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Open"));
02128   g_signal_connect (window->button_open, "clicked", window_open, NULL);
02129
02130   // Creating the save button
02131   window->button_save = (GtkToolButton *) gtk_tool_button_new
02132     (gtk_image_new_from_icon_name ("document-save",
```

```
02133                                   GTK_ICON_SIZE_LARGE_TOOLBAR), _("Save"));
02134   g_signal_connect (window->button_save, "clicked", (GCallback)
      window_save,
02135                     NULL);
02136
02137   // Creating the run button
02138   window->button_run = (GtkToolButton *) gtk_tool_button_new
02139     (gtk_image_new_from_icon_name ("system-run",
02140                                   GTK_ICON_SIZE_LARGE_TOOLBAR), _("Run"));
02141   g_signal_connect (window->button_run, "clicked", window_run, NULL);
02142
02143   // Creating the options button
02144   window->button_options = (GtkToolButton *) gtk_tool_button_new
02145     (gtk_image_new_from_icon_name ("preferences-system",
02146                                   GTK_ICON_SIZE_LARGE_TOOLBAR), _("Options"));
02147   g_signal_connect (window->button_options, "clicked", options_new, NULL);
02148
02149   // Creating the help button
02150   window->button_help = (GtkToolButton *) gtk_tool_button_new
02151     (gtk_image_new_from_icon_name ("help-browser",
02152                                   GTK_ICON_SIZE_LARGE_TOOLBAR), _("Help"));
02153   g_signal_connect (window->button_help, "clicked", window_help, NULL);
02154
02155   // Creating the about button
02156   window->button_about = (GtkToolButton *) gtk_tool_button_new
02157     (gtk_image_new_from_icon_name ("help-about",
02158                                   GTK_ICON_SIZE_LARGE_TOOLBAR), _("About"));
02159   g_signal_connect (window->button_about, "clicked", window_about, NULL);
02160
02161   // Creating the exit button
02162   window->button_exit = (GtkToolButton *) gtk_tool_button_new
02163     (gtk_image_new_from_icon_name ("application-exit",
02164                                   GTK_ICON_SIZE_LARGE_TOOLBAR), _("Exit"));
02165   g_signal_connect_swapped (window->button_exit, "clicked",
02166                             G_CALLBACK (g_application_quit),
02167                             G_APPLICATION (application));
02168
02169   // Creating the buttons bar
02170   window->bar_buttons = (GtkToolbar *) gtk_toolbar_new ();
02171   gtk_toolbar_insert
02172     (window->bar_buttons, GTK_TOOL_ITEM (window->button_open), 0);
02173   gtk_toolbar_insert
02174     (window->bar_buttons, GTK_TOOL_ITEM (window->button_save), 1);
02175   gtk_toolbar_insert
02176     (window->bar_buttons, GTK_TOOL_ITEM (window->button_run), 2);
02177   gtk_toolbar_insert
02178     (window->bar_buttons, GTK_TOOL_ITEM (window->button_options), 3);
02179   gtk_toolbar_insert
02180     (window->bar_buttons, GTK_TOOL_ITEM (window->button_help), 4);
02181   gtk_toolbar_insert
02182     (window->bar_buttons, GTK_TOOL_ITEM (window->button_about), 5);
02183   gtk_toolbar_insert
02184     (window->bar_buttons, GTK_TOOL_ITEM (window->button_exit), 6);
02185   gtk_toolbar_set_style (window->bar_buttons, GTK_TOOLBAR_BOTH);
02186
02187   // Creating the simulator program label and entry
02188   window->label_simulator = (GtkLabel *) gtk_label_new (_("Simulator program"));
02189   window->button_simulator = (GtkFileChooserButton *)
02190     gtk_file_chooser_button_new (_("Simulator program"),
02191                                  GTK_FILE_CHOOSER_ACTION_OPEN);
02192   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_simulator),
02193                                _("Simulator program executable file"));
02194   gtk_widget_set_hexpand (GTK_WIDGET (window->button_simulator), TRUE);
02195
02196   // Creating the evaluator program label and entry
02197   window->check_evaluator = (GtkCheckButton *)
02198     gtk_check_button_new_with_mnemonic (_("_Evaluator program"));
02199   g_signal_connect (window->check_evaluator, "toggled",
      window_update, NULL);
02200   window->button_evaluator = (GtkFileChooserButton *)
02201     gtk_file_chooser_button_new (_("Evaluator program"),
02202                                  GTK_FILE_CHOOSER_ACTION_OPEN);
02203   gtk_widget_set_tooltip_text
02204     (GTK_WIDGET (window->button_evaluator),
02205      _("Optional evaluator program executable file"));
02206
02207   // Creating the results files labels and entries
02208   window->label_result = (GtkLabel *) gtk_label_new (_("Result file"));
02209   window->entry_result = (GtkEntry *) gtk_entry_new ();
02210   gtk_widget_set_tooltip_text
02211     (GTK_WIDGET (window->entry_result), _("Best results file"));
02212   window->label_variables = (GtkLabel *) gtk_label_new (_("Variables file"));
02213   window->entry_variables = (GtkEntry *) gtk_entry_new ();
02214   gtk_widget_set_tooltip_text
02215     (GTK_WIDGET (window->entry_variables), _("All simulated results file"));
02216
02217   // Creating the files grid and attaching widgets
```

```
02218   window->grid_files = (GtkGrid *) gtk_grid_new ();
02219   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      label_simulator),
02220                    0, 0, 1, 1);
02221   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      button_simulator),
02222                    1, 0, 1, 1);
02223   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      check_evaluator),
02224                    0, 1, 1, 1);
02225   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      button_evaluator),
02226                    1, 1, 1, 1);
02227   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      label_result),
02228                    0, 2, 1, 1);
02229   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      entry_result),
02230                    1, 2, 1, 1);
02231   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      label_variables),
02232                    0, 3, 1, 1);
02233   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      entry_variables),
02234                    1, 3, 1, 1);
02235
02236   // Creating the algorithm properties
02237   window->label_simulations = (GtkLabel *) gtk_label_new
02238     (_("Simulations number"));
02239   window->spin_simulations
02240     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
02241   gtk_widget_set_tooltip_text
02242     (GTK_WIDGET (window->spin_simulations),
02243      _("Number of simulations to perform for each iteration"));
02244   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_simulations), TRUE);
02245   window->label_iterations = (GtkLabel *)
02246     gtk_label_new (_("Iterations number"));
02247   window->spin_iterations
02248     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
02249   gtk_widget_set_tooltip_text
02250     (GTK_WIDGET (window->spin_iterations), _("Number of iterations"));
02251   g_signal_connect
02252     (window->spin_iterations, "value-changed", window_update, NULL);
02253   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_iterations), TRUE);
02254   window->label_tolerance = (GtkLabel *) gtk_label_new (_("Tolerance"));
02255   window->spin_tolerance =
02256     (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02257   gtk_widget_set_tooltip_text
02258     (GTK_WIDGET (window->spin_tolerance),
02259      _("Tolerance to set the variable interval on the next iteration"));
02260   window->label_bests = (GtkLabel *) gtk_label_new (_("Bests number"));
02261   window->spin_bests
02262     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
02263   gtk_widget_set_tooltip_text
02264     (GTK_WIDGET (window->spin_bests),
02265      _("Number of best simulations used to set the variable interval "
02266        "on the next iteration"));
02267   window->label_population
02268     = (GtkLabel *) gtk_label_new (_("Population number"));
02269   window->spin_population
02270     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
02271   gtk_widget_set_tooltip_text
02272     (GTK_WIDGET (window->spin_population),
02273      _("Number of population for the genetic algorithm"));
02274   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_population), TRUE);
02275   window->label_generations
02276     = (GtkLabel *) gtk_label_new (_("Generations number"));
02277   window->spin_generations
02278     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
02279   gtk_widget_set_tooltip_text
02280     (GTK_WIDGET (window->spin_generations),
02281      _("Number of generations for the genetic algorithm"));
02282   window->label_mutation = (GtkLabel *) gtk_label_new (_("Mutation ratio"));
02283   window->spin_mutation
02284     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02285   gtk_widget_set_tooltip_text
02286     (GTK_WIDGET (window->spin_mutation),
02287      _("Ratio of mutation for the genetic algorithm"));
02288   window->label_reproduction
02289     = (GtkLabel *) gtk_label_new (_("Reproduction ratio"));
02290   window->spin_reproduction
02291     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02292   gtk_widget_set_tooltip_text
02293     (GTK_WIDGET (window->spin_reproduction),
02294      _("Ratio of reproduction for the genetic algorithm"));
02295   window->label_adaptation = (GtkLabel *) gtk_label_new (_("Adaptation ratio"));
02296   window->spin_adaptation
```

```
02297     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02298   gtk_widget_set_tooltip_text
02299     (GTK_WIDGET (window->spin_adaptation),
02300      _("Ratio of adaptation for the genetic algorithm"));
02301   window->label_threshold = (GtkLabel *) gtk_label_new (_("Threshold"));
02302   window->spin_threshold = (GtkSpinButton *)
02303     gtk_spin_button_new_with_range (-G_MAXDOUBLE, G_MAXDOUBLE,
02304                                     precision[DEFAULT_PRECISION]);
02305   gtk_widget_set_tooltip_text
02306     (GTK_WIDGET (window->spin_threshold),
02307      _("Threshold in the objective function to finish the simulations"));
02308   window->scrolled_threshold =
02309     (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02310   gtk_container_add (GTK_CONTAINER (window->scrolled_threshold),
02311                      GTK_WIDGET (window->spin_threshold));
02312 //  gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_threshold), TRUE);
02313 //  gtk_widget_set_halign (GTK_WIDGET (window->scrolled_threshold),
02314 //                         GTK_ALIGN_FILL);
02315
02316   // Creating the direction search method properties
02317   window->check_direction = (GtkCheckButton *)
02318     gtk_check_button_new_with_mnemonic (_("_Direction search method"));
02319   g_signal_connect (window->check_direction, "clicked",
    window_update, NULL);
02320   window->grid_direction = (GtkGrid *) gtk_grid_new ();
02321   window->button_direction[0] = (GtkRadioButton *)
02322     gtk_radio_button_new_with_mnemonic (NULL, label_direction[0]);
02323   gtk_grid_attach (window->grid_direction,
02324                    GTK_WIDGET (window->button_direction[0]), 0, 0, 1, 1);
02325   g_signal_connect (window->button_direction[0], "clicked",
    window_update,
02326                     NULL);
02327   for (i = 0; ++i < NDIRECTIONS;)
02328     {
02329       window->button_direction[i] = (GtkRadioButton *)
02330         gtk_radio_button_new_with_mnemonic
02331         (gtk_radio_button_get_group (window->button_direction[0]),
02332          label_direction[i]);
02333       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_direction[i]),
02334                                    tip_direction[i]);
02335       gtk_grid_attach (window->grid_direction,
02336                        GTK_WIDGET (window->button_direction[i]), 0, i, 1, 1);
02337       g_signal_connect (window->button_direction[i], "clicked",
02338                         window_update, NULL);
02339     }
02340   window->label_steps = (GtkLabel *) gtk_label_new (_("Steps number"));
02341   window->spin_steps = (GtkSpinButton *)
02342     gtk_spin_button_new_with_range (1., 1.e12, 1.);
02343   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_steps), TRUE);
02344   window->label_estimates
02345     = (GtkLabel *) gtk_label_new (_("Direction estimates number"));
02346   window->spin_estimates = (GtkSpinButton *)
02347     gtk_spin_button_new_with_range (1., 1.e3, 1.);
02348   window->label_relaxation
02349     = (GtkLabel *) gtk_label_new (_("Relaxation parameter"));
02350   window->spin_relaxation = (GtkSpinButton *)
02351     gtk_spin_button_new_with_range (0., 2., 0.001);
02352   gtk_grid_attach (window->grid_direction, GTK_WIDGET (window->
    label_steps),
02353                    0, NDIRECTIONS, 1, 1);
02354   gtk_grid_attach (window->grid_direction, GTK_WIDGET (window->
    spin_steps),
02355                    1, NDIRECTIONS, 1, 1);
02356   gtk_grid_attach (window->grid_direction,
02357                    GTK_WIDGET (window->label_estimates), 0, NDIRECTIONS + 1,
02358                    1, 1);
02359   gtk_grid_attach (window->grid_direction,
02360                    GTK_WIDGET (window->spin_estimates), 1, NDIRECTIONS + 1, 1,
02361                    1);
02362   gtk_grid_attach (window->grid_direction,
02363                    GTK_WIDGET (window->label_relaxation), 0, NDIRECTIONS + 2,
02364                    1, 1);
02365   gtk_grid_attach (window->grid_direction,
02366                    GTK_WIDGET (window->spin_relaxation), 1, NDIRECTIONS + 2,
02367                    1, 1);
02368
02369   // Creating the array of algorithms
02370   window->grid_algorithm = (GtkGrid *) gtk_grid_new ();
02371   window->button_algorithm[0] = (GtkRadioButton *)
02372     gtk_radio_button_new_with_mnemonic (NULL, label_algorithm[0]);
02373   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[0]),
02374                                tip_algorithm[0]);
02375   gtk_grid_attach (window->grid_algorithm,
02376                    GTK_WIDGET (window->button_algorithm[0]), 0, 0, 1, 1);
02377   g_signal_connect (window->button_algorithm[0], "clicked",
02378                     window_set_algorithm, NULL);
02379   for (i = 0; ++i < NALGORITHMS;)
```

```
02380     {
02381       window->button_algorithm[i] = (GtkRadioButton *)
02382         gtk_radio_button_new_with_mnemonic
02383         (gtk_radio_button_get_group (window->button_algorithm[0]),
02384          label_algorithm[i]);
02385       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[i]),
02386                                    tip_algorithm[i]);
02387       gtk_grid_attach (window->grid_algorithm,
02388                        GTK_WIDGET (window->button_algorithm[i]), 0, i, 1, 1);
02389       g_signal_connect (window->button_algorithm[i], "clicked",
02390                         window_set_algorithm, NULL);
02391     }
02392   gtk_grid_attach (window->grid_algorithm,
02393                    GTK_WIDGET (window->label_simulations), 0,
02394                    NALGORITHMS, 1, 1);
02395   gtk_grid_attach (window->grid_algorithm,
02396                    GTK_WIDGET (window->spin_simulations), 1, NALGORITHMS, 1, 1);
02397   gtk_grid_attach (window->grid_algorithm,
02398                    GTK_WIDGET (window->label_iterations), 0, NALGORITHMS + 1,
02399                    1, 1);
02400   gtk_grid_attach (window->grid_algorithm,
02401                    GTK_WIDGET (window->spin_iterations), 1, NALGORITHMS + 1,
02402                    1, 1);
02403   gtk_grid_attach (window->grid_algorithm,
02404                    GTK_WIDGET (window->label_tolerance), 0, NALGORITHMS + 2,
02405                    1, 1);
02406   gtk_grid_attach (window->grid_algorithm,
02407                    GTK_WIDGET (window->spin_tolerance), 1, NALGORITHMS + 2, 1,
02408                    1);
02409   gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->
      label_bests),
02410                    0, NALGORITHMS + 3, 1, 1);
02411   gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->
      spin_bests), 1,
02412                    NALGORITHMS + 3, 1, 1);
02413   gtk_grid_attach (window->grid_algorithm,
02414                    GTK_WIDGET (window->label_population), 0, NALGORITHMS + 4,
02415                    1, 1);
02416   gtk_grid_attach (window->grid_algorithm,
02417                    GTK_WIDGET (window->spin_population), 1, NALGORITHMS + 4,
02418                    1, 1);
02419   gtk_grid_attach (window->grid_algorithm,
02420                    GTK_WIDGET (window->label_generations), 0, NALGORITHMS + 5,
02421                    1, 1);
02422   gtk_grid_attach (window->grid_algorithm,
02423                    GTK_WIDGET (window->spin_generations), 1, NALGORITHMS + 5,
02424                    1, 1);
02425   gtk_grid_attach (window->grid_algorithm,
02426                    GTK_WIDGET (window->label_mutation), 0, NALGORITHMS + 6, 1,
02427                    1);
02428   gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->
      spin_mutation),
02429                    1, NALGORITHMS + 6, 1, 1);
02430   gtk_grid_attach (window->grid_algorithm,
02431                    GTK_WIDGET (window->label_reproduction), 0,
02432                    NALGORITHMS + 7, 1, 1);
02433   gtk_grid_attach (window->grid_algorithm,
02434                    GTK_WIDGET (window->spin_reproduction), 1, NALGORITHMS + 7,
02435                    1, 1);
02436   gtk_grid_attach (window->grid_algorithm,
02437                    GTK_WIDGET (window->label_adaptation), 0, NALGORITHMS + 8,
02438                    1, 1);
02439   gtk_grid_attach (window->grid_algorithm,
02440                    GTK_WIDGET (window->spin_adaptation), 1, NALGORITHMS + 8,
02441                    1, 1);
02442   gtk_grid_attach (window->grid_algorithm,
02443                    GTK_WIDGET (window->check_direction), 0, NALGORITHMS + 9,
02444                    2, 1);
02445   gtk_grid_attach (window->grid_algorithm,
02446                    GTK_WIDGET (window->grid_direction), 0, NALGORITHMS + 10,
02447                    2, 1);
02448   gtk_grid_attach (window->grid_algorithm,
02449                    GTK_WIDGET (window->label_threshold), 0, NALGORITHMS + 11,
02450                    1, 1);
02451   gtk_grid_attach (window->grid_algorithm,
02452                    GTK_WIDGET (window->scrolled_threshold), 1,
02453                    NALGORITHMS + 11, 1, 1);
02454   window->frame_algorithm = (GtkFrame *) gtk_frame_new (_("Algorithm"));
02455   gtk_container_add (GTK_CONTAINER (window->frame_algorithm),
02456                      GTK_WIDGET (window->grid_algorithm));
02457
02458   // Creating the variable widgets
02459   window->combo_variable = (GtkComboBoxText *) gtk_combo_box_text_new ();
02460   gtk_widget_set_tooltip_text
02461     (GTK_WIDGET (window->combo_variable), _("Variables selector"));
02462   window->id_variable = g_signal_connect
02463     (window->combo_variable, "changed", window_set_variable, NULL);
```

```
02464   window->button_add_variable
02465     = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
02466                                                    GTK_ICON_SIZE_BUTTON);
02467   g_signal_connect
02468     (window->button_add_variable, "clicked",
      window_add_variable, NULL);
02469   gtk_widget_set_tooltip_text
02470     (GTK_WIDGET (window->button_add_variable), _("Add variable"));
02471   window->button_remove_variable
02472     = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
02473                                                    GTK_ICON_SIZE_BUTTON);
02474   g_signal_connect
02475     (window->button_remove_variable, "clicked",
      window_remove_variable, NULL);
02476   gtk_widget_set_tooltip_text
02477     (GTK_WIDGET (window->button_remove_variable), _("Remove variable"));
02478   window->label_variable = (GtkLabel *) gtk_label_new (_("Name"));
02479   window->entry_variable = (GtkEntry *) gtk_entry_new ();
02480   gtk_widget_set_tooltip_text
02481     (GTK_WIDGET (window->entry_variable), _("Variable name"));
02482   gtk_widget_set_hexpand (GTK_WIDGET (window->entry_variable), TRUE);
02483   window->id_variable_label = g_signal_connect
02484     (window->entry_variable, "changed", window_label_variable, NULL);
02485   window->label_min = (GtkLabel *) gtk_label_new (_("Minimum"));
02486   window->spin_min = (GtkSpinButton *) gtk_spin_button_new_with_range
02487     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02488   gtk_widget_set_tooltip_text
02489     (GTK_WIDGET (window->spin_min), _("Minimum initial value of the variable"));
02490   window->scrolled_min
02491     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02492   gtk_container_add (GTK_CONTAINER (window->scrolled_min),
02493                      GTK_WIDGET (window->spin_min));
02494   g_signal_connect (window->spin_min, "value-changed",
02495                     window_rangemin_variable, NULL);
02496   window->label_max = (GtkLabel *) gtk_label_new (_("Maximum"));
02497   window->spin_max = (GtkSpinButton *) gtk_spin_button_new_with_range
02498     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02499   gtk_widget_set_tooltip_text
02500     (GTK_WIDGET (window->spin_max), _("Maximum initial value of the variable"));
02501   window->scrolled_max
02502     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02503   gtk_container_add (GTK_CONTAINER (window->scrolled_max),
02504                      GTK_WIDGET (window->spin_max));
02505   g_signal_connect (window->spin_max, "value-changed",
02506                     window_rangemax_variable, NULL);
02507   window->check_minabs = (GtkCheckButton *)
02508     gtk_check_button_new_with_mnemonic (_("_Absolute minimum"));
02509   g_signal_connect (window->check_minabs, "toggled", window_update, NULL);
02510   window->spin_minabs = (GtkSpinButton *) gtk_spin_button_new_with_range
02511     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02512   gtk_widget_set_tooltip_text
02513     (GTK_WIDGET (window->spin_minabs),
02514      _("Minimum allowed value of the variable"));
02515   window->scrolled_minabs
02516     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02517   gtk_container_add (GTK_CONTAINER (window->scrolled_minabs),
02518                      GTK_WIDGET (window->spin_minabs));
02519   g_signal_connect (window->spin_minabs, "value-changed",
02520                     window_rangeminabs_variable, NULL);
02521   window->check_maxabs = (GtkCheckButton *)
02522     gtk_check_button_new_with_mnemonic (_("_Absolute maximum"));
02523   g_signal_connect (window->check_maxabs, "toggled", window_update, NULL);
02524   window->spin_maxabs = (GtkSpinButton *) gtk_spin_button_new_with_range
02525     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02526   gtk_widget_set_tooltip_text
02527     (GTK_WIDGET (window->spin_maxabs),
02528      _("Maximum allowed value of the variable"));
02529   window->scrolled_maxabs
02530     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02531   gtk_container_add (GTK_CONTAINER (window->scrolled_maxabs),
02532                      GTK_WIDGET (window->spin_maxabs));
02533   g_signal_connect (window->spin_maxabs, "value-changed",
02534                     window_rangemaxabs_variable, NULL);
02535   window->label_precision = (GtkLabel *) gtk_label_new (_("Precision digits"));
02536   window->spin_precision = (GtkSpinButton *)
02537     gtk_spin_button_new_with_range (0., (gdouble) DEFAULT_PRECISION, 1.);
02538   gtk_widget_set_tooltip_text
02539     (GTK_WIDGET (window->spin_precision),
02540      _("Number of precision floating point digits\n"
02541        "0 is for integer numbers"));
02542   g_signal_connect (window->spin_precision, "value-changed",
02543                     window_precision_variable, NULL);
02544   window->label_sweeps = (GtkLabel *) gtk_label_new (_("Sweeps number"));
02545   window->spin_sweeps =
02546     (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
02547   gtk_widget_set_tooltip_text (GTK_WIDGET (window->spin_sweeps),
02548                                _("Number of steps sweeping the variable"));
```

```
02549   g_signal_connect (window->spin_sweeps, "value-changed",
02550                     window_update_variable, NULL);
02551   window->label_bits = (GtkLabel *) gtk_label_new (_("Bits number"));
02552   window->spin_bits
02553     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
02554   gtk_widget_set_tooltip_text
02555     (GTK_WIDGET (window->spin_bits),
02556      _("Number of bits to encode the variable"));
02557   g_signal_connect
02558     (window->spin_bits, "value-changed", window_update_variable, NULL);
02559   window->label_step = (GtkLabel *) gtk_label_new (_("Step size"));
02560   window->spin_step = (GtkSpinButton *) gtk_spin_button_new_with_range
02561     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02562   gtk_widget_set_tooltip_text
02563     (GTK_WIDGET (window->spin_step),
02564      _("Initial step size for the direction search method"));
02565   window->scrolled_step
02566     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02567   gtk_container_add (GTK_CONTAINER (window->scrolled_step),
02568                      GTK_WIDGET (window->spin_step));
02569   g_signal_connect
02570     (window->spin_step, "value-changed", window_step_variable, NULL);
02571   window->grid_variable = (GtkGrid *) gtk_grid_new ();
02572   gtk_grid_attach (window->grid_variable,
02573                    GTK_WIDGET (window->combo_variable), 0, 0, 2, 1);
02574   gtk_grid_attach (window->grid_variable,
02575                    GTK_WIDGET (window->button_add_variable), 2, 0, 1, 1);
02576   gtk_grid_attach (window->grid_variable,
02577                    GTK_WIDGET (window->button_remove_variable), 3, 0, 1, 1);
02578   gtk_grid_attach (window->grid_variable,
02579                    GTK_WIDGET (window->label_variable), 0, 1, 1, 1);
02580   gtk_grid_attach (window->grid_variable,
02581                    GTK_WIDGET (window->entry_variable), 1, 1, 3, 1);
02582   gtk_grid_attach (window->grid_variable,
02583                    GTK_WIDGET (window->label_min), 0, 2, 1, 1);
02584   gtk_grid_attach (window->grid_variable,
02585                    GTK_WIDGET (window->scrolled_min), 1, 2, 3, 1);
02586   gtk_grid_attach (window->grid_variable,
02587                    GTK_WIDGET (window->label_max), 0, 3, 1, 1);
02588   gtk_grid_attach (window->grid_variable,
02589                    GTK_WIDGET (window->scrolled_max), 1, 3, 3, 1);
02590   gtk_grid_attach (window->grid_variable,
02591                    GTK_WIDGET (window->check_minabs), 0, 4, 1, 1);
02592   gtk_grid_attach (window->grid_variable,
02593                    GTK_WIDGET (window->scrolled_minabs), 1, 4, 3, 1);
02594   gtk_grid_attach (window->grid_variable,
02595                    GTK_WIDGET (window->check_maxabs), 0, 5, 1, 1);
02596   gtk_grid_attach (window->grid_variable,
02597                    GTK_WIDGET (window->scrolled_maxabs), 1, 5, 3, 1);
02598   gtk_grid_attach (window->grid_variable,
02599                    GTK_WIDGET (window->label_precision), 0, 6, 1, 1);
02600   gtk_grid_attach (window->grid_variable,
02601                    GTK_WIDGET (window->spin_precision), 1, 6, 3, 1);
02602   gtk_grid_attach (window->grid_variable,
02603                    GTK_WIDGET (window->label_sweeps), 0, 7, 1, 1);
02604   gtk_grid_attach (window->grid_variable,
02605                    GTK_WIDGET (window->spin_sweeps), 1, 7, 3, 1);
02606   gtk_grid_attach (window->grid_variable,
02607                    GTK_WIDGET (window->label_bits), 0, 8, 1, 1);
02608   gtk_grid_attach (window->grid_variable,
02609                    GTK_WIDGET (window->spin_bits), 1, 8, 3, 1);
02610   gtk_grid_attach (window->grid_variable,
02611                    GTK_WIDGET (window->label_step), 0, 9, 1, 1);
02612   gtk_grid_attach (window->grid_variable,
02613                    GTK_WIDGET (window->scrolled_step), 1, 9, 3, 1);
02614   window->frame_variable = (GtkFrame *) gtk_frame_new (_("Variable"));
02615   gtk_container_add (GTK_CONTAINER (window->frame_variable),
02616                      GTK_WIDGET (window->grid_variable));
02617
02618   // Creating the experiment widgets
02619   window->combo_experiment = (GtkComboBoxText *) gtk_combo_box_text_new ();
02620   gtk_widget_set_tooltip_text (GTK_WIDGET (window->combo_experiment),
02621                                _("Experiment selector"));
02622   window->id_experiment = g_signal_connect
02623     (window->combo_experiment, "changed", window_set_experiment, NULL)
    ;
02624   window->button_add_experiment
02625     = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
02626                                                    GTK_ICON_SIZE_BUTTON);
02627   g_signal_connect
02628     (window->button_add_experiment, "clicked",
    window_add_experiment, NULL);
02629   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_experiment),
02630                                _("Add experiment"));
02631   window->button_remove_experiment
02632     = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
02633                                                    GTK_ICON_SIZE_BUTTON);
```

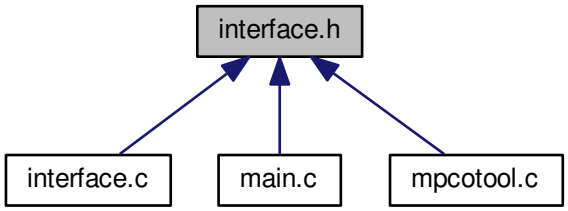
```
02634   g_signal_connect (window->button_remove_experiment, "clicked",
02635                     window_remove_experiment, NULL);
02636   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_remove_experiment),
02637                                _("Remove experiment"));
02638   window->label_experiment
02639     = (GtkLabel *) gtk_label_new (_("Experimental data file"));
02640   window->button_experiment = (GtkFileChooserButton *)
02641     gtk_file_chooser_button_new (_("Experimental data file"),
02642                                  GTK_FILE_CHOOSER_ACTION_OPEN);
02643   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_experiment),
02644                                _("Experimental data file"));
02645   window->id_experiment_name
02646     = g_signal_connect (window->button_experiment, "selection-changed",
02647                         window_name_experiment, NULL);
02648   gtk_widget_set_hexpand (GTK_WIDGET (window->button_experiment), TRUE);
02649   window->label_weight = (GtkLabel *) gtk_label_new (_("Weight"));
02650   window->spin_weight
02651     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02652   gtk_widget_set_tooltip_text
02653     (GTK_WIDGET (window->spin_weight),
02654      _("Weight factor to build the objective function"));
02655   g_signal_connect
02656     (window->spin_weight, "value-changed", window_weight_experiment,
    NULL);
02657   window->grid_experiment = (GtkGrid *) gtk_grid_new ();
02658   gtk_grid_attach (window->grid_experiment,
02659                    GTK_WIDGET (window->combo_experiment), 0, 0, 2, 1);
02660   gtk_grid_attach (window->grid_experiment,
02661                    GTK_WIDGET (window->button_add_experiment), 2, 0, 1, 1);
02662   gtk_grid_attach (window->grid_experiment,
02663                    GTK_WIDGET (window->button_remove_experiment), 3, 0, 1, 1);
02664   gtk_grid_attach (window->grid_experiment,
02665                    GTK_WIDGET (window->label_experiment), 0, 1, 1, 1);
02666   gtk_grid_attach (window->grid_experiment,
02667                    GTK_WIDGET (window->button_experiment), 1, 1, 3, 1);
02668   gtk_grid_attach (window->grid_experiment,
02669                    GTK_WIDGET (window->label_weight), 0, 2, 1, 1);
02670   gtk_grid_attach (window->grid_experiment,
02671                    GTK_WIDGET (window->spin_weight), 1, 2, 3, 1);
02672   for (i = 0; i < MAX_NINPUTS; ++i)
02673     {
02674       snprintf (buffer3, 64, "%s %u", _("Input template"), i + 1);
02675       window->check_template[i] = (GtkCheckButton *)
02676         gtk_check_button_new_with_label (buffer3);
02677       window->id_template[i]
02678         = g_signal_connect (window->check_template[i], "toggled",
02679                             window_inputs_experiment, NULL);
02680       gtk_grid_attach (window->grid_experiment,
02681                        GTK_WIDGET (window->check_template[i]), 0, 3 + i, 1, 1);
02682       window->button_template[i] =
02683         (GtkFileChooserButton *)
02684         gtk_file_chooser_button_new (_("Input template"),
02685                                      GTK_FILE_CHOOSER_ACTION_OPEN);
02686       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_template[i]),
02687                                    _("Experimental input template file"));
02688       window->id_input[i] =
02689         g_signal_connect_swapped (window->button_template[i],
02690                                   "selection-changed",
02691                                   (GCallback) window_template_experiment,
02692                                   (void *) (size_t) i);
02693       gtk_grid_attach (window->grid_experiment,
02694                        GTK_WIDGET (window->button_template[i]), 1, 3 + i, 3, 1);
02695     }
02696   window->frame_experiment = (GtkFrame *) gtk_frame_new (_("Experiment"));
02697   gtk_container_add (GTK_CONTAINER (window->frame_experiment),
02698                      GTK_WIDGET (window->grid_experiment));
02699
02700   // Creating the error norm widgets
02701   window->frame_norm = (GtkFrame *) gtk_frame_new (_("Error norm"));
02702   window->grid_norm = (GtkGrid *) gtk_grid_new ();
02703   gtk_container_add (GTK_CONTAINER (window->frame_norm),
02704                      GTK_WIDGET (window->grid_norm));
02705   window->button_norm[0] = (GtkRadioButton *)
02706     gtk_radio_button_new_with_mnemonic (NULL, label_norm[0]);
02707   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[0]),
02708                                tip_norm[0]);
02709   gtk_grid_attach (window->grid_norm,
02710                    GTK_WIDGET (window->button_norm[0]), 0, 0, 1, 1);
02711   g_signal_connect (window->button_norm[0], "clicked", window_update, NULL);
02712   for (i = 0; ++i < NNORMS;)
02713     {
02714       window->button_norm[i] = (GtkRadioButton *)
02715         gtk_radio_button_new_with_mnemonic
02716         (gtk_radio_button_get_group (window->button_norm[0]), label_norm[i]);
02717       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[i]),
02718                                    tip_norm[i]);
02719       gtk_grid_attach (window->grid_norm,
```

```
02720                       GTK_WIDGET (window->button_norm[i]), 0, i, 1, 1);
02721       g_signal_connect (window->button_norm[i], "clicked",
    window_update, NULL);
02722     }
02723   window->label_p = (GtkLabel *) gtk_label_new (_("P parameter"));
02724   gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->label_p), 1, 1, 1, 1);
02725   window->spin_p =
02726     (GtkSpinButton *) gtk_spin_button_new_with_range (-G_MAXDOUBLE,
02727                                                       G_MAXDOUBLE, 0.01);
02728   gtk_widget_set_tooltip_text (GTK_WIDGET (window->spin_p),
02729                                _("P parameter for the P error norm"));
02730   window->scrolled_p =
02731     (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02732   gtk_container_add (GTK_CONTAINER (window->scrolled_p),
02733                      GTK_WIDGET (window->spin_p));
02734   gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_p), TRUE);
02735   gtk_widget_set_halign (GTK_WIDGET (window->scrolled_p), GTK_ALIGN_FILL);
02736   gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->scrolled_p),
02737                    1, 2, 1, 2);
02738
02739   // Creating the grid and attaching the widgets to the grid
02740   window->grid = (GtkGrid *) gtk_grid_new ();
02741   gtk_grid_attach (window->grid, GTK_WIDGET (window->bar_buttons), 0, 0, 3, 1);
02742   gtk_grid_attach (window->grid, GTK_WIDGET (window->grid_files), 0, 1, 1, 1);
02743   gtk_grid_attach (window->grid,
02744                    GTK_WIDGET (window->frame_algorithm), 0, 2, 1, 1);
02745   gtk_grid_attach (window->grid,
02746                    GTK_WIDGET (window->frame_variable), 1, 2, 1, 1);
02747   gtk_grid_attach (window->grid,
02748                    GTK_WIDGET (window->frame_experiment), 2, 2, 1, 1);
02749   gtk_grid_attach (window->grid, GTK_WIDGET (window->frame_norm), 1, 1, 2, 1);
02750   gtk_container_add (GTK_CONTAINER (window->window), GTK_WIDGET (window->
    grid));
02751
02752   // Setting the window logo
02753   window->logo = gdk_pixbuf_new_from_xpm_data (logo);
02754   gtk_window_set_icon (window->window, window->logo);
02755
02756   // Showing the window
02757   gtk_widget_show_all (GTK_WIDGET (window->window));
02758
02759   // In GTK+ 3.16 and 3.18 the default scrolled size is wrong
02760 #if GTK_MINOR_VERSION >= 16
02761   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_min), -1, 40);
02762   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_max), -1, 40);
02763   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_minabs), -1, 40);
02764   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_maxabs), -1, 40);
02765   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_step), -1, 40);
02766   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_p), -1, 40);
02767   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_threshold), -1, 40);
02768 #endif
02769
02770   // Reading initial example
02771   input_new ();
02772   buffer2 = g_get_current_dir ();
02773   buffer = g_build_filename (buffer2, "..", "tests", "test1", INPUT_FILE, NULL);
02774   g_free (buffer2);
02775   window_read (buffer);
02776   g_free (buffer);
02777
02778 #if DEBUG_INTERFACE
02779   fprintf (stderr, "window_new: start\n");
02780 #endif
02781 }
```

4.13 interface.h File Reference

Header file to define the graphical interface functions.

This graph shows which files directly or indirectly include this file:



Data Structures

- struct Options

  Struct to define the options dialog.
- struct Running

  Struct to define the running dialog.
- struct Window

  Struct to define the main window.

Macros

- #define MAX_LENGTH (DEFAULT_PRECISION + 8)

  Max length of texts allowed in GtkSpinButtons.

Functions

- unsigned int gtk_array_get_active (GtkRadioButton *array[ ], unsigned int n)

  Function to get the active GtkRadioButton.
- void input_save (char *filename)

  Function to save the input file.
- void options_new ()

  Function to open the options dialog.
- void running_new ()

  Function to open the running dialog.
- unsigned int window_get_algorithm ()

  Function to get the stochastic algorithm number.
- unsigned int window_get_direction ()

  Function to get the direction search method number.
- unsigned int window_get_norm ()

  Function to get the norm method number.
- void window_save_direction ()

  Function to save the direction search method data in the input file.
- int window_save ()

Function to save the input file.

- void window_run ()

  Function to run a optimization.
- void window_help ()

  Function to show a help dialog.
- void window_update_direction ()

  Function to update direction search method widgets view in the main window.
- void window_update ()

  Function to update the main window view.
- void window_set_algorithm ()

  Function to avoid memory errors changing the algorithm.
- void window_set_experiment ()

  Function to set the experiment data in the main window.
- void window_remove_experiment ()

  Function to remove an experiment in the main window.
- void window_add_experiment ()

  Function to add an experiment in the main window.
- void window_name_experiment ()

  Function to set the experiment name in the main window.
- void window_weight_experiment ()

  Function to update the experiment weight in the main window.
- void window_inputs_experiment ()

  Function to update the experiment input templates number in the main window.
- void window_template_experiment (void *data)

  Function to update the experiment i-th input template in the main window.
- void window_set_variable ()

  Function to set the variable data in the main window.
- void window_remove_variable ()

  Function to remove a variable in the main window.
- void window_add_variable ()

  Function to add a variable in the main window.
- void window_label_variable ()

  Function to set the variable label in the main window.
- void window_precision_variable ()

  Function to update the variable precision in the main window.
- void window_rangemin_variable ()

  Function to update the variable rangemin in the main window.
- void window_rangemax_variable ()

  Function to update the variable rangemax in the main window.
- void window_rangeminabs_variable ()

  Function to update the variable rangeminabs in the main window.
- void window_rangemaxabs_variable ()

  Function to update the variable rangemaxabs in the main window.
- void window_update_variable ()

  Function to update the variable data in the main window.
- int window_read (char *filename)

  Function to read the input data of a file.
- void window_open ()

  Function to open the input data.
- void window_new (GtkApplication *application)

  Function to open the main window.

Variables

- const char * logo [ ]

  Logo pixmap.
- Options options [1]

  Options struct to define the options dialog.
- Running running [1]

  Running struct to define the running dialog.
- Window window [1]

  Window struct to define the main interface window.

4.13.1 Detailed Description

Header file to define the graphical interface functions.

Authors

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Definition in file interface.h.

4.13.2 Function Documentation

4.13.2.1 gtk_array_get_active()

```
unsigned int gtk_array_get_active (
             GtkRadioButton * array[],
             unsigned int n )
```

Function to get the active GtkRadioButton.

Parameters

array	Array of GtkRadioButtons.
n	Number of GtkRadioButtons.

Returns

Active GtkRadioButton.

Definition at line 566 of file utils.c.

```
00567 {
00568   unsigned int i;
00569   for (i = 0; i < n; ++i)
00570     if (gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (array[i])))
00571       break;
00572   return i;
00573 }
```

4.13.2.2 input_save()

```
void input_save (
             char * filename )
```

Function to save the input file.

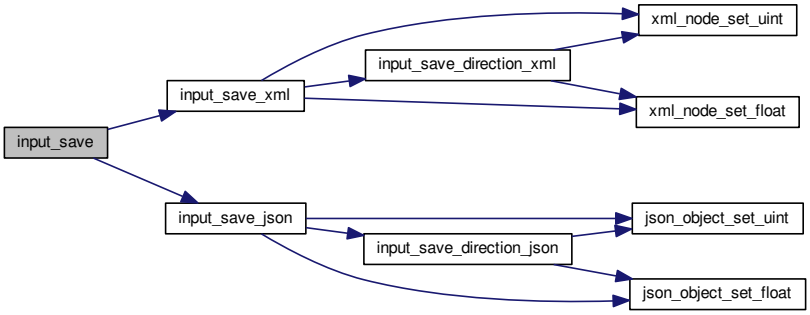
Parameters

filename	Input file name.

Definition at line 575 of file interface.c.

```
00576 {
00577   xmlDoc *doc;
00578   JsonGenerator *generator;
00579
00580 #if DEBUG_INTERFACE
00581   fprintf (stderr, "input_save: start\n");
00582 #endif
00583
00584   // Getting the input file directory
00585   input->name = g_path_get_basename (filename);
00586   input->directory = g_path_get_dirname (filename);
00587
00588   if (input->type == INPUT_TYPE_XML)
00589     {
00590       // Opening the input file
00591       doc = xmlNewDoc ((const xmlChar *) "1.0");
00592       input_save_xml (doc);
00593
00594       // Saving the XML file
00595       xmlSaveFormatFile (filename, doc, 1);
00596
00597       // Freeing memory
00598       xmlFreeDoc (doc);
00599     }
00600   else
00601     {
00602       // Opening the input file
00603       generator = json_generator_new ();
00604       json_generator_set_pretty (generator, TRUE);
00605       input_save_json (generator);
00606
00607       // Saving the JSON file
00608       json_generator_to_file (generator, filename, NULL);
00609
00610       // Freeing memory
00611       g_object_unref (generator);
00612     }
00613
00614 #if DEBUG_INTERFACE
00615   fprintf (stderr, "input_save: end\n");
00616 #endif
00617 }
```

Here is the call graph for this function:



4.13.2.3 window_get_algorithm()

```
unsigned int window_get_algorithm ( )
```

Function to get the stochastic algorithm number.

Returns

Stochastic algorithm number.

Definition at line 725 of file interface.c.

```
00726 {
00727   unsigned int i;
00728 #if DEBUG_INTERFACE
00729   fprintf (stderr, "window_get_algorithm: start\n");
00730 #endif
00731   i = gtk_array_get_active (window->button_algorithm,
      NALGORITHMS);
00732 #if DEBUG_INTERFACE
00733   fprintf (stderr, "window_get_algorithm: %u\n", i);
00734   fprintf (stderr, "window_get_algorithm: end\n");
00735 #endif
00736   return i;
00737 }
```

Here is the call graph for this function:

4.13.2.4 window_get_direction()

```
unsigned int window_get_direction ( )
```

Function to get the direction search method number.

Returns

Direction search method number.

Definition at line 745 of file interface.c.

```
00746 {
00747   unsigned int i;
00748 #if DEBUG_INTERFACE
00749   fprintf (stderr, "window_get_direction: start\n");
00750 #endif
00751   i = gtk_array_get_active (window->button_direction,
      NDIRECTIONS);
00752 #if DEBUG_INTERFACE
00753   fprintf (stderr, "window_get_direction: %u\n", i);
00754   fprintf (stderr, "window_get_direction: end\n");
00755 #endif
00756   return i;
00757 }
```

Here is the call graph for this function:

4.13.2.5 window_get_norm()

```
unsigned int window_get_norm ( )
```

Function to get the norm method number.

Returns

Norm method number.

Definition at line 765 of file interface.c.

```
00766 {
00767   unsigned int i;
00768 #if DEBUG_INTERFACE
00769   fprintf (stderr, "window_get_norm: start\n");
00770 #endif
00771   i = gtk_array_get_active (window->button_norm,
      NNORMS);
00772 #if DEBUG_INTERFACE
00773   fprintf (stderr, "window_get_norm: %u\n", i);
00774   fprintf (stderr, "window_get_norm: end\n");
00775 #endif
00776   return i;
00777 }
```

Here is the call graph for this function:

4.13.2.6 window_new()

```
void window_new (
             GtkApplication * application )
```

Function to open the main window.

Parameters

application	GtkApplication struct.

Definition at line 2081 of file interface.c.

```
02082 {
02083   unsigned int i;
02084   char *buffer, *buffer2, buffer3[64];
02085   char *label_algorithm[NALGORITHMS] = {
02086     "_Monte-Carlo", _("_Sweep"), _("_Genetic")
02087   };
02088   char *tip_algorithm[NALGORITHMS] = {
02089     _("Monte-Carlo brute force algorithm"),
02090     _("Sweep brute force algorithm"),
02091     _("Genetic algorithm")
02092   };
02093   char *label_direction[NDIRECTIONS] = {
02094     _("_Coordinates descent"), _("_Random")
02095   };
02096   char *tip_direction[NDIRECTIONS] = {
02097     _("Coordinates direction estimate method"),
02098     _("Random direction estimate method")
02099   };
02100   char *label_norm[NNORMS] = { "L2", "L", "Lp", "L1" };
02101   char *tip_norm[NNORMS] = {
02102     _("Euclidean error norm (L2)"),
02103     _("Maximum error norm (L)"),
```

```
02104     _("P error norm (Lp)"),
02105     _("Taxicab error norm (L1)")
02106   };
02107
02108 #if DEBUG_INTERFACE
02109   fprintf (stderr, "window_new: start\n");
02110 #endif
02111
02112   // Creating the window
02113   window->window = main_window
02114     = (GtkWindow *) gtk_application_window_new (application);
02115
02116   // Finish when closing the window
02117   g_signal_connect_swapped (window->window, "delete-event",
02118                             G_CALLBACK (g_application_quit),
02119                             G_APPLICATION (application));
02120
02121   // Setting the window title
02122   gtk_window_set_title (window->window, "MPCOTool");
02123
02124   // Creating the open button
02125   window->button_open = (GtkToolButton *) gtk_tool_button_new
02126     (gtk_image_new_from_icon_name ("document-open",
02127                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Open"));
02128   g_signal_connect (window->button_open, "clicked", window_open, NULL);
02129
02130   // Creating the save button
02131   window->button_save = (GtkToolButton *) gtk_tool_button_new
02132     (gtk_image_new_from_icon_name ("document-save",
02133                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Save"));
02134   g_signal_connect (window->button_save, "clicked", (GCallback)
      window_save,
02135                     NULL);
02136
02137   // Creating the run button
02138   window->button_run = (GtkToolButton *) gtk_tool_button_new
02139     (gtk_image_new_from_icon_name ("system-run",
02140                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Run"));
02141   g_signal_connect (window->button_run, "clicked", window_run, NULL);
02142
02143   // Creating the options button
02144   window->button_options = (GtkToolButton *) gtk_tool_button_new
02145     (gtk_image_new_from_icon_name ("preferences-system",
02146                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Options"));
02147   g_signal_connect (window->button_options, "clicked",
      options_new, NULL);
02148
02149   // Creating the help button
02150   window->button_help = (GtkToolButton *) gtk_tool_button_new
02151     (gtk_image_new_from_icon_name ("help-browser",
02152                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Help"));
02153   g_signal_connect (window->button_help, "clicked", window_help, NULL);
02154
02155   // Creating the about button
02156   window->button_about = (GtkToolButton *) gtk_tool_button_new
02157     (gtk_image_new_from_icon_name ("help-about",
02158                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("About"));
02159   g_signal_connect (window->button_about, "clicked",
      window_about, NULL);
02160
02161   // Creating the exit button
02162   window->button_exit = (GtkToolButton *) gtk_tool_button_new
02163     (gtk_image_new_from_icon_name ("application-exit",
02164                                    GTK_ICON_SIZE_LARGE_TOOLBAR), _("Exit"));
02165   g_signal_connect_swapped (window->button_exit, "clicked",
02166                             G_CALLBACK (g_application_quit),
02167                             G_APPLICATION (application));
02168
02169   // Creating the buttons bar
02170   window->bar_buttons = (GtkToolbar *) gtk_toolbar_new ();
02171   gtk_toolbar_insert
02172     (window->bar_buttons, GTK_TOOL_ITEM (window->
      button_open), 0);
02173   gtk_toolbar_insert
02174     (window->bar_buttons, GTK_TOOL_ITEM (window->
      button_save), 1);
02175   gtk_toolbar_insert
02176     (window->bar_buttons, GTK_TOOL_ITEM (window->
      button_run), 2);
02177   gtk_toolbar_insert
02178     (window->bar_buttons, GTK_TOOL_ITEM (window->
      button_options), 3);
02179   gtk_toolbar_insert
02180     (window->bar_buttons, GTK_TOOL_ITEM (window->
      button_help), 4);
02181   gtk_toolbar_insert
02182     (window->bar_buttons, GTK_TOOL_ITEM (window->
```

```
button_about), 5);
02183   gtk_toolbar_insert
02184     (window->bar_buttons, GTK_TOOL_ITEM (window->
button_exit), 6);
02185   gtk_toolbar_set_style (window->bar_buttons, GTK_TOOLBAR_BOTH);
02186
02187   // Creating the simulator program label and entry
02188   window->label_simulator = (GtkLabel *) gtk_label_new (_("Simulator program"));
02189   window->button_simulator = (GtkFileChooserButton *)
02190     gtk_file_chooser_button_new (_("Simulator program"),
02191                                  GTK_FILE_CHOOSER_ACTION_OPEN);
02192   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_simulator),
02193                                _("Simulator program executable file"));
02194   gtk_widget_set_hexpand (GTK_WIDGET (window->button_simulator), TRUE);
02195
02196   // Creating the evaluator program label and entry
02197   window->check_evaluator = (GtkCheckButton *)
02198     gtk_check_button_new_with_mnemonic (_("_Evaluator program"));
02199   g_signal_connect (window->check_evaluator, "toggled",
window_update, NULL);
02200   window->button_evaluator = (GtkFileChooserButton *)
02201     gtk_file_chooser_button_new (_("Evaluator program"),
02202                                  GTK_FILE_CHOOSER_ACTION_OPEN);
02203   gtk_widget_set_tooltip_text
02204     (GTK_WIDGET (window->button_evaluator),
02205      _("Optional evaluator program executable file"));
02206
02207   // Creating the results files labels and entries
02208   window->label_result = (GtkLabel *) gtk_label_new (_("Result file"));
02209   window->entry_result = (GtkEntry *) gtk_entry_new ();
02210   gtk_widget_set_tooltip_text
02211     (GTK_WIDGET (window->entry_result), _("Best results file"));
02212   window->label_variables = (GtkLabel *) gtk_label_new (_("Variables file"));
02213   window->entry_variables = (GtkEntry *) gtk_entry_new ();
02214   gtk_widget_set_tooltip_text
02215     (GTK_WIDGET (window->entry_variables), _("All simulated results file"));
02216
02217   // Creating the files grid and attaching widgets
02218   window->grid_files = (GtkGrid *) gtk_grid_new ();
02219   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
label_simulator),
02220                    0, 0, 1, 1);
02221   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
button_simulator),
02222                    1, 0, 1, 1);
02223   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
check_evaluator),
02224                    0, 1, 1, 1);
02225   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
button_evaluator),
02226                    1, 1, 1, 1);
02227   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
label_result),
02228                    0, 2, 1, 1);
02229   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
entry_result),
02230                    1, 2, 1, 1);
02231   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
label_variables),
02232                    0, 3, 1, 1);
02233   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
entry_variables),
02234                    1, 3, 1, 1);
02235
02236   // Creating the algorithm properties
02237   window->label_simulations = (GtkLabel *) gtk_label_new
02238     (_("Simulations number"));
02239   window->spin_simulations
02240     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
02241   gtk_widget_set_tooltip_text
02242     (GTK_WIDGET (window->spin_simulations),
02243      _("Number of simulations to perform for each iteration"));
02244   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_simulations), TRUE);
02245   window->label_iterations = (GtkLabel *)
02246     gtk_label_new (_("Iterations number"));
02247   window->spin_iterations
02248     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
02249   gtk_widget_set_tooltip_text
02250     (GTK_WIDGET (window->spin_iterations), _("Number of iterations"));
02251   g_signal_connect
02252     (window->spin_iterations, "value-changed",
window_update, NULL);
02253   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_iterations), TRUE);
02254   window->label_tolerance = (GtkLabel *) gtk_label_new (_("Tolerance"));
02255   window->spin_tolerance =
02256     (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02257   gtk_widget_set_tooltip_text
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02258     (GTK_WIDGET (window->spin_tolerance),
02259      _("Tolerance to set the variable interval on the next iteration"));
02260   window->label_bests = (GtkLabel *) gtk_label_new (_("Bests number"));
02261   window->spin_bests
02262     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
02263   gtk_widget_set_tooltip_text
02264     (GTK_WIDGET (window->spin_bests),
02265      _("Number of best simulations used to set the variable interval "
02266        "on the next iteration"));
02267   window->label_population
02268     = (GtkLabel *) gtk_label_new (_("Population number"));
02269   window->spin_population
02270     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
02271   gtk_widget_set_tooltip_text
02272     (GTK_WIDGET (window->spin_population),
02273      _("Number of population for the genetic algorithm"));
02274   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_population), TRUE);
02275   window->label_generations
02276     = (GtkLabel *) gtk_label_new (_("Generations number"));
02277   window->spin_generations
02278     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
02279   gtk_widget_set_tooltip_text
02280     (GTK_WIDGET (window->spin_generations),
02281      _("Number of generations for the genetic algorithm"));
02282   window->label_mutation = (GtkLabel *) gtk_label_new (_("Mutation ratio"));
02283   window->spin_mutation
02284     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02285   gtk_widget_set_tooltip_text
02286     (GTK_WIDGET (window->spin_mutation),
02287      _("Ratio of mutation for the genetic algorithm"));
02288   window->label_reproduction
02289     = (GtkLabel *) gtk_label_new (_("Reproduction ratio"));
02290   window->spin_reproduction
02291     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02292   gtk_widget_set_tooltip_text
02293     (GTK_WIDGET (window->spin_reproduction),
02294      _("Ratio of reproduction for the genetic algorithm"));
02295   window->label_adaptation = (GtkLabel *) gtk_label_new (_("Adaptation ratio"));
02296   window->spin_adaptation
02297     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02298   gtk_widget_set_tooltip_text
02299     (GTK_WIDGET (window->spin_adaptation),
02300      _("Ratio of adaptation for the genetic algorithm"));
02301   window->label_threshold = (GtkLabel *) gtk_label_new (_("Threshold"));
02302   window->spin_threshold = (GtkSpinButton *)
02303     gtk_spin_button_new_with_range (-G_MAXDOUBLE, G_MAXDOUBLE,
02304                                     precision[DEFAULT_PRECISION]);
02305   gtk_widget_set_tooltip_text
02306     (GTK_WIDGET (window->spin_threshold),
02307      _("Threshold in the objective function to finish the simulations"));
02308   window->scrolled_threshold =
02309     (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02310   gtk_container_add (GTK_CONTAINER (window->scrolled_threshold),
02311                      GTK_WIDGET (window->spin_threshold));
02312 //  gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_threshold), TRUE);
02313 //  gtk_widget_set_halign (GTK_WIDGET (window->scrolled_threshold),
02314 //                         GTK_ALIGN_FILL);
02315
02316   // Creating the direction search method properties
02317   window->check_direction = (GtkCheckButton *)
02318     gtk_check_button_new_with_mnemonic (_("_Direction search method"));
02319   g_signal_connect (window->check_direction, "clicked",
      window_update, NULL);
02320   window->grid_direction = (GtkGrid *) gtk_grid_new ();
02321   window->button_direction[0] = (GtkRadioButton *)
02322     gtk_radio_button_new_with_mnemonic (NULL, label_direction[0]);
02323   gtk_grid_attach (window->grid_direction,
02324                    GTK_WIDGET (window->button_direction[0]), 0, 0, 1, 1);
02325   g_signal_connect (window->button_direction[0], "clicked",
      window_update,
02326                     NULL);
02327   for (i = 0; ++i < NDIRECTIONS;)
02328     {
02329       window->button_direction[i] = (GtkRadioButton *)
02330         gtk_radio_button_new_with_mnemonic
02331         (gtk_radio_button_get_group (window->button_direction[0]),
02332          label_direction[i]);
02333       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_direction[i]),
02334                                    tip_direction[i]);
02335       gtk_grid_attach (window->grid_direction,
02336                        GTK_WIDGET (window->button_direction[i]), 0, i, 1, 1);
02337       g_signal_connect (window->button_direction[i], "clicked",
02338                         window_update, NULL);
02339     }
02340   window->label_steps = (GtkLabel *) gtk_label_new (_("Steps number"));
02341   window->spin_steps = (GtkSpinButton *)
02342     gtk_spin_button_new_with_range (1., 1.e12, 1.);
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02343   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_steps), TRUE);
02344   window->label_estimates
02345     = (GtkLabel *) gtk_label_new (_("Direction estimates number"));
02346   window->spin_estimates = (GtkSpinButton *)
02347     gtk_spin_button_new_with_range (1., 1.e3, 1.);
02348   window->label_relaxation
02349     = (GtkLabel *) gtk_label_new (_("Relaxation parameter"));
02350   window->spin_relaxation = (GtkSpinButton *)
02351     gtk_spin_button_new_with_range (0., 2., 0.001);
02352   gtk_grid_attach (window->grid_direction, GTK_WIDGET (
      window->label_steps),
02353                    0, NDIRECTIONS, 1, 1);
02354   gtk_grid_attach (window->grid_direction, GTK_WIDGET (
      window->spin_steps),
02355                    1, NDIRECTIONS, 1, 1);
02356   gtk_grid_attach (window->grid_direction,
02357                    GTK_WIDGET (window->label_estimates), 0, NDIRECTIONS + 1,
02358                    1, 1);
02359   gtk_grid_attach (window->grid_direction,
02360                    GTK_WIDGET (window->spin_estimates), 1, NDIRECTIONS + 1, 1,
02361                    1);
02362   gtk_grid_attach (window->grid_direction,
02363                    GTK_WIDGET (window->label_relaxation), 0, NDIRECTIONS + 2,
02364                    1, 1);
02365   gtk_grid_attach (window->grid_direction,
02366                    GTK_WIDGET (window->spin_relaxation), 1, NDIRECTIONS + 2,
02367                    1, 1);
02368
02369   // Creating the array of algorithms
02370   window->grid_algorithm = (GtkGrid *) gtk_grid_new ();
02371   window->button_algorithm[0] = (GtkRadioButton *)
02372     gtk_radio_button_new_with_mnemonic (NULL, label_algorithm[0]);
02373   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[0]),
02374                                tip_algorithm[0]);
02375   gtk_grid_attach (window->grid_algorithm,
02376                    GTK_WIDGET (window->button_algorithm[0]), 0, 0, 1, 1);
02377   g_signal_connect (window->button_algorithm[0], "clicked",
02378                     window_set_algorithm, NULL);
02379   for (i = 0; ++i < NALGORITHMS;)
02380     {
02381       window->button_algorithm[i] = (GtkRadioButton *)
02382         gtk_radio_button_new_with_mnemonic
02383         (gtk_radio_button_get_group (window->button_algorithm[0]),
02384          label_algorithm[i]);
02385       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[i]),
02386                                    tip_algorithm[i]);
02387       gtk_grid_attach (window->grid_algorithm,
02388                        GTK_WIDGET (window->button_algorithm[i]), 0, i, 1, 1);
02389       g_signal_connect (window->button_algorithm[i], "clicked",
02390                         window_set_algorithm, NULL);
02391     }
02392   gtk_grid_attach (window->grid_algorithm,
02393                    GTK_WIDGET (window->label_simulations), 0,
02394                    NALGORITHMS, 1, 1);
02395   gtk_grid_attach (window->grid_algorithm,
02396                    GTK_WIDGET (window->spin_simulations), 1, NALGORITHMS, 1, 1);
02397   gtk_grid_attach (window->grid_algorithm,
02398                    GTK_WIDGET (window->label_iterations), 0, NALGORITHMS + 1,
02399                    1, 1);
02400   gtk_grid_attach (window->grid_algorithm,
02401                    GTK_WIDGET (window->spin_iterations), 1, NALGORITHMS + 1,
02402                    1, 1);
02403   gtk_grid_attach (window->grid_algorithm,
02404                    GTK_WIDGET (window->label_tolerance), 0, NALGORITHMS + 2,
02405                    1, 1);
02406   gtk_grid_attach (window->grid_algorithm,
02407                    GTK_WIDGET (window->spin_tolerance), 1, NALGORITHMS + 2, 1,
02408                    1);
02409   gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (
      window->label_bests),
02410                    0, NALGORITHMS + 3, 1, 1);
02411   gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (
      window->spin_bests), 1,
02412                    NALGORITHMS + 3, 1, 1);
02413   gtk_grid_attach (window->grid_algorithm,
02414                    GTK_WIDGET (window->label_population), 0, NALGORITHMS + 4,
02415                    1, 1);
02416   gtk_grid_attach (window->grid_algorithm,
02417                    GTK_WIDGET (window->spin_population), 1, NALGORITHMS + 4,
02418                    1, 1);
02419   gtk_grid_attach (window->grid_algorithm,
02420                    GTK_WIDGET (window->label_generations), 0, NALGORITHMS + 5,
02421                    1, 1);
02422   gtk_grid_attach (window->grid_algorithm,
02423                    GTK_WIDGET (window->spin_generations), 1, NALGORITHMS + 5,
02424                    1, 1);
02425   gtk_grid_attach (window->grid_algorithm,
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02426                   GTK_WIDGET (window->label_mutation), 0, NALGORITHMS + 6, 1,
02427                   1);
02428   gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (
      window->spin_mutation),
02429                   1, NALGORITHMS + 6, 1, 1);
02430   gtk_grid_attach (window->grid_algorithm,
02431                   GTK_WIDGET (window->label_reproduction), 0,
02432                   NALGORITHMS + 7, 1, 1);
02433   gtk_grid_attach (window->grid_algorithm,
02434                   GTK_WIDGET (window->spin_reproduction), 1, NALGORITHMS + 7,
02435                   1, 1);
02436   gtk_grid_attach (window->grid_algorithm,
02437                   GTK_WIDGET (window->label_adaptation), 0, NALGORITHMS + 8,
02438                   1, 1);
02439   gtk_grid_attach (window->grid_algorithm,
02440                   GTK_WIDGET (window->spin_adaptation), 1, NALGORITHMS + 8,
02441                   1, 1);
02442   gtk_grid_attach (window->grid_algorithm,
02443                   GTK_WIDGET (window->check_direction), 0, NALGORITHMS + 9,
02444                   2, 1);
02445   gtk_grid_attach (window->grid_algorithm,
02446                   GTK_WIDGET (window->grid_direction), 0, NALGORITHMS + 10,
02447                   2, 1);
02448   gtk_grid_attach (window->grid_algorithm,
02449                   GTK_WIDGET (window->label_threshold), 0, NALGORITHMS + 11,
02450                   1, 1);
02451   gtk_grid_attach (window->grid_algorithm,
02452                   GTK_WIDGET (window->scrolled_threshold), 1,
02453                   NALGORITHMS + 11, 1, 1);
02454   window->frame_algorithm = (GtkFrame *) gtk_frame_new (_("Algorithm"));
02455   gtk_container_add (GTK_CONTAINER (window->frame_algorithm),
02456                      GTK_WIDGET (window->grid_algorithm));
02457
02458   // Creating the variable widgets
02459   window->combo_variable = (GtkComboBoxText *) gtk_combo_box_text_new ();
02460   gtk_widget_set_tooltip_text
02461     (GTK_WIDGET (window->combo_variable), _("Variables selector"));
02462   window->id_variable = g_signal_connect
02463     (window->combo_variable, "changed", window_set_variable, NULL);
02464   window->button_add_variable
02465     = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
02466                                                    GTK_ICON_SIZE_BUTTON);
02467   g_signal_connect
02468     (window->button_add_variable, "clicked",
      window_add_variable, NULL);
02469   gtk_widget_set_tooltip_text
02470     (GTK_WIDGET (window->button_add_variable), _("Add variable"));
02471   window->button_remove_variable
02472     = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
02473                                                    GTK_ICON_SIZE_BUTTON);
02474   g_signal_connect
02475     (window->button_remove_variable, "clicked",
      window_remove_variable, NULL);
02476   gtk_widget_set_tooltip_text
02477     (GTK_WIDGET (window->button_remove_variable), _("Remove variable"));
02478   window->label_variable = (GtkLabel *) gtk_label_new (_("Name"));
02479   window->entry_variable = (GtkEntry *) gtk_entry_new ();
02480   gtk_widget_set_tooltip_text
02481     (GTK_WIDGET (window->entry_variable), _("Variable name"));
02482   gtk_widget_set_hexpand (GTK_WIDGET (window->entry_variable), TRUE);
02483   window->id_variable_label = g_signal_connect
02484     (window->entry_variable, "changed",
      window_label_variable, NULL);
02485   window->label_min = (GtkLabel *) gtk_label_new (_("Minimum"));
02486   window->spin_min = (GtkSpinButton *) gtk_spin_button_new_with_range
02487     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02488   gtk_widget_set_tooltip_text
02489     (GTK_WIDGET (window->spin_min), _("Minimum initial value of the variable"));
02490   window->scrolled_min
02491     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02492   gtk_container_add (GTK_CONTAINER (window->scrolled_min),
02493                      GTK_WIDGET (window->spin_min));
02494   g_signal_connect (window->spin_min, "value-changed",
02495                     window_rangemin_variable, NULL);
02496   window->label_max = (GtkLabel *) gtk_label_new (_("Maximum"));
02497   window->spin_max = (GtkSpinButton *) gtk_spin_button_new_with_range
02498     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02499   gtk_widget_set_tooltip_text
02500     (GTK_WIDGET (window->spin_max), _("Maximum initial value of the variable"));
02501   window->scrolled_max
02502     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02503   gtk_container_add (GTK_CONTAINER (window->scrolled_max),
02504                      GTK_WIDGET (window->spin_max));
02505   g_signal_connect (window->spin_max, "value-changed",
02506                     window_rangemax_variable, NULL);
02507   window->check_minabs = (GtkCheckButton *)
02508     gtk_check_button_new_with_mnemonic (_("_Absolute minimum"));
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02509   g_signal_connect (window->check_minabs, "toggled",
      window_update, NULL);
02510   window->spin_minabs = (GtkSpinButton *) gtk_spin_button_new_with_range
02511     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02512   gtk_widget_set_tooltip_text
02513     (GTK_WIDGET (window->spin_minabs),
02514      _("Minimum allowed value of the variable"));
02515   window->scrolled_minabs
02516     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02517   gtk_container_add (GTK_CONTAINER (window->scrolled_minabs),
02518                      GTK_WIDGET (window->spin_minabs));
02519   g_signal_connect (window->spin_minabs, "value-changed",
02520                     window_rangeminabs_variable, NULL);
02521   window->check_maxabs = (GtkCheckButton *)
02522     gtk_check_button_new_with_mnemonic (_("_Absolute maximum"));
02523   g_signal_connect (window->check_maxabs, "toggled",
      window_update, NULL);
02524   window->spin_maxabs = (GtkSpinButton *) gtk_spin_button_new_with_range
02525     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02526   gtk_widget_set_tooltip_text
02527     (GTK_WIDGET (window->spin_maxabs),
02528      _("Maximum allowed value of the variable"));
02529   window->scrolled_maxabs
02530     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02531   gtk_container_add (GTK_CONTAINER (window->scrolled_maxabs),
02532                      GTK_WIDGET (window->spin_maxabs));
02533   g_signal_connect (window->spin_maxabs, "value-changed",
02534                     window_rangemaxabs_variable, NULL);
02535   window->label_precision = (GtkLabel *) gtk_label_new (_("Precision digits"));
02536   window->spin_precision = (GtkSpinButton *)
02537     gtk_spin_button_new_with_range (0., (gdouble) DEFAULT_PRECISION, 1.);
02538   gtk_widget_set_tooltip_text
02539     (GTK_WIDGET (window->spin_precision),
02540      _("Number of precision floating point digits\n"
02541        "0 is for integer numbers"));
02542   g_signal_connect (window->spin_precision, "value-changed",
02543                     window_precision_variable, NULL);
02544   window->label_sweeps = (GtkLabel *) gtk_label_new (_("Sweeps number"));
02545   window->spin_sweeps =
02546     (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
02547   gtk_widget_set_tooltip_text (GTK_WIDGET (window->spin_sweeps),
02548                                _("Number of steps sweeping the variable"));
02549   g_signal_connect (window->spin_sweeps, "value-changed",
02550                     window_update_variable, NULL);
02551   window->label_bits = (GtkLabel *) gtk_label_new (_("Bits number"));
02552   window->spin_bits
02553     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
02554   gtk_widget_set_tooltip_text
02555     (GTK_WIDGET (window->spin_bits),
02556      _("Number of bits to encode the variable"));
02557   g_signal_connect
02558     (window->spin_bits, "value-changed", window_update_variable, NULL)
      ;
02559   window->label_step = (GtkLabel *) gtk_label_new (_("Step size"));
02560   window->spin_step = (GtkSpinButton *) gtk_spin_button_new_with_range
02561     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02562   gtk_widget_set_tooltip_text
02563     (GTK_WIDGET (window->spin_step),
02564      _("Initial step size for the direction search method"));
02565   window->scrolled_step
02566     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02567   gtk_container_add (GTK_CONTAINER (window->scrolled_step),
02568                      GTK_WIDGET (window->spin_step));
02569   g_signal_connect
02570     (window->spin_step, "value-changed", window_step_variable, NULL);
02571   window->grid_variable = (GtkGrid *) gtk_grid_new ();
02572   gtk_grid_attach (window->grid_variable,
02573                    GTK_WIDGET (window->combo_variable), 0, 0, 2, 1);
02574   gtk_grid_attach (window->grid_variable,
02575                    GTK_WIDGET (window->button_add_variable), 2, 0, 1, 1);
02576   gtk_grid_attach (window->grid_variable,
02577                    GTK_WIDGET (window->button_remove_variable), 3, 0, 1, 1);
02578   gtk_grid_attach (window->grid_variable,
02579                    GTK_WIDGET (window->label_variable), 0, 1, 1, 1);
02580   gtk_grid_attach (window->grid_variable,
02581                    GTK_WIDGET (window->entry_variable), 1, 1, 3, 1);
02582   gtk_grid_attach (window->grid_variable,
02583                    GTK_WIDGET (window->label_min), 0, 2, 1, 1);
02584   gtk_grid_attach (window->grid_variable,
02585                    GTK_WIDGET (window->scrolled_min), 1, 2, 3, 1);
02586   gtk_grid_attach (window->grid_variable,
02587                    GTK_WIDGET (window->label_max), 0, 3, 1, 1);
02588   gtk_grid_attach (window->grid_variable,
02589                    GTK_WIDGET (window->scrolled_max), 1, 3, 3, 1);
02590   gtk_grid_attach (window->grid_variable,
02591                    GTK_WIDGET (window->check_minabs), 0, 4, 1, 1);
02592   gtk_grid_attach (window->grid_variable,
```

```
02593                    GTK_WIDGET (window->scrolled_minabs), 1, 4, 3, 1);
02594     gtk_grid_attach (window->grid_variable,
02595                    GTK_WIDGET (window->check_maxabs), 0, 5, 1, 1);
02596     gtk_grid_attach (window->grid_variable,
02597                    GTK_WIDGET (window->scrolled_maxabs), 1, 5, 3, 1);
02598     gtk_grid_attach (window->grid_variable,
02599                    GTK_WIDGET (window->label_precision), 0, 6, 1, 1);
02600     gtk_grid_attach (window->grid_variable,
02601                    GTK_WIDGET (window->spin_precision), 1, 6, 3, 1);
02602     gtk_grid_attach (window->grid_variable,
02603                    GTK_WIDGET (window->label_sweeps), 0, 7, 1, 1);
02604     gtk_grid_attach (window->grid_variable,
02605                    GTK_WIDGET (window->spin_sweeps), 1, 7, 3, 1);
02606     gtk_grid_attach (window->grid_variable,
02607                    GTK_WIDGET (window->label_bits), 0, 8, 1, 1);
02608     gtk_grid_attach (window->grid_variable,
02609                    GTK_WIDGET (window->spin_bits), 1, 8, 3, 1);
02610     gtk_grid_attach (window->grid_variable,
02611                    GTK_WIDGET (window->label_step), 0, 9, 1, 1);
02612     gtk_grid_attach (window->grid_variable,
02613                    GTK_WIDGET (window->scrolled_step), 1, 9, 3, 1);
02614     window->frame_variable = (GtkFrame *) gtk_frame_new (_("Variable"));
02615     gtk_container_add (GTK_CONTAINER (window->frame_variable),
02616                        GTK_WIDGET (window->grid_variable));
02617
02618     // Creating the experiment widgets
02619     window->combo_experiment = (GtkComboBoxText *) gtk_combo_box_text_new ();
02620     gtk_widget_set_tooltip_text (GTK_WIDGET (window->combo_experiment),
02621                                  _("Experiment selector"));
02622     window->id_experiment = g_signal_connect
02623       (window->combo_experiment, "changed",
      window_set_experiment, NULL);
02624     window->button_add_experiment
02625       = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
02626                                                      GTK_ICON_SIZE_BUTTON);
02627     g_signal_connect
02628       (window->button_add_experiment, "clicked",
      window_add_experiment, NULL);
02629     gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_experiment),
02630                                  _("Add experiment"));
02631     window->button_remove_experiment
02632       = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
02633                                                      GTK_ICON_SIZE_BUTTON);
02634     g_signal_connect (window->button_remove_experiment, "clicked",
02635                       window_remove_experiment, NULL);
02636     gtk_widget_set_tooltip_text (GTK_WIDGET (window->
      button_remove_experiment),
02637                                  _("Remove experiment"));
02638     window->label_experiment
02639       = (GtkLabel *) gtk_label_new (_("Experimental data file"));
02640     window->button_experiment = (GtkFileChooserButton *)
02641       gtk_file_chooser_button_new (_("Experimental data file"),
02642                                    GTK_FILE_CHOOSER_ACTION_OPEN);
02643     gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_experiment),
02644                                  _("Experimental data file"));
02645     window->id_experiment_name
02646       = g_signal_connect (window->button_experiment, "selection-changed",
02647                           window_name_experiment, NULL);
02648     gtk_widget_set_hexpand (GTK_WIDGET (window->button_experiment), TRUE);
02649     window->label_weight = (GtkLabel *) gtk_label_new (_("Weight"));
02650     window->spin_weight
02651       = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02652     gtk_widget_set_tooltip_text
02653       (GTK_WIDGET (window->spin_weight),
02654        _("Weight factor to build the objective function"));
02655     g_signal_connect
02656       (window->spin_weight, "value-changed",
      window_weight_experiment, NULL);
02657     window->grid_experiment = (GtkGrid *) gtk_grid_new ();
02658     gtk_grid_attach (window->grid_experiment,
02659                      GTK_WIDGET (window->combo_experiment), 0, 0, 2, 1);
02660     gtk_grid_attach (window->grid_experiment,
02661                      GTK_WIDGET (window->button_add_experiment), 2, 0, 1, 1);
02662     gtk_grid_attach (window->grid_experiment,
02663                      GTK_WIDGET (window->button_remove_experiment), 3, 0, 1, 1)
    ;
02664     gtk_grid_attach (window->grid_experiment,
02665                      GTK_WIDGET (window->label_experiment), 0, 1, 1, 1);
02666     gtk_grid_attach (window->grid_experiment,
02667                      GTK_WIDGET (window->button_experiment), 1, 1, 3, 1);
02668     gtk_grid_attach (window->grid_experiment,
02669                      GTK_WIDGET (window->label_weight), 0, 2, 1, 1);
02670     gtk_grid_attach (window->grid_experiment,
02671                      GTK_WIDGET (window->spin_weight), 1, 2, 3, 1);
02672     for (i = 0; i < MAX_NINPUTS; ++i)
02673       {
02674         snprintf (buffer3, 64, "%s %u", _("Input template"), i + 1);
```

```
02675       window->check_template[i] = (GtkCheckButton *)
02676         gtk_check_button_new_with_label (buffer3);
02677       window->id_template[i]
02678         = g_signal_connect (window->check_template[i], "toggled",
02679                             window_inputs_experiment, NULL);
02680       gtk_grid_attach (window->grid_experiment,
02681                        GTK_WIDGET (window->check_template[i]), 0, 3 + i, 1, 1);
02682       window->button_template[i] =
02683         (GtkFileChooserButton *)
02684         gtk_file_chooser_button_new (_("Input template"),
02685                                      GTK_FILE_CHOOSER_ACTION_OPEN);
02686       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_template[i]),
02687                                    _("Experimental input template file"));
02688       window->id_input[i] =
02689         g_signal_connect_swapped (window->button_template[i],
02690                                   "selection-changed",
02691                                   (GCallback) window_template_experiment,
02692                                   (void *) (size_t) i);
02693       gtk_grid_attach (window->grid_experiment,
02694                        GTK_WIDGET (window->button_template[i]), 1, 3 + i, 3, 1);
02695     }
02696   window->frame_experiment = (GtkFrame *) gtk_frame_new (_("Experiment"));
02697   gtk_container_add (GTK_CONTAINER (window->frame_experiment),
02698                      GTK_WIDGET (window->grid_experiment));
02699
02700   // Creating the error norm widgets
02701   window->frame_norm = (GtkFrame *) gtk_frame_new (_("Error norm"));
02702   window->grid_norm = (GtkGrid *) gtk_grid_new ();
02703   gtk_container_add (GTK_CONTAINER (window->frame_norm),
02704                      GTK_WIDGET (window->grid_norm));
02705   window->button_norm[0] = (GtkRadioButton *)
02706     gtk_radio_button_new_with_mnemonic (NULL, label_norm[0]);
02707   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[0]),
02708                                tip_norm[0]);
02709   gtk_grid_attach (window->grid_norm,
02710                    GTK_WIDGET (window->button_norm[0]), 0, 0, 1, 1);
02711   g_signal_connect (window->button_norm[0], "clicked",
      window_update, NULL);
02712   for (i = 0; ++i < NNORMS;)
02713     {
02714       window->button_norm[i] = (GtkRadioButton *)
02715         gtk_radio_button_new_with_mnemonic
02716         (gtk_radio_button_get_group (window->button_norm[0]), label_norm[i]);
02717       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[i]),
02718                                    tip_norm[i]);
02719       gtk_grid_attach (window->grid_norm,
02720                        GTK_WIDGET (window->button_norm[i]), 0, i, 1, 1);
02721       g_signal_connect (window->button_norm[i], "clicked",
      window_update, NULL);
02722     }
02723   window->label_p = (GtkLabel *) gtk_label_new (_("P parameter"));
02724   gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->
      label_p), 1, 1, 1, 1);
02725   window->spin_p =
02726     (GtkSpinButton *) gtk_spin_button_new_with_range (-G_MAXDOUBLE,
02727                                                       G_MAXDOUBLE, 0.01);
02728   gtk_widget_set_tooltip_text (GTK_WIDGET (window->spin_p),
02729                                _("P parameter for the P error norm"));
02730   window->scrolled_p =
02731     (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02732   gtk_container_add (GTK_CONTAINER (window->scrolled_p),
02733                      GTK_WIDGET (window->spin_p));
02734   gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_p), TRUE);
02735   gtk_widget_set_halign (GTK_WIDGET (window->scrolled_p), GTK_ALIGN_FILL);
02736   gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->
      scrolled_p),
02737                    1, 2, 1, 2);
02738
02739   // Creating the grid and attaching the widgets to the grid
02740   window->grid = (GtkGrid *) gtk_grid_new ();
02741   gtk_grid_attach (window->grid, GTK_WIDGET (window->bar_buttons), 0, 0, 3, 1);
02742   gtk_grid_attach (window->grid, GTK_WIDGET (window->grid_files), 0, 1, 1, 1);
02743   gtk_grid_attach (window->grid,
02744                    GTK_WIDGET (window->frame_algorithm), 0, 2, 1, 1);
02745   gtk_grid_attach (window->grid,
02746                    GTK_WIDGET (window->frame_variable), 1, 2, 1, 1);
02747   gtk_grid_attach (window->grid,
02748                    GTK_WIDGET (window->frame_experiment), 2, 2, 1, 1);
02749   gtk_grid_attach (window->grid, GTK_WIDGET (window->frame_norm), 1, 1, 2, 1);
02750   gtk_container_add (GTK_CONTAINER (window->window), GTK_WIDGET (
      window->grid));
02751
02752   // Setting the window logo
02753   window->logo = gdk_pixbuf_new_from_xpm_data (logo);
02754   gtk_window_set_icon (window->window, window->logo);
02755
02756   // Showing the window
```

```
02757   gtk_widget_show_all (GTK_WIDGET (window->window));
02758
02759   // In GTK+ 3.16 and 3.18 the default scrolled size is wrong
02760 #if GTK_MINOR_VERSION >= 16
02761   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_min), -1, 40);
02762   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_max), -1, 40);
02763   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_minabs), -1, 40);
02764   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_maxabs), -1, 40);
02765   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_step), -1, 40);
02766   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_p), -1, 40);
02767   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_threshold), -1, 40);
02768 #endif
02769
02770   // Reading initial example
02771   input_new ();
02772   buffer2 = g_get_current_dir ();
02773   buffer = g_build_filename (buffer2, "..", "tests", "test1", INPUT_FILE, NULL);
02774   g_free (buffer2);
02775   window_read (buffer);
02776   g_free (buffer);
02777
02778 #if DEBUG_INTERFACE
02779   fprintf (stderr, "window_new: start\n");
02780 #endif
02781 }
```

4.13.2.7 window_read()

```
int window_read (
              char * filename )
```

Function to read the input data of a file.

Parameters

filename	File name.

Returns

1 on succes, 0 on error.

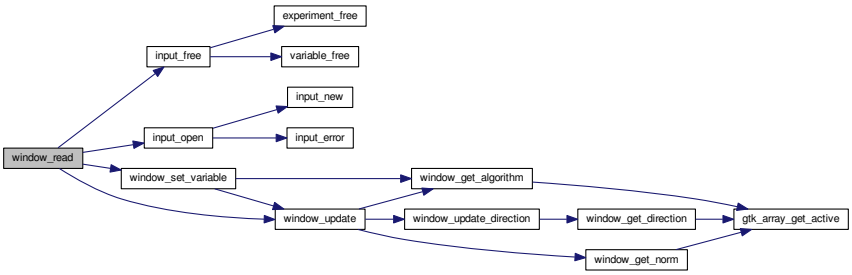
Definition at line 1877 of file interface.c.

```
01878 {
01879   unsigned int i;
01880   char *buffer;
01881 #if DEBUG_INTERFACE
01882   fprintf (stderr, "window_read: start\n");
01883 #endif
01884
01885   // Reading new input file
01886   input_free ();
01887     input->result = input->variables = NULL;
01888   if (!input_open (filename))
01889     {
01890 #if DEBUG_INTERFACE
01891       fprintf (stderr, "window_read: end\n");
01892 #endif
01893       return 0;
01894     }
01895
01896   // Setting GTK+ widgets data
01897   gtk_entry_set_text (window->entry_result, input->result);
01898   gtk_entry_set_text (window->entry_variables, input->
      variables);
01899   buffer = g_build_filename (input->directory, input->
      simulator, NULL);
```

```
01900   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01901                                  (window->button_simulator), buffer);
01902   g_free (buffer);
01903   gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
01904                                 (size_t) input->evaluator);
01905   if (input->evaluator)
01906     {
01907       buffer = g_build_filename (input->directory, input->
      evaluator, NULL);
01908       gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01909                                      (window->button_evaluator), buffer);
01910       g_free (buffer);
01911     }
01912   gtk_toggle_button_set_active
01913     (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
      algorithm]), TRUE);
01914   switch (input->algorithm)
01915     {
01916     case ALGORITHM_MONTE_CARLO:
01917       gtk_spin_button_set_value (window->spin_simulations,
01918                                  (gdouble) input->nsimulations);
01919     case ALGORITHM_SWEEP:
01920       gtk_spin_button_set_value (window->spin_iterations,
01921                                  (gdouble) input->niterations);
01922       gtk_spin_button_set_value (window->spin_bests, (gdouble)
      input->nbest);
01923       gtk_spin_button_set_value (window->spin_tolerance,
      input->tolerance);
01924       gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON
01925                                     (window->check_direction),
      input->nsteps);
01926       if (input->nsteps)
01927         {
01928           gtk_toggle_button_set_active
01929             (GTK_TOGGLE_BUTTON (window->button_direction
01930                                 [input->direction]), TRUE);
01931           gtk_spin_button_set_value (window->spin_steps,
01932                                      (gdouble) input->nsteps);
01933           gtk_spin_button_set_value (window->spin_relaxation,
01934                                      (gdouble) input->relaxation);
01935           switch (input->direction)
01936             {
01937             case DIRECTION_METHOD_RANDOM:
01938               gtk_spin_button_set_value (window->spin_estimates,
01939                                          (gdouble) input->nestimates);
01940             }
01941         }
01942       break;
01943     default:
01944       gtk_spin_button_set_value (window->spin_population,
01945                                  (gdouble) input->nsimulations);
01946       gtk_spin_button_set_value (window->spin_generations,
01947                                  (gdouble) input->niterations);
01948       gtk_spin_button_set_value (window->spin_mutation, input->
      mutation_ratio);
01949       gtk_spin_button_set_value (window->spin_reproduction,
01950                                  input->reproduction_ratio);
01951       gtk_spin_button_set_value (window->spin_adaptation,
01952                                  input->adaptation_ratio);
01953     }
01954   gtk_toggle_button_set_active
01955     (GTK_TOGGLE_BUTTON (window->button_norm[input->norm]), TRUE);
01956   gtk_spin_button_set_value (window->spin_p, input->p);
01957   gtk_spin_button_set_value (window->spin_threshold, input->
      threshold);
01958   g_signal_handler_block (window->combo_experiment, window->
      id_experiment);
01959   g_signal_handler_block (window->button_experiment,
01960                           window->id_experiment_name);
01961   gtk_combo_box_text_remove_all (window->combo_experiment);
01962   for (i = 0; i < input->nexperiments; ++i)
01963     gtk_combo_box_text_append_text (window->combo_experiment,
01964                                     input->experiment[i].name);
01965   g_signal_handler_unblock
01966     (window->button_experiment, window->
      id_experiment_name);
01967   g_signal_handler_unblock (window->combo_experiment,
      window->id_experiment);
01968   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
01969   g_signal_handler_block (window->combo_variable, window->
      id_variable);
01970   g_signal_handler_block (window->entry_variable, window->
      id_variable_label);
01971   gtk_combo_box_text_remove_all (window->combo_variable);
01972   for (i = 0; i < input->nvariables; ++i)
01973     gtk_combo_box_text_append_text (window->combo_variable,
01974                                     input->variable[i].name);
```

```
01975   g_signal_handler_unblock (window->entry_variable, window->
      id_variable_label);
01976   g_signal_handler_unblock (window->combo_variable, window->
      id_variable);
01977   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
01978   window_set_variable ();
01979   window_update ();
01980
01981 #if DEBUG_INTERFACE
01982   fprintf (stderr, "window_read: end\n");
01983 #endif
01984   return 1;
01985 }
```

Here is the call graph for this function:



4.13.2.8 window_save()

```
int window_save ( )
```

Function to save the input file.

Returns

1 on OK, 0 on Cancel.

Definition at line 818 of file interface.c.

```
00819 {
00820   GtkFileChooserDialog *dlg;
00821   GtkFileFilter *filter1, *filter2;
00822   char *buffer;
00823
00824 #if DEBUG_INTERFACE
00825   fprintf (stderr, "window_save: start\n");
00826 #endif
00827
00828   // Opening the saving dialog
00829   dlg = (GtkFileChooserDialog *)
00830     gtk_file_chooser_dialog_new (_("Save file"),
00831                                  window->window,
00832                                  GTK_FILE_CHOOSER_ACTION_SAVE,
00833                                  _("_Cancel"), GTK_RESPONSE_CANCEL,
00834                                  _("_OK"), GTK_RESPONSE_OK, NULL);
00835   gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
00836   buffer = g_build_filename (input->directory, input->name, NULL);
00837   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER (dlg), buffer);
00838   g_free (buffer);
00839
00840   // Adding XML filter
```

```
00841   filter1 = (GtkFileFilter *) gtk_file_filter_new ();
00842   gtk_file_filter_set_name (filter1, "XML");
00843   gtk_file_filter_add_pattern (filter1, "*.xml");
00844   gtk_file_filter_add_pattern (filter1, "*.XML");
00845   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter1);
00846
00847   // Adding JSON filter
00848   filter2 = (GtkFileFilter *) gtk_file_filter_new ();
00849   gtk_file_filter_set_name (filter2, "JSON");
00850   gtk_file_filter_add_pattern (filter2, "*.json");
00851   gtk_file_filter_add_pattern (filter2, "*.JSON");
00852   gtk_file_filter_add_pattern (filter2, "*.js");
00853   gtk_file_filter_add_pattern (filter2, "*.JS");
00854   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter2);
00855
00856   if (input->type == INPUT_TYPE_XML)
00857     gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter1);
00858   else
00859     gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter2);
00860
00861   // If OK response then saving
00862   if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
00863     {
00864       // Setting input file type
00865       filter1 = gtk_file_chooser_get_filter (GTK_FILE_CHOOSER (dlg));
00866       buffer = (char *) gtk_file_filter_get_name (filter1);
00867       if (!strcmp (buffer, "XML"))
00868         input->type = INPUT_TYPE_XML;
00869       else
00870         input->type = INPUT_TYPE_JSON;
00871
00872       // Adding properties to the root XML node
00873       input->simulator = gtk_file_chooser_get_filename
00874         (GTK_FILE_CHOOSER (window->button_simulator));
00875       if (gtk_toggle_button_get_active
00876           (GTK_TOGGLE_BUTTON (window->check_evaluator)))
00877         input->evaluator = gtk_file_chooser_get_filename
00878           (GTK_FILE_CHOOSER (window->button_evaluator));
00879       else
00880         input->evaluator = NULL;
00881       if (input->type == INPUT_TYPE_XML)
00882         {
00883           input->result
00884             = (char *) xmlStrdup ((const xmlChar *)
00885                                   gtk_entry_get_text (window->entry_result));
00886           input->variables
00887             = (char *) xmlStrdup ((const xmlChar *)
00888                                   gtk_entry_get_text (window->
      entry_variables));
00889         }
00890       else
00891         {
00892           input->result = g_strdup (gtk_entry_get_text (window->
      entry_result));
00893           input->variables =
00894             g_strdup (gtk_entry_get_text (window->entry_variables));
00895         }
00896
00897       // Setting the algorithm
00898       switch (window_get_algorithm ())
00899         {
00900         case ALGORITHM_MONTE_CARLO:
00901           input->algorithm = ALGORITHM_MONTE_CARLO;
00902           input->nsimulations
00903             = gtk_spin_button_get_value_as_int (window->spin_simulations);
00904           input->niterations
00905             = gtk_spin_button_get_value_as_int (window->spin_iterations);
00906           input->tolerance = gtk_spin_button_get_value (window->
      spin_tolerance);
00907           input->nbest = gtk_spin_button_get_value_as_int (window->
      spin_bests);
00908           window_save_direction ();
00909           break;
00910         case ALGORITHM_SWEEP:
00911           input->algorithm = ALGORITHM_SWEEP;
00912           input->niterations
00913             = gtk_spin_button_get_value_as_int (window->spin_iterations);
00914           input->tolerance = gtk_spin_button_get_value (window->
      spin_tolerance);
00915           input->nbest = gtk_spin_button_get_value_as_int (window->
      spin_bests);
00916           window_save_direction ();
00917           break;
00918         default:
00919           input->algorithm = ALGORITHM_GENETIC;
00920           input->nsimulations
00921             = gtk_spin_button_get_value_as_int (window->spin_population);
```

```
00922           input->niterations
00923             = gtk_spin_button_get_value_as_int (window->spin_generations);
00924           input->mutation_ratio
00925             = gtk_spin_button_get_value (window->spin_mutation);
00926           input->reproduction_ratio
00927             = gtk_spin_button_get_value (window->spin_reproduction);
00928           input->adaptation_ratio
00929             = gtk_spin_button_get_value (window->spin_adaptation);
00930           break;
00931         }
00932       input->norm = window_get_norm ();
00933       input->p = gtk_spin_button_get_value (window->spin_p);
00934       input->threshold = gtk_spin_button_get_value (window->
      spin_threshold);
00935
00936       // Saving the XML file
00937       buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
00938       input_save (buffer);
00939
00940       // Closing and freeing memory
00941       g_free (buffer);
00942       gtk_widget_destroy (GTK_WIDGET (dlg));
00943 #if DEBUG_INTERFACE
00944       fprintf (stderr, "window_save: end\n");
00945 #endif
00946       return 1;
00947     }
00948
00949   // Closing and freeing memory
00950   gtk_widget_destroy (GTK_WIDGET (dlg));
00951 #if DEBUG_INTERFACE
00952   fprintf (stderr, "window_save: end\n");
00953 #endif
00954   return 0;
00955 }
```

4.13.2.9 window_template_experiment()

```
void window_template_experiment (
             void * data )
```

Function to update the experiment i-th input template in the main window.

Parameters

data	Callback data (i-th input template).

Definition at line 1521 of file interface.c.

```
01522 {
01523   unsigned int i, j;
01524   char *buffer;
01525   GFile *file1, *file2;
01526 #if DEBUG_INTERFACE
01527   fprintf (stderr, "window_template_experiment: start\n");
01528 #endif
01529   i = (size_t) data;
01530   j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01531   file1
01532     = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
01533   file2 = g_file_new_for_path (input->directory);
01534   buffer = g_file_get_relative_path (file2, file1);
01535   if (input->type == INPUT_TYPE_XML)
01536     input->experiment[j].stencil[i] = (char *) xmlStrdup ((xmlChar *) buffer);
01537   else
01538     input->experiment[j].stencil[i] = g_strdup (buffer);
01539   g_free (buffer);
01540   g_object_unref (file2);
01541   g_object_unref (file1);
01542 #if DEBUG_INTERFACE
```

```
01543   fprintf (stderr, "window_template_experiment: end\n");
01544 #endif
01545 }
```

4.14 interface.h

```
00001 /*
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
00007
00008 Copyright 2012-2017, AUTHORS.
00009
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00011 are permitted provided that the following conditions are met:
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00013   1. Redistributions of source code must retain the above copyright notice,
00014      this list of conditions and the following disclaimer.
00015
00016   2. Redistributions in binary form must reproduce the above copyright notice,
00017      this list of conditions and the following disclaimer in the
00018      documentation and/or other materials provided with the distribution.
00019
00020 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00021 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00022 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00023 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00024 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00025 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00026 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #ifndef INTERFACE__H
00039 #define INTERFACE__H 1
00040
00041 #define MAX_LENGTH (DEFAULT_PRECISION + 8)
00042
00048 typedef struct
00049 {
00050   GtkDialog *dialog;
00051   GtkGrid *grid;
00052   GtkLabel *label_seed;
00054   GtkSpinButton *spin_seed;
00056   GtkLabel *label_threads;
00057   GtkSpinButton *spin_threads;
00058   GtkLabel *label_direction;
00059   GtkSpinButton *spin_direction;
00061 } Options;
00062
00067 typedef struct
00068 {
00069   GtkDialog *dialog;
00070   GtkLabel *label;
00071   GtkSpinner *spinner;
00072   GtkGrid *grid;
00073 } Running;
00074
00079 typedef struct
00080 {
00081   GtkWindow *window;
00082   GtkGrid *grid;
00083   GtkToolbar *bar_buttons;
00084   GtkToolButton *button_open;
00085   GtkToolButton *button_save;
00086   GtkToolButton *button_run;
00087   GtkToolButton *button_options;
00088   GtkToolButton *button_help;
00089   GtkToolButton *button_about;
00090   GtkToolButton *button_exit;
00091   GtkGrid *grid_files;
00092   GtkLabel *label_simulator;
00093   GtkFileChooserButton *button_simulator;
00095   GtkCheckButton *check_evaluator;
00096   GtkFileChooserButton *button_evaluator;
00098   GtkLabel *label_result;
00099   GtkEntry *entry_result;
00100   GtkLabel *label_variables;
```

```
00101   GtkEntry *entry_variables;
00102   GtkFrame *frame_norm;
00103   GtkGrid *grid_norm;
00104   GtkRadioButton *button_norm[NNORMS];
00106   GtkLabel *label_p;
00107   GtkSpinButton *spin_p;
00108   GtkScrolledWindow *scrolled_p;
00110   GtkFrame *frame_algorithm;
00111   GtkGrid *grid_algorithm;
00112   GtkRadioButton *button_algorithm[NALGORITHMS];
00114   GtkLabel *label_simulations;
00115   GtkSpinButton *spin_simulations;
00117   GtkLabel *label_iterations;
00118   GtkSpinButton *spin_iterations;
00120   GtkLabel *label_tolerance;
00121   GtkSpinButton *spin_tolerance;
00122   GtkLabel *label_bests;
00123   GtkSpinButton *spin_bests;
00124   GtkLabel *label_population;
00125   GtkSpinButton *spin_population;
00127   GtkLabel *label_generations;
00128   GtkSpinButton *spin_generations;
00130   GtkLabel *label_mutation;
00131   GtkSpinButton *spin_mutation;
00132   GtkLabel *label_reproduction;
00133   GtkSpinButton *spin_reproduction;
00135   GtkLabel *label_adaptation;
00136   GtkSpinButton *spin_adaptation;
00138   GtkCheckButton *check_direction;
00140   GtkGrid *grid_direction;
00142   GtkRadioButton *button_direction[NDIRECTIONS];
00144   GtkLabel *label_steps;
00145   GtkSpinButton *spin_steps;
00146   GtkLabel *label_estimates;
00147   GtkSpinButton *spin_estimates;
00149   GtkLabel *label_relaxation;
00151   GtkSpinButton *spin_relaxation;
00153   GtkLabel *label_threshold;
00154   GtkSpinButton *spin_threshold;
00155   GtkScrolledWindow *scrolled_threshold;
00157   GtkFrame *frame_variable;
00158   GtkGrid *grid_variable;
00159   GtkComboBoxText *combo_variable;
00161   GtkButton *button_add_variable;
00162   GtkButton *button_remove_variable;
00163   GtkLabel *label_variable;
00164   GtkEntry *entry_variable;
00165   GtkLabel *label_min;
00166   GtkSpinButton *spin_min;
00167   GtkScrolledWindow *scrolled_min;
00168   GtkLabel *label_max;
00169   GtkSpinButton *spin_max;
00170   GtkScrolledWindow *scrolled_max;
00171   GtkCheckButton *check_minabs;
00172   GtkSpinButton *spin_minabs;
00173   GtkScrolledWindow *scrolled_minabs;
00174   GtkCheckButton *check_maxabs;
00175   GtkSpinButton *spin_maxabs;
00176   GtkScrolledWindow *scrolled_maxabs;
00177   GtkLabel *label_precision;
00178   GtkSpinButton *spin_precision;
00179   GtkLabel *label_sweeps;
00180   GtkSpinButton *spin_sweeps;
00181   GtkLabel *label_bits;
00182   GtkSpinButton *spin_bits;
00183   GtkLabel *label_step;
00184   GtkSpinButton *spin_step;
00185   GtkScrolledWindow *scrolled_step;
00186   GtkFrame *frame_experiment;
00187   GtkGrid *grid_experiment;
00188   GtkComboBoxText *combo_experiment;
00189   GtkButton *button_add_experiment;
00190   GtkButton *button_remove_experiment;
00191   GtkLabel *label_experiment;
00192   GtkFileChooserButton *button_experiment;
00194   GtkLabel *label_weight;
00195   GtkSpinButton *spin_weight;
00196   GtkCheckButton *check_template[MAX_NINPUTS];
00198   GtkFileChooserButton *button_template[MAX_NINPUTS];
00200   GdkPixbuf *logo;
00201   Experiment *experiment;
00202   Variable *variable;
00203   char *application_directory;
00204   gulong id_experiment;
00205   gulong id_experiment_name;
00206   gulong id_variable;
00207   gulong id_variable_label;
```

```
00208   gulong id_template[MAX_NINPUTS];
00210   gulong id_input[MAX_NINPUTS];
00212   unsigned int nexperiments;
00213   unsigned int nvariables;
00214 } Window;
00215
00216 // Global variables
00217 extern const char *logo[];
00218 extern Options options[1];
00219 extern Running running[1];
00220 extern Window window[1];
00221
00222 // Inline functions
00223 #if GTK_MINOR_VERSION < 10
00224 static inline GtkButton *
00225 gtk_button_new_from_icon_name (const char *name, GtkIconSize size)
00226 {
00227   GtkButton *button;
00228   GtkImage *image;
00229   button = (GtkButton *) gtk_button_new ();
00230   image = (GtkImage *) gtk_image_new_from_icon_name (name, size);
00231   gtk_button_set_image (button, GTK_WIDGET (image));
00232   return button;
00233 }
00234 #endif
00235
00236 // Public functions
00237 unsigned int gtk_array_get_active (GtkRadioButton * array[], unsigned int n);
00238 void input_save (char *filename);
00239 void options_new ();
00240 void running_new ();
00241 unsigned int window_get_algorithm ();
00242 unsigned int window_get_direction ();
00243 unsigned int window_get_norm ();
00244 void window_save_direction ();
00245 int window_save ();
00246 void window_run ();
00247 void window_help ();
00248 void window_update_direction ();
00249 void window_update ();
00250 void window_set_algorithm ();
00251 void window_set_experiment ();
00252 void window_remove_experiment ();
00253 void window_add_experiment ();
00254 void window_name_experiment ();
00255 void window_weight_experiment ();
00256 void window_inputs_experiment ();
00257 void window_template_experiment (void *data);
00258 void window_set_variable ();
00259 void window_remove_variable ();
00260 void window_add_variable ();
00261 void window_label_variable ();
00262 void window_precision_variable ();
00263 void window_rangemin_variable ();
00264 void window_rangemax_variable ();
00265 void window_rangeminabs_variable ();
00266 void window_rangemaxabs_variable ();
00267 void window_update_variable ();
00268 int window_read (char *filename);
00269 void window_open ();
00270 void window_new (GtkApplication * application);
00271
00272 #endif
```

4.15 main.c File Reference

Main source file.

```
#include "config.h"
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <math.h>
#include <locale.h>
#include <gsl/gsl_rng.h>
#include <libxml/parser.h>
```

```
#include <libintl.h>
#include <glib.h>
#include <json-glib/json-glib.h>
#include <mpi.h>
#include <gio/gio.h>
#include <gtk/gtk.h>
#include "genetic/genetic.h"
#include "utils.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"
#include "optimize.h"
#include "interface.h"
#include "mpcotool.h"
```

Include dependency graph for main.c:

Functions

- int **main** (int argn, char **argc)

4.15.1 Detailed Description

Main source file.

Authors

Javier Burguete and Borja Latorre.

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Definition in file main.c.

4.16 main.c

```
00001 /*
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
00007
00008 Copyright 2012-2017, AUTHORS.
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00010 Redistribution and use in source and binary forms, with or without modification,
00011 are permitted provided that the following conditions are met:
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00013     1. Redistributions of source code must retain the above copyright notice,
00014         this list of conditions and the following disclaimer.
00015
```

```
00016     2. Redistributions in binary form must reproduce the above copyright notice,
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00020 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00021 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00022 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00023 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00024 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00025 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00026 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #define _GNU_SOURCE
00039 #include "config.h"
00040 #include <stdio.h>
00041 #include <stdlib.h>
00042 #include <string.h>
00043 #include <math.h>
00044 #include <locale.h>
00045 #include <gsl/gsl_rng.h>
00046 #include <libxml/parser.h>
00047 #include <libintl.h>
00048 #include <glib.h>
00049 #include <json-glib/json-glib.h>
00050 #ifdef G_OS_WIN32
00051 #include <windows.h>
00052 #endif
00053 #if HAVE_MPI
00054 #include <mpi.h>
00055 #endif
00056 #if HAVE_GTK
00057 #include <gio/gio.h>
00058 #include <gtk/gtk.h>
00059 #endif
00060 #include "genetic/genetic.h"
00061 #include "utils.h"
00062 #include "experiment.h"
00063 #include "variable.h"
00064 #include "input.h"
00065 #include "optimize.h"
00066 #if HAVE_GTK
00067 #include "interface.h"
00068 #endif
00069 #include "mpcotool.h"
00070
00071 int
00072 main (int argn, char **argc)
00073 {
00074 #if HAVE_GTK
00075   show_pending = process_pending;
00076 #endif
00077   return mpcotool (argn, argc);
00078 }
```

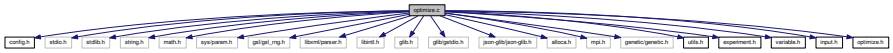
4.17 optimize.c File Reference

Source file to define the optimization functions.

```
#include "config.h"
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <math.h>
#include <sys/param.h>
#include <gsl/gsl_rng.h>
#include <libxml/parser.h>
#include <libintl.h>
#include <glib.h>
#include <glib/gstdio.h>
#include <json-glib/json-glib.h>
```

```
#include <alloca.h>
#include <mpi.h>
#include "genetic/genetic.h"
#include "utils.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"
#include "optimize.h"
```

Include dependency graph for optimize.c:



Macros

- #define DEBUG_OPTIMIZE 0

  Macro to debug optimize functions.
- #define RM "rm"

  Macro to define the shell remove command.

Functions

- void optimize_input (unsigned int simulation, char *input, GMappedFile *stencil)

  Function to write the simulation input file.
- double optimize_parse (unsigned int simulation, unsigned int experiment)

  Function to parse input files, simulating and calculating the \ objective function.
- double optimize_norm_euclidian (unsigned int simulation)

  Function to calculate the Euclidian error norm.
- double optimize_norm_maximum (unsigned int simulation)

  Function to calculate the maximum error norm.
- double optimize_norm_p (unsigned int simulation)

  Function to calculate the P error norm.
- double optimize_norm_taxicab (unsigned int simulation)

  Function to calculate the taxicab error norm.
- void optimize_print ()

  Function to print the results.
- void optimize_save_variables (unsigned int simulation, double error)

  Function to save in a file the variables and the error.
- void optimize_best (unsigned int simulation, double value)

  Function to save the best simulations.
- void optimize_sequential ()

  Function to optimize sequentially.
- void * optimize_thread (ParallelData *data)

  Function to optimize on a thread.
- void optimize_merge (unsigned int nsaveds, unsigned int *simulation_best, double *error_best)

  Function to merge the 2 optimization results.
- void optimize_synchronise ()

  Function to synchronise the optimization results of MPI tasks.
- void optimize_sweep ()

Function to optimize with the sweep algorithm.

- void optimize_MonteCarlo ()

  Function to optimize with the Monte-Carlo algorithm.
- void optimize_best_direction (unsigned int simulation, double value)

  Function to save the best simulation in a direction search method.
- void optimize_direction_sequential (unsigned int simulation)

  Function to estimate the direction search sequentially.
- void * optimize_direction_thread (ParallelData *data)

  Function to estimate the direction search on a thread.
- double optimize_estimate_direction_random (unsigned int variable, unsigned int estimate)

  Function to estimate a component of the direction search vector.
- double optimize_estimate_direction_coordinates (unsigned int variable, unsigned int estimate)

  Function to estimate a component of the direction search vector.
- void optimize_step_direction (unsigned int simulation)

  Function to do a step of the direction search method.
- void optimize_direction ()

  Function to optimize with a direction search method.
- double optimize_genetic_objective (**Entity** *entity)

  Function to calculate the objective function of an entity.
- void optimize_genetic ()

  Function to optimize with the genetic algorithm.
- void optimize_save_old ()

  Function to save the best results on iterative methods.
- void optimize_merge_old ()

  Function to merge the best results with the previous step best results on iterative methods.
- void optimize_refine ()

  Function to refine the search ranges of the variables in iterative algorithms.
- void optimize_step ()

  Function to do a step of the iterative algorithm.
- void optimize_iterate ()

  Function to iterate the algorithm.
- void optimize_free ()

  Function to free the memory used by the Optimize struct.
- void optimize_open ()

  Function to open and perform a optimization.

Variables

- unsigned int nthreads_direction

  Number of threads for the direction search method.
- void(* optimize_algorithm)()

  Pointer to the function to perform a optimization algorithm step.
- double(* optimize_estimate_direction)(unsigned int variable, unsigned int estimate)

  Pointer to the function to estimate the direction.
- double(* optimize_norm)(unsigned int simulation)

  Pointer to the error norm function.
- Optimize optimize [1]

  Optimization data.

4.17.1 Detailed Description

Source file to define the optimization functions.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file optimize.c.

4.17.2 Function Documentation

4.17.2.1 optimize_best()

```
void optimize_best (
             unsigned int simulation,
             double value )
```

Function to save the best simulations.

Parameters

simulation	Simulation number.
value	Objective function value.

Definition at line 470 of file optimize.c.

```
00471 {
00472   unsigned int i, j;
00473   double e;
00474 #if DEBUG_OPTIMIZE
00475   fprintf (stderr, "optimize_best: start\n");
00476   fprintf (stderr, "optimize_best: nsaveds=%u nbest=%u\n",
00477            optimize->nsaveds, optimize->nbest);
00478 #endif
00479   if (optimize->nsaveds < optimize->nbest
00480       || value < optimize->error_best[optimize->nsaveds - 1])
00481     {
00482       if (optimize->nsaveds < optimize->nbest)
00483         ++optimize->nsaveds;
00484       optimize->error_best[optimize->nsaveds - 1] = value;
00485       optimize->simulation_best[optimize->nsaveds - 1] = simulation;
00486       for (i = optimize->nsaveds; --i;)
00487         {
00488           if (optimize->error_best[i] < optimize->
      error_best[i - 1])
00489             {
00490               j = optimize->simulation_best[i];
00491               e = optimize->error_best[i];
00492               optimize->simulation_best[i] = optimize->
      simulation_best[i - 1];
```

```
00493               optimize->error_best[i] = optimize->
      error_best[i - 1];
00494               optimize->simulation_best[i - 1] = j;
00495               optimize->error_best[i - 1] = e;
00496             }
00497           else
00498             break;
00499         }
00500     }
00501 #if DEBUG_OPTIMIZE
00502   fprintf (stderr, "optimize_best: end\n");
00503 #endif
00504 }
```

4.17.2.2 optimize_best_direction()

```
void optimize_best_direction (
              unsigned int simulation,
              double value )
```

Function to save the best simulation in a direction search method.

Parameters

simulation	Simulation number.
value	Objective function value.

Definition at line 797 of file optimize.c.

```
00798 {
00799 #if DEBUG_OPTIMIZE
00800   fprintf (stderr, "optimize_best_direction: start\n");
00801   fprintf (stderr,
00802            "optimize_best_direction: simulation=%u value=%.14le best=%.14le\n",
00803            simulation, value, optimize->error_best[0]);
00804 #endif
00805   if (value < optimize->error_best[0])
00806     {
00807       optimize->error_best[0] = value;
00808       optimize->simulation_best[0] = simulation;
00809 #if DEBUG_OPTIMIZE
00810       fprintf (stderr,
00811                "optimize_best_direction: BEST simulation=%u value=%.14le\n",
00812                simulation, value);
00813 #endif
00814     }
00815 #if DEBUG_OPTIMIZE
00816   fprintf (stderr, "optimize_best_direction: end\n");
00817 #endif
00818 }
```

4.17.2.3 optimize_direction_sequential()

```
void optimize_direction_sequential (
              unsigned int simulation )
```

Function to estimate the direction search sequentially.

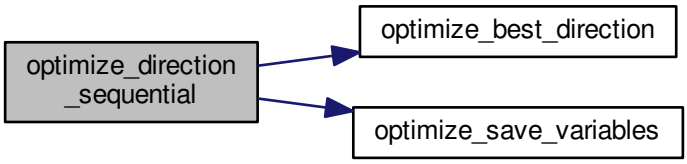
Parameters

simulation	Simulation number.

Definition at line 827 of file optimize.c.

```
00828 {
00829   unsigned int i, j;
00830   double e;
00831 #if DEBUG_OPTIMIZE
00832   fprintf (stderr, "optimize_direction_sequential: start\n");
00833   fprintf (stderr, "optimize_direction_sequential: nstart_direction=%u "
00834            "nend_direction=%u\n",
00835            optimize->nstart_direction, optimize->
      nend_direction);
00836 #endif
00837   for (i = optimize->nstart_direction; i < optimize->nend_direction; ++i)
00838     {
00839       j = simulation + i;
00840       e = optimize_norm (j);
00841       optimize_best_direction (j, e);
00842       optimize_save_variables (j, e);
00843       if (e < optimize->threshold)
00844         {
00845           optimize->stop = 1;
00846           break;
00847         }
00848 #if DEBUG_OPTIMIZE
00849       fprintf (stderr, "optimize_direction_sequential: i=%u e=%lg\n", i, e);
00850 #endif
00851     }
00852 #if DEBUG_OPTIMIZE
00853   fprintf (stderr, "optimize_direction_sequential: end\n");
00854 #endif
00855 }
```

Here is the call graph for this function:



4.17.2.4 optimize_direction_thread()

```
void * optimize_direction_thread (
             ParallelData * data )
```

Function to estimate the direction search on a thread.

Parameters

data	Function data.

Returns

NULL

Definition at line 865 of file optimize.c.

```
00866 {
00867   unsigned int i, thread;
00868   double e;
00869 #if DEBUG_OPTIMIZE
00870   fprintf (stderr, "optimize_direction_thread: start\n");
00871 #endif
00872   thread = data->thread;
00873 #if DEBUG_OPTIMIZE
00874   fprintf (stderr, "optimize_direction_thread: thread=%u start=%u end=%u\n",
00875            thread,
00876            optimize->thread_direction[thread],
00877            optimize->thread_direction[thread + 1]);
00878 #endif
00879   for (i = optimize->thread_direction[thread];
00880        i < optimize->thread_direction[thread + 1]; ++i)
00881     {
00882       e = optimize_norm (i);
00883       g_mutex_lock (mutex);
00884       optimize_best_direction (i, e);
00885       optimize_save_variables (i, e);
00886       if (e < optimize->threshold)
00887         optimize->stop = 1;
00888       g_mutex_unlock (mutex);
00889       if (optimize->stop)
00890         break;
00891 #if DEBUG_OPTIMIZE
00892       fprintf (stderr, "optimize_direction_thread: i=%u e=%lg\n", i, e);
00893 #endif
00894     }
00895 #if DEBUG_OPTIMIZE
00896   fprintf (stderr, "optimize_direction_thread: end\n");
00897 #endif
00898   g_thread_exit (NULL);
00899   return NULL;
00900 }
```

4.17.2.5 optimize_estimate_direction_coordinates()

```
double optimize_estimate_direction_coordinates (
            unsigned int variable,
            unsigned int estimate )
```

Function to estimate a component of the direction search vector.

Parameters

variable	Variable number.
estimate	Estimate number.

Definition at line 939 of file optimize.c.

```
00941 {
00942   double x;
00943 #if DEBUG_OPTIMIZE
00944   fprintf (stderr, "optimize_estimate_direction_coordinates: start\n");
00945 #endif
00946   x = optimize->direction[variable];
00947   if (estimate >= (2 * variable) && estimate < (2 * variable + 2))
00948     {
00949       if (estimate & 1)
00950         x += optimize->step[variable];
00951       else
00952         x -= optimize->step[variable];
00953     }
00954 #if DEBUG_OPTIMIZE
00955   fprintf (stderr,
00956            "optimize_estimate_direction_coordinates: direction%u=%lg\n",
00957            variable, x);
00958   fprintf (stderr, "optimize_estimate_direction_coordinates: end\n");
00959 #endif
00960   return x;
00961 }
```

4.17.2.6 optimize_estimate_direction_random()

```
double optimize_estimate_direction_random (
              unsigned int variable,
              unsigned int estimate )
```

Function to estimate a component of the direction search vector.

Parameters

variable	Variable number.
estimate	Estimate number.

Definition at line 912 of file optimize.c.

```
00914 {
00915   double x;
00916 #if DEBUG_OPTIMIZE
00917   fprintf (stderr, "optimize_estimate_direction_random: start\n");
00918 #endif
00919   x = optimize->direction[variable]
00920     + (1. - 2. * gsl_rng_uniform (optimize->rng)) * optimize->
      step[variable];
00921 #if DEBUG_OPTIMIZE
00922   fprintf (stderr, "optimize_estimate_direction_random: direction%u=%lg\n",
00923            variable, x);
00924   fprintf (stderr, "optimize_estimate_direction_random: end\n");
00925 #endif
00926   return x;
00927 }
```

4.17.2.7 optimize_genetic_objective()

```
double optimize_genetic_objective (
               Entity * entity )
```

Function to calculate the objective function of an entity.

Parameters

entity	entity data.

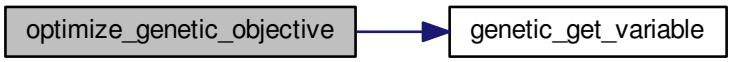
Returns

objective function value.

Definition at line 1106 of file optimize.c.

```
01107 {
01108   unsigned int j;
01109   double objective;
01110   char buffer[64];
01111 #if DEBUG_OPTIMIZE
01112   fprintf (stderr, "optimize_genetic_objective: start\n");
01113 #endif
01114   for (j = 0; j < optimize->nvariables; ++j)
01115     {
01116       optimize->value[entity->id * optimize->nvariables + j]
01117         = genetic_get_variable (entity, optimize->genetic_variable + j);
01118     }
01119   objective = optimize_norm (entity->id);
01120   g_mutex_lock (mutex);
01121   for (j = 0; j < optimize->nvariables; ++j)
01122     {
01123       snprintf (buffer, 64, "%s ", format[optimize->precision[j]]);
01124       fprintf (optimize->file_variables, buffer,
01125                genetic_get_variable (entity, optimize->genetic_variable + j));
01126     }
01127   fprintf (optimize->file_variables, "%.14le\n", objective);
01128   g_mutex_unlock (mutex);
01129 #if DEBUG_OPTIMIZE
01130   fprintf (stderr, "optimize_genetic_objective: end\n");
01131 #endif
01132   return objective;
01133 }
```

Here is the call graph for this function:



4.17.2.8 optimize_input()

```
void optimize_input (
             unsigned int simulation,
             char * input,
             GMappedFile * stencil )
```

Function to write the simulation input file.

Parameters

simulation	Simulation number.
input	Input file name.
stencil	Template of the input file name.

Definition at line 101 of file optimize.c.

```
00102 {
00103   unsigned int i;
00104   char buffer[32], value[32], *buffer2, *buffer3, *content;
00105   FILE *file;
00106   gsize length;
00107   GRegex *regex;
00108
00109 #if DEBUG_OPTIMIZE
00110   fprintf (stderr, "optimize_input: start\n");
00111 #endif
00112
00113   // Checking the file
00114   if (!stencil)
00115     goto optimize_input_end;
00116
00117   // Opening stencil
00118   content = g_mapped_file_get_contents (stencil);
00119   length = g_mapped_file_get_length (stencil);
00120 #if DEBUG_OPTIMIZE
00121   fprintf (stderr, "optimize_input: length=%lu\ncontent:\n%s", length, content);
00122 #endif
00123   file = g_fopen (input, "w");
00124
00125   // Parsing stencil
00126   for (i = 0; i < optimize->nvariables; ++i)
00127     {
00128 #if DEBUG_OPTIMIZE
00129       fprintf (stderr, "optimize_input: variable=%u\n", i);
00130 #endif
00131       snprintf (buffer, 32, "@variable%u@", i + 1);
00132       regex = g_regex_new (buffer, (GRegexCompileFlags) 0, (GRegexMatchFlags) 0,
00133                            NULL);
00134       if (i == 0)
00135         {
00136           buffer2 = g_regex_replace_literal (regex, content, length, 0,
00137                                              optimize->label[i],
00138                                              (GRegexMatchFlags) 0, NULL);
00139 #if DEBUG_OPTIMIZE
00140           fprintf (stderr, "optimize_input: buffer2\n%s", buffer2);
00141 #endif
00142         }
00143       else
00144         {
00145           length = strlen (buffer3);
00146           buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
00147                                              optimize->label[i],
00148                                              (GRegexMatchFlags) 0, NULL);
00149           g_free (buffer3);
00150         }
00151       g_regex_unref (regex);
00152       length = strlen (buffer2);
00153       snprintf (buffer, 32, "@value%u@", i + 1);
00154       regex = g_regex_new (buffer, (GRegexCompileFlags) 0, (GRegexMatchFlags) 0,
00155                            NULL);
00156       snprintf (value, 32, format[optimize->precision[i]],
00157                 optimize->value[simulation * optimize->
      nvariables + i]);
00158
00159 #if DEBUG_OPTIMIZE
00160       fprintf (stderr, "optimize_input: value=%s\n", value);
00161 #endif
00162       buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
00163                                          (GRegexMatchFlags) 0, NULL);
00164       g_free (buffer2);
00165       g_regex_unref (regex);
00166     }
00167
00168   // Saving input file
00169   fwrite (buffer3, strlen (buffer3), sizeof (char), file);
00170   g_free (buffer3);
00171   fclose (file);
00172
```

```
00173 optimize_input_end:
00174 #if DEBUG_OPTIMIZE
00175   fprintf (stderr, "optimize_input: end\n");
00176 #endif
00177   return;
00178 }
```

4.17.2.9 optimize_merge()

```
void optimize_merge (
             unsigned int nsaveds,
             unsigned int * simulation_best,
             double * error_best )
```

Function to merge the 2 optimization results.

Parameters

nsaveds	Number of saved results.
simulation_best	Array of best simulation numbers.
error_best	Array of best objective function values.

Definition at line 593 of file optimize.c.

```
00595 {
00596   unsigned int i, j, k, s[optimize->nbest];
00597   double e[optimize->nbest];
00598 #if DEBUG_OPTIMIZE
00599   fprintf (stderr, "optimize_merge: start\n");
00600 #endif
00601   i = j = k = 0;
00602   do
00603     {
00604       if (i == optimize->nsaveds)
00605         {
00606           s[k] = simulation_best[j];
00607           e[k] = error_best[j];
00608           ++j;
00609           ++k;
00610           if (j == nsaveds)
00611             break;
00612         }
00613       else if (j == nsaveds)
00614         {
00615           s[k] = optimize->simulation_best[i];
00616           e[k] = optimize->error_best[i];
00617           ++i;
00618           ++k;
00619           if (i == optimize->nsaveds)
00620             break;
00621         }
00622       else if (optimize->error_best[i] > error_best[j])
00623         {
00624           s[k] = simulation_best[j];
00625           e[k] = error_best[j];
00626           ++j;
00627           ++k;
00628         }
00629       else
00630         {
00631           s[k] = optimize->simulation_best[i];
00632           e[k] = optimize->error_best[i];
00633           ++i;
00634           ++k;
00635         }
00636     }
00637   while (k < optimize->nbest);
```

```
00638   optimize->nsaveds = k;
00639   memcpy (optimize->simulation_best, s, k * sizeof (unsigned int));
00640   memcpy (optimize->error_best, e, k * sizeof (double));
00641 #if DEBUG_OPTIMIZE
00642   fprintf (stderr, "optimize_merge: end\n");
00643 #endif
00644 }
```

4.17.2.10 optimize_norm_euclidian()

```
double optimize_norm_euclidian (
             unsigned int simulation )
```

Function to calculate the Euclidian error norm.

Parameters

simulation	simulation number.

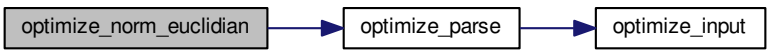
Returns

Euclidian error norm.

Definition at line 302 of file optimize.c.

```
00303 {
00304   double e, ei;
00305   unsigned int i;
00306 #if DEBUG_OPTIMIZE
00307   fprintf (stderr, "optimize_norm_euclidian: start\n");
00308 #endif
00309   e = 0.;
00310   for (i = 0; i < optimize->nexperiments; ++i)
00311     {
00312       ei = optimize_parse (simulation, i);
00313       e += ei * ei;
00314     }
00315   e = sqrt (e);
00316 #if DEBUG_OPTIMIZE
00317   fprintf (stderr, "optimize_norm_euclidian: error=%lg\n", e);
00318   fprintf (stderr, "optimize_norm_euclidian: end\n");
00319 #endif
00320   return e;
00321 }
```

Here is the call graph for this function:



4.17.2.11 optimize_norm_maximum()

```
double optimize_norm_maximum (
             unsigned int simulation )
```

Function to calculate the maximum error norm.

Parameters

simulation	simulation number.

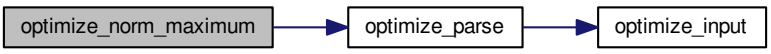
Returns

Maximum error norm.

Definition at line 331 of file optimize.c.

```
00332 {
00333   double e, ei;
00334   unsigned int i;
00335 #if DEBUG_OPTIMIZE
00336   fprintf (stderr, "optimize_norm_maximum: start\n");
00337 #endif
00338   e = 0.;
00339   for (i = 0; i < optimize->nexperiments; ++i)
00340     {
00341       ei = fabs (optimize_parse (simulation, i));
00342       e = fmax (e, ei);
00343     }
00344 #if DEBUG_OPTIMIZE
00345   fprintf (stderr, "optimize_norm_maximum: error=%lg\n", e);
00346   fprintf (stderr, "optimize_norm_maximum: end\n");
00347 #endif
00348   return e;
00349 }
```

Here is the call graph for this function:



4.17.2.12 optimize_norm_p()

```
double optimize_norm_p (
             unsigned int simulation )
```

Function to calculate the P error norm.

Parameters

simulation	simulation number.

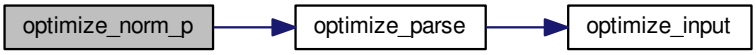
Returns

P error norm.

Definition at line 359 of file optimize.c.

```
00360 {
00361   double e, ei;
00362   unsigned int i;
00363 #if DEBUG_OPTIMIZE
00364   fprintf (stderr, "optimize_norm_p: start\n");
00365 #endif
00366   e = 0.;
00367   for (i = 0; i < optimize->nexperiments; ++i)
00368     {
00369       ei = fabs (optimize_parse (simulation, i));
00370       e += pow (ei, optimize->p);
00371     }
00372   e = pow (e, 1. / optimize->p);
00373 #if DEBUG_OPTIMIZE
00374   fprintf (stderr, "optimize_norm_p: error=%lg\n", e);
00375   fprintf (stderr, "optimize_norm_p: end\n");
00376 #endif
00377   return e;
00378 }
```

Here is the call graph for this function:



4.17.2.13 optimize_norm_taxicab()

```
double optimize_norm_taxicab (
            unsigned int simulation )
```

Function to calculate the taxicab error norm.

Parameters

simulation	simulation number.

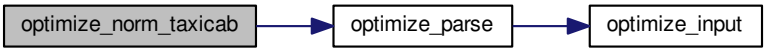
Returns

Taxicab error norm.

Definition at line 388 of file optimize.c.

```
00389 {
00390   double e;
00391   unsigned int i;
00392 #if DEBUG_OPTIMIZE
00393   fprintf (stderr, "optimize_norm_taxicab: start\n");
00394 #endif
00395   e = 0.;
00396   for (i = 0; i < optimize->nexperiments; ++i)
00397     e += fabs (optimize_parse (simulation, i));
00398 #if DEBUG_OPTIMIZE
00399   fprintf (stderr, "optimize_norm_taxicab: error=%lg\n", e);
00400   fprintf (stderr, "optimize_norm_taxicab: end\n");
00401 #endif
00402   return e;
00403 }
```

Here is the call graph for this function:



4.17.2.14 optimize_parse()

```
double optimize_parse (
              unsigned int simulation,
              unsigned int experiment )
```

Function to parse input files, simulating and calculating the \ objective function.

Parameters

simulation	Simulation number.
experiment	Experiment number.

Returns

Objective function value.

Definition at line 191 of file optimize.c.

```
00192 {
00193   unsigned int i;
00194   double e;
```

```
00195   char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
00196     *buffer3, *buffer4;
00197   FILE *file_result;
00198
00199 #if DEBUG_OPTIMIZE
00200   fprintf (stderr, "optimize_parse: start\n");
00201   fprintf (stderr, "optimize_parse: simulation=%u experiment=%u\n",
00202            simulation, experiment);
00203 #endif
00204
00205   // Opening input files
00206   for (i = 0; i < optimize->ninputs; ++i)
00207     {
00208       snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
00209 #if DEBUG_OPTIMIZE
00210       fprintf (stderr, "optimize_parse: i=%u input=%s\n", i, &input[i][0]);
00211 #endif
00212       optimize_input (simulation, &input[i][0], optimize->
      file[i][experiment]);
00213     }
00214   for (; i < MAX_NINPUTS; ++i)
00215     strcpy (&input[i][0], "");
00216 #if DEBUG_OPTIMIZE
00217   fprintf (stderr, "optimize_parse: parsing end\n");
00218 #endif
00219
00220   // Performing the simulation
00221   snprintf (output, 32, "output-%u-%u", simulation, experiment);
00222   buffer2 = g_path_get_dirname (optimize->simulator);
00223   buffer3 = g_path_get_basename (optimize->simulator);
00224   buffer4 = g_build_filename (buffer2, buffer3, NULL);
00225   snprintf (buffer, 512, "\"%s\" %s %s %s %s %s %s %s %s %s",
00226             buffer4, input[0], input[1], input[2], input[3], input[4],
00227             input[5], input[6], input[7], output);
00228   g_free (buffer4);
00229   g_free (buffer3);
00230   g_free (buffer2);
00231 #if DEBUG_OPTIMIZE
00232   fprintf (stderr, "optimize_parse: %s\n", buffer);
00233 #endif
00234   system (buffer);
00235
00236   // Checking the objective value function
00237   if (optimize->evaluator)
00238     {
00239       snprintf (result, 32, "result-%u-%u", simulation, experiment);
00240       buffer2 = g_path_get_dirname (optimize->evaluator);
00241       buffer3 = g_path_get_basename (optimize->evaluator);
00242       buffer4 = g_build_filename (buffer2, buffer3, NULL);
00243       snprintf (buffer, 512, "\"%s\" %s %s %s",
00244                 buffer4, output, optimize->experiment[experiment], result);
00245       g_free (buffer4);
00246       g_free (buffer3);
00247       g_free (buffer2);
00248 #if DEBUG_OPTIMIZE
00249       fprintf (stderr, "optimize_parse: %s\n", buffer);
00250       fprintf (stderr, "optimize_parse: result=%s\n", result);
00251 #endif
00252       system (buffer);
00253       file_result = g_fopen (result, "r");
00254       e = atof (fgets (buffer, 512, file_result));
00255       fclose (file_result);
00256     }
00257   else
00258     {
00259 #if DEBUG_OPTIMIZE
00260       fprintf (stderr, "optimize_parse: output=%s\n", output);
00261 #endif
00262       strcpy (result, "");
00263       file_result = g_fopen (output, "r");
00264       e = atof (fgets (buffer, 512, file_result));
00265       fclose (file_result);
00266     }
00267
00268   // Removing files
00269 #if !DEBUG_OPTIMIZE
00270   for (i = 0; i < optimize->ninputs; ++i)
00271     {
00272       if (optimize->file[i][0])
00273         {
00274           snprintf (buffer, 512, RM " %s", &input[i][0]);
00275           system (buffer);
00276         }
00277     }
00278   snprintf (buffer, 512, RM " %s %s", output, result);
00279   system (buffer);
00280 #endif
```

```
00281
00282   // Processing pending events
00283   if (show_pending)
00284     show_pending ();
00285
00286 #if DEBUG_OPTIMIZE
00287   fprintf (stderr, "optimize_parse: end\n");
00288 #endif
00289
00290   // Returning the objective function
00291   return e * optimize->weight[experiment];
00292 }
```

Here is the call graph for this function:

4.17.2.15 optimize_save_variables()

```
void optimize_save_variables (
              unsigned int simulation,
              double error )
```

Function to save in a file the variables and the error.

Parameters

simulation	Simulation number.
error	Error value.

Definition at line 441 of file optimize.c.

```
00442 {
00443   unsigned int i;
00444   char buffer[64];
00445 #if DEBUG_OPTIMIZE
00446   fprintf (stderr, "optimize_save_variables: start\n");
00447 #endif
00448   for (i = 0; i < optimize->nvariables; ++i)
00449     {
00450       snprintf (buffer, 64, "%s ", format[optimize->precision[i]]);
00451       fprintf (optimize->file_variables, buffer,
00452                optimize->value[simulation * optimize->
      nvariables + i]);
00453     }
00454   fprintf (optimize->file_variables, "%.14le\n", error);
00455   fflush (optimize->file_variables);
00456 #if DEBUG_OPTIMIZE
00457   fprintf (stderr, "optimize_save_variables: end\n");
00458 #endif
00459 }
```

4.17.2.16 optimize_step_direction()

```
void optimize_step_direction (
             unsigned int simulation )
```

Function to do a step of the direction search method.

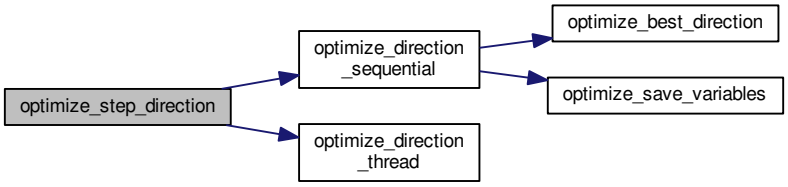
Parameters

simulation	Simulation number.

Definition at line 970 of file optimize.c.

```
00971 {
00972   GThread *thread[nthreads_direction];
00973   ParallelData data[nthreads_direction];
00974   unsigned int i, j, k, b;
00975 #if DEBUG_OPTIMIZE
00976   fprintf (stderr, "optimize_step_direction: start\n");
00977 #endif
00978   for (i = 0; i < optimize->nestimates; ++i)
00979     {
00980       k = (simulation + i) * optimize->nvariables;
00981       b = optimize->simulation_best[0] * optimize->
      nvariables;
00982 #if DEBUG_OPTIMIZE
00983       fprintf (stderr, "optimize_step_direction: simulation=%u best=%u\n",
00984                simulation + i, optimize->simulation_best[0]);
00985 #endif
00986       for (j = 0; j < optimize->nvariables; ++j, ++k, ++b)
00987         {
00988 #if DEBUG_OPTIMIZE
00989           fprintf (stderr,
00990                    "optimize_step_direction: estimate=%u best%u=%.14le\n",
00991                    i, j, optimize->value[b]);
00992 #endif
00993           optimize->value[k]
00994             = optimize->value[b] + optimize_estimate_direction (j,
      i);
00995           optimize->value[k] = fmin (fmax (optimize->value[k],
00996                                            optimize->rangeminabs[j]),
00997                                      optimize->rangemaxabs[j]);
00998 #if DEBUG_OPTIMIZE
00999           fprintf (stderr,
01000                    "optimize_step_direction: estimate=%u variable%u=%.14le\n",
01001                    i, j, optimize->value[k]);
01002 #endif
01003         }
01004     }
01005   if (nthreads_direction == 1)
01006     optimize_direction_sequential (simulation);
01007   else
01008     {
01009       for (i = 0; i <= nthreads_direction; ++i)
01010         {
01011           optimize->thread_direction[i]
01012             = simulation + optimize->nstart_direction
01013             + i * (optimize->nend_direction - optimize->
      nstart_direction)
01014               / nthreads_direction;
01015 #if DEBUG_OPTIMIZE
01016           fprintf (stderr,
01017                    "optimize_step_direction: i=%u thread_direction=%u\n",
01018                    i, optimize->thread_direction[i]);
01019 #endif
01020         }
01021       for (i = 0; i < nthreads_direction; ++i)
01022         {
01023           data[i].thread = i;
01024           thread[i] = g_thread_new
01025             (NULL, (GThreadFunc) optimize_direction_thread, &data[i]);
01026         }
01027       for (i = 0; i < nthreads_direction; ++i)
01028         g_thread_join (thread[i]);
01029     }
01030 #if DEBUG_OPTIMIZE
01031   fprintf (stderr, "optimize_step_direction: end\n");
01032 #endif
01033 }
```

Here is the call graph for this function:



4.17.2.17 optimize_thread()

```
void * optimize_thread (
            ParallelData * data )
```

Function to optimize on a thread.

Parameters

data	Function data.

Returns

NULL

Definition at line 547 of file optimize.c.

```
00548 {
00549   unsigned int i, thread;
00550   double e;
00551 #if DEBUG_OPTIMIZE
00552   fprintf (stderr, "optimize_thread: start\n");
00553 #endif
00554   thread = data->thread;
00555 #if DEBUG_OPTIMIZE
00556   fprintf (stderr, "optimize_thread: thread=%u start=%u end=%u\n", thread,
00557            optimize->thread[thread], optimize->thread[thread + 1]);
00558 #endif
00559   for (i = optimize->thread[thread]; i < optimize->thread[thread + 1]; ++i)
00560     {
00561       e = optimize_norm (i);
00562       g_mutex_lock (mutex);
00563       optimize_best (i, e);
00564       optimize_save_variables (i, e);
00565       if (e < optimize->threshold)
00566         optimize->stop = 1;
00567       g_mutex_unlock (mutex);
00568       if (optimize->stop)
00569         break;
00570 #if DEBUG_OPTIMIZE
00571       fprintf (stderr, "optimize_thread: i=%u e=%lg\n", i, e);
00572 #endif
00573     }
00574 #if DEBUG_OPTIMIZE
00575   fprintf (stderr, "optimize_thread: end\n");
00576 #endif
00577   g_thread_exit (NULL);
00578   return NULL;
00579 }
```

4.18 optimize.c

```
00001 /*
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
00007
00008 Copyright 2012-2017, AUTHORS.
00009
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00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #define _GNU_SOURCE
00039 #include "config.h"
00040 #include <stdio.h>
00041 #include <stdlib.h>
00042 #include <string.h>
00043 #include <math.h>
00044 #include <sys/param.h>
00045 #include <gsl/gsl_rng.h>
00046 #include <libxml/parser.h>
00047 #include <libintl.h>
00048 #include <glib.h>
00049 #include <glib/gstdio.h>
00050 #include <json-glib/json-glib.h>
00051 #ifdef G_OS_WIN32
00052 #include <windows.h>
00053 #elif !defined(__BSD_VISIBLE) && !defined(NetBSD)
00054 #include <alloca.h>
00055 #endif
00056 #if HAVE_MPI
00057 #include <mpi.h>
00058 #endif
00059 #include "genetic/genetic.h"
00060 #include "utils.h"
00061 #include "experiment.h"
00062 #include "variable.h"
00063 #include "input.h"
00064 #include "optimize.h"
00065
00066 #define DEBUG_OPTIMIZE 0
00067
00068
00072 #ifdef G_OS_WIN32
00073 #define RM "del"
00074 #else
00075 #define RM "rm"
00076 #endif
00077
00078 unsigned int nthreads_direction;
00080 void (*optimize_algorithm) ();
00082 double (*optimize_estimate_direction) (unsigned int variable,
00083                                        unsigned int estimate);
00085 double (*optimize_norm) (unsigned int simulation);
00087 Optimize optimize[1];
00088
00100 void
00101 optimize_input (unsigned int simulation, char *input, GMappedFile *
      stencil)
00102 {
00103   unsigned int i;
00104   char buffer[32], value[32], *buffer2, *buffer3, *content;
00105   FILE *file;
00106   gsize length;
00107   GRegex *regex;
```

```
00108
00109 #if DEBUG_OPTIMIZE
00110   fprintf (stderr, "optimize_input: start\n");
00111 #endif
00112
00113   // Checking the file
00114   if (!stencil)
00115     goto optimize_input_end;
00116
00117   // Opening stencil
00118   content = g_mapped_file_get_contents (stencil);
00119   length = g_mapped_file_get_length (stencil);
00120 #if DEBUG_OPTIMIZE
00121   fprintf (stderr, "optimize_input: length=%lu\ncontent:\n%s", length, content);
00122 #endif
00123   file = g_fopen (input, "w");
00124
00125   // Parsing stencil
00126   for (i = 0; i < optimize->nvariables; ++i)
00127     {
00128 #if DEBUG_OPTIMIZE
00129       fprintf (stderr, "optimize_input: variable=%u\n", i);
00130 #endif
00131       snprintf (buffer, 32, "@variable%u@", i + 1);
00132       regex = g_regex_new (buffer, (GRegexCompileFlags) 0, (GRegexMatchFlags) 0,
00133                            NULL);
00134       if (i == 0)
00135         {
00136           buffer2 = g_regex_replace_literal (regex, content, length, 0,
00137                                              optimize->label[i],
00138                                              (GRegexMatchFlags) 0, NULL);
00139 #if DEBUG_OPTIMIZE
00140           fprintf (stderr, "optimize_input: buffer2\n%s", buffer2);
00141 #endif
00142         }
00143       else
00144         {
00145           length = strlen (buffer3);
00146           buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
00147                                              optimize->label[i],
00148                                              (GRegexMatchFlags) 0, NULL);
00149           g_free (buffer3);
00150         }
00151       g_regex_unref (regex);
00152       length = strlen (buffer2);
00153       snprintf (buffer, 32, "@value%u@", i + 1);
00154       regex = g_regex_new (buffer, (GRegexCompileFlags) 0, (GRegexMatchFlags) 0,
00155                            NULL);
00156       snprintf (value, 32, format[optimize->precision[i]],
00157                 optimize->value[simulation * optimize->nvariables + i]);
00158
00159 #if DEBUG_OPTIMIZE
00160       fprintf (stderr, "optimize_input: value=%s\n", value);
00161 #endif
00162       buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
00163                                          (GRegexMatchFlags) 0, NULL);
00164       g_free (buffer2);
00165       g_regex_unref (regex);
00166     }
00167
00168   // Saving input file
00169   fwrite (buffer3, strlen (buffer3), sizeof (char), file);
00170   g_free (buffer3);
00171   fclose (file);
00172
00173 optimize_input_end:
00174 #if DEBUG_OPTIMIZE
00175   fprintf (stderr, "optimize_input: end\n");
00176 #endif
00177   return;
00178 }
00179
00190 double
00191 optimize_parse (unsigned int simulation, unsigned int experiment)
00192 {
00193   unsigned int i;
00194   double e;
00195   char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
00196     *buffer3, *buffer4;
00197   FILE *file_result;
00198
00199 #if DEBUG_OPTIMIZE
00200   fprintf (stderr, "optimize_parse: start\n");
00201   fprintf (stderr, "optimize_parse: simulation=%u experiment=%u\n",
00202            simulation, experiment);
00203 #endif
00204
```

```
00205   // Opening input files
00206   for (i = 0; i < optimize->ninputs; ++i)
00207     {
00208       snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
00209 #if DEBUG_OPTIMIZE
00210       fprintf (stderr, "optimize_parse: i=%u input=%s\n", i, &input[i][0]);
00211 #endif
00212       optimize_input (simulation, &input[i][0], optimize->file[i][experiment]);
00213     }
00214   for (; i < MAX_NINPUTS; ++i)
00215     strcpy (&input[i][0], "");
00216 #if DEBUG_OPTIMIZE
00217   fprintf (stderr, "optimize_parse: parsing end\n");
00218 #endif
00219
00220   // Performing the simulation
00221   snprintf (output, 32, "output-%u-%u", simulation, experiment);
00222   buffer2 = g_path_get_dirname (optimize->simulator);
00223   buffer3 = g_path_get_basename (optimize->simulator);
00224   buffer4 = g_build_filename (buffer2, buffer3, NULL);
00225   snprintf (buffer, 512, "\"%s\" %s %s %s %s %s %s %s %s %s",
00226             buffer4, input[0], input[1], input[2], input[3], input[4],
00227             input[5], input[6], input[7], output);
00228   g_free (buffer4);
00229   g_free (buffer3);
00230   g_free (buffer2);
00231 #if DEBUG_OPTIMIZE
00232   fprintf (stderr, "optimize_parse: %s\n", buffer);
00233 #endif
00234   system (buffer);
00235
00236   // Checking the objective value function
00237   if (optimize->evaluator)
00238     {
00239       snprintf (result, 32, "result-%u-%u", simulation, experiment);
00240       buffer2 = g_path_get_dirname (optimize->evaluator);
00241       buffer3 = g_path_get_basename (optimize->evaluator);
00242       buffer4 = g_build_filename (buffer2, buffer3, NULL);
00243       snprintf (buffer, 512, "\"%s\" %s %s %s",
00244                 buffer4, output, optimize->experiment[experiment], result);
00245       g_free (buffer4);
00246       g_free (buffer3);
00247       g_free (buffer2);
00248 #if DEBUG_OPTIMIZE
00249       fprintf (stderr, "optimize_parse: %s\n", buffer);
00250       fprintf (stderr, "optimize_parse: result=%s\n", result);
00251 #endif
00252       system (buffer);
00253       file_result = g_fopen (result, "r");
00254       e = atof (fgets (buffer, 512, file_result));
00255       fclose (file_result);
00256     }
00257   else
00258     {
00259 #if DEBUG_OPTIMIZE
00260       fprintf (stderr, "optimize_parse: output=%s\n", output);
00261 #endif
00262       strcpy (result, "");
00263       file_result = g_fopen (output, "r");
00264       e = atof (fgets (buffer, 512, file_result));
00265       fclose (file_result);
00266     }
00267
00268   // Removing files
00269 #if !DEBUG_OPTIMIZE
00270   for (i = 0; i < optimize->ninputs; ++i)
00271     {
00272       if (optimize->file[i][0])
00273         {
00274           snprintf (buffer, 512, RM " %s", &input[i][0]);
00275           system (buffer);
00276         }
00277     }
00278   snprintf (buffer, 512, RM " %s %s", output, result);
00279   system (buffer);
00280 #endif
00281
00282   // Processing pending events
00283   if (show_pending)
00284     show_pending ();
00285
00286 #if DEBUG_OPTIMIZE
00287   fprintf (stderr, "optimize_parse: end\n");
00288 #endif
00289
00290   // Returning the objective function
00291   return e * optimize->weight[experiment];
```

```
00292 }
00293
00301 double
00302 optimize_norm_euclidian (unsigned int simulation)
00303 {
00304   double e, ei;
00305   unsigned int i;
00306 #if DEBUG_OPTIMIZE
00307   fprintf (stderr, "optimize_norm_euclidian: start\n");
00308 #endif
00309   e = 0.;
00310   for (i = 0; i < optimize->nexperiments; ++i)
00311     {
00312       ei = optimize_parse (simulation, i);
00313       e += ei * ei;
00314     }
00315   e = sqrt (e);
00316 #if DEBUG_OPTIMIZE
00317   fprintf (stderr, "optimize_norm_euclidian: error=%lg\n", e);
00318   fprintf (stderr, "optimize_norm_euclidian: end\n");
00319 #endif
00320   return e;
00321 }
00322
00330 double
00331 optimize_norm_maximum (unsigned int simulation)
00332 {
00333   double e, ei;
00334   unsigned int i;
00335 #if DEBUG_OPTIMIZE
00336   fprintf (stderr, "optimize_norm_maximum: start\n");
00337 #endif
00338   e = 0.;
00339   for (i = 0; i < optimize->nexperiments; ++i)
00340     {
00341       ei = fabs (optimize_parse (simulation, i));
00342       e = fmax (e, ei);
00343     }
00344 #if DEBUG_OPTIMIZE
00345   fprintf (stderr, "optimize_norm_maximum: error=%lg\n", e);
00346   fprintf (stderr, "optimize_norm_maximum: end\n");
00347 #endif
00348   return e;
00349 }
00350
00358 double
00359 optimize_norm_p (unsigned int simulation)
00360 {
00361   double e, ei;
00362   unsigned int i;
00363 #if DEBUG_OPTIMIZE
00364   fprintf (stderr, "optimize_norm_p: start\n");
00365 #endif
00366   e = 0.;
00367   for (i = 0; i < optimize->nexperiments; ++i)
00368     {
00369       ei = fabs (optimize_parse (simulation, i));
00370       e += pow (ei, optimize->p);
00371     }
00372   e = pow (e, 1. / optimize->p);
00373 #if DEBUG_OPTIMIZE
00374   fprintf (stderr, "optimize_norm_p: error=%lg\n", e);
00375   fprintf (stderr, "optimize_norm_p: end\n");
00376 #endif
00377   return e;
00378 }
00379
00387 double
00388 optimize_norm_taxicab (unsigned int simulation)
00389 {
00390   double e;
00391   unsigned int i;
00392 #if DEBUG_OPTIMIZE
00393   fprintf (stderr, "optimize_norm_taxicab: start\n");
00394 #endif
00395   e = 0.;
00396   for (i = 0; i < optimize->nexperiments; ++i)
00397     e += fabs (optimize_parse (simulation, i));
00398 #if DEBUG_OPTIMIZE
00399   fprintf (stderr, "optimize_norm_taxicab: error=%lg\n", e);
00400   fprintf (stderr, "optimize_norm_taxicab: end\n");
00401 #endif
00402   return e;
00403 }
00404
00409 void
00410 optimize_print ()
```

```
00411 {
00412   unsigned int i;
00413   char buffer[512];
00414 #if HAVE_MPI
00415   if (optimize->mpi_rank)
00416     return;
00417 #endif
00418   printf ("%s\n", _("Best result"));
00419   fprintf (optimize->file_result, "%s\n", _("Best result"));
00420   printf ("error = %.15le\n", optimize->error_old[0]);
00421   fprintf (optimize->file_result, "error = %.15le\n", optimize->
      error_old[0]);
00422   for (i = 0; i < optimize->nvariables; ++i)
00423     {
00424       snprintf (buffer, 512, "%s = %s\n",
00425                 optimize->label[i], format[optimize->precision[i]]);
00426       printf (buffer, optimize->value_old[i]);
00427       fprintf (optimize->file_result, buffer, optimize->value_old[i]);
00428     }
00429   fflush (optimize->file_result);
00430 }
00431
00440 void
00441 optimize_save_variables (unsigned int simulation, double error)
00442 {
00443   unsigned int i;
00444   char buffer[64];
00445 #if DEBUG_OPTIMIZE
00446   fprintf (stderr, "optimize_save_variables: start\n");
00447 #endif
00448   for (i = 0; i < optimize->nvariables; ++i)
00449     {
00450       snprintf (buffer, 64, "%s ", format[optimize->precision[i]]);
00451       fprintf (optimize->file_variables, buffer,
00452                optimize->value[simulation * optimize->nvariables + i]);
00453     }
00454   fprintf (optimize->file_variables, "%.14le\n", error);
00455   fflush (optimize->file_variables);
00456 #if DEBUG_OPTIMIZE
00457   fprintf (stderr, "optimize_save_variables: end\n");
00458 #endif
00459 }
00460
00469 void
00470 optimize_best (unsigned int simulation, double value)
00471 {
00472   unsigned int i, j;
00473   double e;
00474 #if DEBUG_OPTIMIZE
00475   fprintf (stderr, "optimize_best: start\n");
00476   fprintf (stderr, "optimize_best: nsaveds=%u nbest=%u\n",
00477            optimize->nsaveds, optimize->nbest);
00478 #endif
00479   if (optimize->nsaveds < optimize->nbest
00480       || value < optimize->error_best[optimize->nsaveds - 1])
00481     {
00482       if (optimize->nsaveds < optimize->nbest)
00483         ++optimize->nsaveds;
00484       optimize->error_best[optimize->nsaveds - 1] = value;
00485       optimize->simulation_best[optimize->nsaveds - 1] = simulation;
00486       for (i = optimize->nsaveds; --i;)
00487         {
00488           if (optimize->error_best[i] < optimize->error_best[i - 1])
00489             {
00490               j = optimize->simulation_best[i];
00491               e = optimize->error_best[i];
00492               optimize->simulation_best[i] = optimize->
      simulation_best[i - 1];
00493               optimize->error_best[i] = optimize->error_best[i - 1];
00494               optimize->simulation_best[i - 1] = j;
00495               optimize->error_best[i - 1] = e;
00496             }
00497           else
00498             break;
00499         }
00500     }
00501 #if DEBUG_OPTIMIZE
00502   fprintf (stderr, "optimize_best: end\n");
00503 #endif
00504 }
00505
00510 void
00511 optimize_sequential ()
00512 {
00513   unsigned int i;
00514   double e;
00515 #if DEBUG_OPTIMIZE
```

```
00516   fprintf (stderr, "optimize_sequential: start\n");
00517   fprintf (stderr, "optimize_sequential: nstart=%u nend=%u\n",
00518            optimize->nstart, optimize->nend);
00519 #endif
00520   for (i = optimize->nstart; i < optimize->nend; ++i)
00521     {
00522       e = optimize_norm (i);
00523       optimize_best (i, e);
00524       optimize_save_variables (i, e);
00525       if (e < optimize->threshold)
00526         {
00527           optimize->stop = 1;
00528           break;
00529         }
00530 #if DEBUG_OPTIMIZE
00531       fprintf (stderr, "optimize_sequential: i=%u e=%lg\n", i, e);
00532 #endif
00533     }
00534 #if DEBUG_OPTIMIZE
00535   fprintf (stderr, "optimize_sequential: end\n");
00536 #endif
00537 }
00538
00546 void *
00547 optimize_thread (ParallelData * data)
00548 {
00549   unsigned int i, thread;
00550   double e;
00551 #if DEBUG_OPTIMIZE
00552   fprintf (stderr, "optimize_thread: start\n");
00553 #endif
00554   thread = data->thread;
00555 #if DEBUG_OPTIMIZE
00556   fprintf (stderr, "optimize_thread: thread=%u start=%u end=%u\n", thread,
00557            optimize->thread[thread], optimize->thread[thread + 1]);
00558 #endif
00559   for (i = optimize->thread[thread]; i < optimize->thread[thread + 1]; ++i)
00560     {
00561       e = optimize_norm (i);
00562       g_mutex_lock (mutex);
00563       optimize_best (i, e);
00564       optimize_save_variables (i, e);
00565       if (e < optimize->threshold)
00566         optimize->stop = 1;
00567       g_mutex_unlock (mutex);
00568       if (optimize->stop)
00569         break;
00570 #if DEBUG_OPTIMIZE
00571       fprintf (stderr, "optimize_thread: i=%u e=%lg\n", i, e);
00572 #endif
00573     }
00574 #if DEBUG_OPTIMIZE
00575   fprintf (stderr, "optimize_thread: end\n");
00576 #endif
00577   g_thread_exit (NULL);
00578   return NULL;
00579 }
00580
00592 void
00593 optimize_merge (unsigned int nsaveds, unsigned int *simulation_best,
00594                 double *error_best)
00595 {
00596   unsigned int i, j, k, s[optimize->nbest];
00597   double e[optimize->nbest];
00598 #if DEBUG_OPTIMIZE
00599   fprintf (stderr, "optimize_merge: start\n");
00600 #endif
00601   i = j = k = 0;
00602   do
00603     {
00604       if (i == optimize->nsaveds)
00605         {
00606           s[k] = simulation_best[j];
00607           e[k] = error_best[j];
00608           ++j;
00609           ++k;
00610           if (j == nsaveds)
00611             break;
00612         }
00613       else if (j == nsaveds)
00614         {
00615           s[k] = optimize->simulation_best[i];
00616           e[k] = optimize->error_best[i];
00617           ++i;
00618           ++k;
00619           if (i == optimize->nsaveds)
00620             break;
```

```
00621         }
00622       else if (optimize->error_best[i] > error_best[j])
00623         {
00624           s[k] = simulation_best[j];
00625           e[k] = error_best[j];
00626           ++j;
00627           ++k;
00628         }
00629       else
00630         {
00631           s[k] = optimize->simulation_best[i];
00632           e[k] = optimize->error_best[i];
00633           ++i;
00634           ++k;
00635         }
00636     }
00637   while (k < optimize->nbest);
00638   optimize->nsaveds = k;
00639   memcpy (optimize->simulation_best, s, k * sizeof (unsigned int));
00640   memcpy (optimize->error_best, e, k * sizeof (double));
00641 #if DEBUG_OPTIMIZE
00642   fprintf (stderr, "optimize_merge: end\n");
00643 #endif
00644 }
00645
00650 #if HAVE_MPI
00651 void
00652 optimize_synchronise ()
00653 {
00654   unsigned int i, nsaveds, simulation_best[optimize->nbest], stop;
00655   double error_best[optimize->nbest];
00656   MPI_Status mpi_stat;
00657 #if DEBUG_OPTIMIZE
00658   fprintf (stderr, "optimize_synchronise: start\n");
00659 #endif
00660   if (optimize->mpi_rank == 0)
00661     {
00662       for (i = 1; i < ntasks; ++i)
00663         {
00664           MPI_Recv (&nsaveds, 1, MPI_INT, i, 1, MPI_COMM_WORLD, &mpi_stat);
00665           MPI_Recv (simulation_best, nsaveds, MPI_INT, i, 1,
00666                     MPI_COMM_WORLD, &mpi_stat);
00667           MPI_Recv (error_best, nsaveds, MPI_DOUBLE, i, 1,
00668                     MPI_COMM_WORLD, &mpi_stat);
00669           optimize_merge (nsaveds, simulation_best, error_best);
00670           MPI_Recv (&stop, 1, MPI_UNSIGNED, i, 1, MPI_COMM_WORLD, &mpi_stat);
00671           if (stop)
00672             optimize->stop = 1;
00673         }
00674       for (i = 1; i < ntasks; ++i)
00675         MPI_Send (&optimize->stop, 1, MPI_UNSIGNED, i, 1, MPI_COMM_WORLD);
00676     }
00677   else
00678     {
00679       MPI_Send (&optimize->nsaveds, 1, MPI_INT, 0, 1, MPI_COMM_WORLD);
00680       MPI_Send (optimize->simulation_best, optimize->nsaveds, MPI_INT, 0, 1,
00681                 MPI_COMM_WORLD);
00682       MPI_Send (optimize->error_best, optimize->nsaveds, MPI_DOUBLE, 0, 1,
00683                 MPI_COMM_WORLD);
00684       MPI_Send (&optimize->stop, 1, MPI_UNSIGNED, 0, 1, MPI_COMM_WORLD);
00685       MPI_Recv (&stop, 1, MPI_UNSIGNED, 0, 1, MPI_COMM_WORLD, &mpi_stat);
00686       if (stop)
00687         optimize->stop = 1;
00688     }
00689 #if DEBUG_OPTIMIZE
00690   fprintf (stderr, "optimize_synchronise: end\n");
00691 #endif
00692 }
00693 #endif
00694
00699 void
00700 optimize_sweep ()
00701 {
00702   unsigned int i, j, k, l;
00703   double e;
00704   GThread *thread[nthreads];
00705   ParallelData data[nthreads];
00706 #if DEBUG_OPTIMIZE
00707   fprintf (stderr, "optimize_sweep: start\n");
00708 #endif
00709   for (i = 0; i < optimize->nsimulations; ++i)
00710     {
00711       k = i;
00712       for (j = 0; j < optimize->nvariables; ++j)
00713         {
00714           l = k % optimize->nsweeps[j];
00715           k /= optimize->nsweeps[j];
```

```
00716           e = optimize->rangemin[j];
00717           if (optimize->nsweeps[j] > 1)
00718             e += l * (optimize->rangemax[j] - optimize->rangemin[j])
00719               / (optimize->nsweeps[j] - 1);
00720           optimize->value[i * optimize->nvariables + j] = e;
00721         }
00722     }
00723   optimize->nsaveds = 0;
00724   if (nthreads <= 1)
00725     optimize_sequential ();
00726   else
00727     {
00728       for (i = 0; i < nthreads; ++i)
00729         {
00730           data[i].thread = i;
00731           thread[i]
00732             = g_thread_new (NULL, (GThreadFunc) optimize_thread, &data[i]);
00733         }
00734       for (i = 0; i < nthreads; ++i)
00735         g_thread_join (thread[i]);
00736     }
00737 #if HAVE_MPI
00738   // Communicating tasks results
00739   optimize_synchronise ();
00740 #endif
00741 #if DEBUG_OPTIMIZE
00742   fprintf (stderr, "optimize_sweep: end\n");
00743 #endif
00744 }
00745
00750 void
00751 optimize_MonteCarlo ()
00752 {
00753   unsigned int i, j;
00754   GThread *thread[nthreads];
00755   ParallelData data[nthreads];
00756 #if DEBUG_OPTIMIZE
00757   fprintf (stderr, "optimize_MonteCarlo: start\n");
00758 #endif
00759   for (i = 0; i < optimize->nsimulations; ++i)
00760     for (j = 0; j < optimize->nvariables; ++j)
00761       optimize->value[i * optimize->nvariables + j]
00762         = optimize->rangemin[j] + gsl_rng_uniform (optimize->rng)
00763         * (optimize->rangemax[j] - optimize->rangemin[j]);
00764   optimize->nsaveds = 0;
00765   if (nthreads <= 1)
00766     optimize_sequential ();
00767   else
00768     {
00769       for (i = 0; i < nthreads; ++i)
00770         {
00771           data[i].thread = i;
00772           thread[i]
00773             = g_thread_new (NULL, (GThreadFunc) optimize_thread, &data[i]);
00774         }
00775       for (i = 0; i < nthreads; ++i)
00776         g_thread_join (thread[i]);
00777     }
00778 #if HAVE_MPI
00779   // Communicating tasks results
00780   optimize_synchronise ();
00781 #endif
00782 #if DEBUG_OPTIMIZE
00783   fprintf (stderr, "optimize_MonteCarlo: end\n");
00784 #endif
00785 }
00786
00796 void
00797 optimize_best_direction (unsigned int simulation, double value)
00798 {
00799 #if DEBUG_OPTIMIZE
00800   fprintf (stderr, "optimize_best_direction: start\n");
00801   fprintf (stderr,
00802            "optimize_best_direction: simulation=%u value=%.14le best=%.14le\n",
00803            simulation, value, optimize->error_best[0]);
00804 #endif
00805   if (value < optimize->error_best[0])
00806     {
00807       optimize->error_best[0] = value;
00808       optimize->simulation_best[0] = simulation;
00809 #if DEBUG_OPTIMIZE
00810       fprintf (stderr,
00811                "optimize_best_direction: BEST simulation=%u value=%.14le\n",
00812                simulation, value);
00813 #endif
00814     }
00815 #if DEBUG_OPTIMIZE
```

```
00816   fprintf (stderr, "optimize_best_direction: end\n");
00817 #endif
00818 }
00819
00826 void
00827 optimize_direction_sequential (unsigned int simulation)
00828 {
00829   unsigned int i, j;
00830   double e;
00831 #if DEBUG_OPTIMIZE
00832   fprintf (stderr, "optimize_direction_sequential: start\n");
00833   fprintf (stderr, "optimize_direction_sequential: nstart_direction=%u "
00834            "nend_direction=%u\n",
00835            optimize->nstart_direction, optimize->nend_direction);
00836 #endif
00837   for (i = optimize->nstart_direction; i < optimize->nend_direction; ++i)
00838     {
00839       j = simulation + i;
00840       e = optimize_norm (j);
00841       optimize_best_direction (j, e);
00842       optimize_save_variables (j, e);
00843       if (e < optimize->threshold)
00844         {
00845           optimize->stop = 1;
00846           break;
00847         }
00848 #if DEBUG_OPTIMIZE
00849       fprintf (stderr, "optimize_direction_sequential: i=%u e=%lg\n", i, e);
00850 #endif
00851     }
00852 #if DEBUG_OPTIMIZE
00853   fprintf (stderr, "optimize_direction_sequential: end\n");
00854 #endif
00855 }
00856
00864 void *
00865 optimize_direction_thread (ParallelData * data)
00866 {
00867   unsigned int i, thread;
00868   double e;
00869 #if DEBUG_OPTIMIZE
00870   fprintf (stderr, "optimize_direction_thread: start\n");
00871 #endif
00872   thread = data->thread;
00873 #if DEBUG_OPTIMIZE
00874   fprintf (stderr, "optimize_direction_thread: thread=%u start=%u end=%u\n",
00875            thread,
00876            optimize->thread_direction[thread],
00877            optimize->thread_direction[thread + 1]);
00878 #endif
00879   for (i = optimize->thread_direction[thread];
00880        i < optimize->thread_direction[thread + 1]; ++i)
00881     {
00882       e = optimize_norm (i);
00883       g_mutex_lock (mutex);
00884       optimize_best_direction (i, e);
00885       optimize_save_variables (i, e);
00886       if (e < optimize->threshold)
00887         optimize->stop = 1;
00888       g_mutex_unlock (mutex);
00889       if (optimize->stop)
00890         break;
00891 #if DEBUG_OPTIMIZE
00892       fprintf (stderr, "optimize_direction_thread: i=%u e=%lg\n", i, e);
00893 #endif
00894     }
00895 #if DEBUG_OPTIMIZE
00896   fprintf (stderr, "optimize_direction_thread: end\n");
00897 #endif
00898   g_thread_exit (NULL);
00899   return NULL;
00900 }
00901
00911 double
00912 optimize_estimate_direction_random (unsigned int variable,
00913                                     unsigned int estimate)
00914 {
00915   double x;
00916 #if DEBUG_OPTIMIZE
00917   fprintf (stderr, "optimize_estimate_direction_random: start\n");
00918 #endif
00919   x = optimize->direction[variable]
00920     + (1. - 2. * gsl_rng_uniform (optimize->rng)) * optimize->step[variable];
00921 #if DEBUG_OPTIMIZE
00922   fprintf (stderr, "optimize_estimate_direction_random: direction%u=%lg\n",
00923            variable, x);
00924   fprintf (stderr, "optimize_estimate_direction_random: end\n");
```

```
00925 #endif
00926   return x;
00927 }
00928
00938 double
00939 optimize_estimate_direction_coordinates (unsigned int variable,
00940                                          unsigned int estimate)
00941 {
00942   double x;
00943 #if DEBUG_OPTIMIZE
00944   fprintf (stderr, "optimize_estimate_direction_coordinates: start\n");
00945 #endif
00946   x = optimize->direction[variable];
00947   if (estimate >= (2 * variable) && estimate < (2 * variable + 2))
00948     {
00949       if (estimate & 1)
00950         x += optimize->step[variable];
00951       else
00952         x -= optimize->step[variable];
00953     }
00954 #if DEBUG_OPTIMIZE
00955   fprintf (stderr,
00956            "optimize_estimate_direction_coordinates: direction%u=%lg\n",
00957            variable, x);
00958   fprintf (stderr, "optimize_estimate_direction_coordinates: end\n");
00959 #endif
00960   return x;
00961 }
00962
00969 void
00970 optimize_step_direction (unsigned int simulation)
00971 {
00972   GThread *thread[nthreads_direction];
00973   ParallelData data[nthreads_direction];
00974   unsigned int i, j, k, b;
00975 #if DEBUG_OPTIMIZE
00976   fprintf (stderr, "optimize_step_direction: start\n");
00977 #endif
00978   for (i = 0; i < optimize->nestimates; ++i)
00979     {
00980       k = (simulation + i) * optimize->nvariables;
00981       b = optimize->simulation_best[0] * optimize->nvariables;
00982 #if DEBUG_OPTIMIZE
00983       fprintf (stderr, "optimize_step_direction: simulation=%u best=%u\n",
00984                simulation + i, optimize->simulation_best[0]);
00985 #endif
00986       for (j = 0; j < optimize->nvariables; ++j, ++k, ++b)
00987         {
00988 #if DEBUG_OPTIMIZE
00989           fprintf (stderr,
00990                    "optimize_step_direction: estimate=%u best%u=%.14le\n",
00991                    i, j, optimize->value[b]);
00992 #endif
00993           optimize->value[k]
00994             = optimize->value[b] + optimize_estimate_direction (j, i);
00995           optimize->value[k] = fmin (fmax (optimize->value[k],
00996                                            optimize->rangeminabs[j]),
00997                                      optimize->rangemaxabs[j]);
00998 #if DEBUG_OPTIMIZE
00999           fprintf (stderr,
01000                    "optimize_step_direction: estimate=%u variable%u=%.14le\n",
01001                    i, j, optimize->value[k]);
01002 #endif
01003         }
01004     }
01005   if (nthreads_direction == 1)
01006     optimize_direction_sequential (simulation);
01007   else
01008     {
01009       for (i = 0; i <= nthreads_direction; ++i)
01010         {
01011           optimize->thread_direction[i]
01012             = simulation + optimize->nstart_direction
01013             + i * (optimize->nend_direction - optimize->
      nstart_direction)
01014             / nthreads_direction;
01015 #if DEBUG_OPTIMIZE
01016           fprintf (stderr,
01017                    "optimize_step_direction: i=%u thread_direction=%u\n",
01018                    i, optimize->thread_direction[i]);
01019 #endif
01020         }
01021       for (i = 0; i < nthreads_direction; ++i)
01022         {
01023           data[i].thread = i;
01024           thread[i] = g_thread_new
01025             (NULL, (GThreadFunc) optimize_direction_thread, &data[i]);
```

```
01026         }
01027       for (i = 0; i < nthreads_direction; ++i)
01028         g_thread_join (thread[i]);
01029     }
01030 #if DEBUG_OPTIMIZE
01031   fprintf (stderr, "optimize_step_direction: end\n");
01032 #endif
01033 }
01034
01039 void
01040 optimize_direction ()
01041 {
01042   unsigned int i, j, k, b, s, adjust;
01043 #if DEBUG_OPTIMIZE
01044   fprintf (stderr, "optimize_direction: start\n");
01045 #endif
01046   for (i = 0; i < optimize->nvariables; ++i)
01047     optimize->direction[i] = 0.;
01048   b = optimize->simulation_best[0] * optimize->nvariables;
01049   s = optimize->nsimulations;
01050   adjust = 1;
01051   for (i = 0; i < optimize->nsteps; ++i, s += optimize->nestimates, b = k)
01052     {
01053 #if DEBUG_OPTIMIZE
01054       fprintf (stderr, "optimize_direction: step=%u old_best=%u\n",
01055                i, optimize->simulation_best[0]);
01056 #endif
01057       optimize_step_direction (s);
01058       k = optimize->simulation_best[0] * optimize->nvariables;
01059 #if DEBUG_OPTIMIZE
01060       fprintf (stderr, "optimize_direction: step=%u best=%u\n",
01061                i, optimize->simulation_best[0]);
01062 #endif
01063       if (k == b)
01064         {
01065           if (adjust)
01066             for (j = 0; j < optimize->nvariables; ++j)
01067               optimize->step[j] *= 0.5;
01068           for (j = 0; j < optimize->nvariables; ++j)
01069             optimize->direction[j] = 0.;
01070           adjust = 1;
01071         }
01072       else
01073         {
01074           for (j = 0; j < optimize->nvariables; ++j)
01075             {
01076 #if DEBUG_OPTIMIZE
01077               fprintf (stderr,
01078                        "optimize_direction: best%u=%.14le old%u=%.14le\n",
01079                        j, optimize->value[k + j], j, optimize->value[b + j]);
01080 #endif
01081               optimize->direction[j]
01082                 = (1. - optimize->relaxation) * optimize->direction[j]
01083                 + optimize->relaxation
01084                 * (optimize->value[k + j] - optimize->value[b + j]);
01085 #if DEBUG_OPTIMIZE
01086               fprintf (stderr, "optimize_direction: direction%u=%.14le\n",
01087                        j, optimize->direction[j]);
01088 #endif
01089             }
01090           adjust = 0;
01091         }
01092     }
01093 #if DEBUG_OPTIMIZE
01094   fprintf (stderr, "optimize_direction: end\n");
01095 #endif
01096 }
01097
01105 double
01106 optimize_genetic_objective (Entity * entity)
01107 {
01108   unsigned int j;
01109   double objective;
01110   char buffer[64];
01111 #if DEBUG_OPTIMIZE
01112   fprintf (stderr, "optimize_genetic_objective: start\n");
01113 #endif
01114   for (j = 0; j < optimize->nvariables; ++j)
01115     {
01116       optimize->value[entity->id * optimize->nvariables + j]
01117         = genetic_get_variable (entity, optimize->genetic_variable + j);
01118     }
01119   objective = optimize_norm (entity->id);
01120   g_mutex_lock (mutex);
01121   for (j = 0; j < optimize->nvariables; ++j)
01122     {
01123       snprintf (buffer, 64, "%s ", format[optimize->precision[j]]);
```

```
01124       fprintf (optimize->file_variables, buffer,
01125                genetic_get_variable (entity, optimize->genetic_variable + j));
01126     }
01127   fprintf (optimize->file_variables, "%.14le\n", objective);
01128   g_mutex_unlock (mutex);
01129 #if DEBUG_OPTIMIZE
01130   fprintf (stderr, "optimize_genetic_objective: end\n");
01131 #endif
01132   return objective;
01133 }
01134
01139 void
01140 optimize_genetic ()
01141 {
01142   char *best_genome;
01143   double best_objective, *best_variable;
01144 #if DEBUG_OPTIMIZE
01145   fprintf (stderr, "optimize_genetic: start\n");
01146   fprintf (stderr, "optimize_genetic: ntasks=%u nthreads=%u\n", ntasks,
01147            nthreads);
01148   fprintf (stderr,
01149            "optimize_genetic: nvariables=%u population=%u generations=%u\n",
01150            optimize->nvariables, optimize->nsimulations, optimize->
     niterations);
01151   fprintf (stderr,
01152            "optimize_genetic: mutation=%lg reproduction=%lg adaptation=%lg\n",
01153            optimize->mutation_ratio, optimize->reproduction_ratio,
01154            optimize->adaptation_ratio);
01155 #endif
01156   genetic_algorithm_default (optimize->nvariables,
01157                              optimize->genetic_variable,
01158                              optimize->nsimulations,
01159                              optimize->niterations,
01160                              optimize->mutation_ratio,
01161                              optimize->reproduction_ratio,
01162                              optimize->adaptation_ratio,
01163                              optimize->seed,
01164                              optimize->threshold,
01165                              &optimize_genetic_objective,
01166                              &best_genome, &best_variable, &best_objective);
01167 #if DEBUG_OPTIMIZE
01168   fprintf (stderr, "optimize_genetic: the best\n");
01169 #endif
01170   optimize->error_old = (double *) g_malloc (sizeof (double));
01171   optimize->value_old
01172     = (double *) g_malloc (optimize->nvariables * sizeof (double));
01173   optimize->error_old[0] = best_objective;
01174   memcpy (optimize->value_old, best_variable,
01175           optimize->nvariables * sizeof (double));
01176   g_free (best_genome);
01177   g_free (best_variable);
01178   optimize_print ();
01179 #if DEBUG_OPTIMIZE
01180   fprintf (stderr, "optimize_genetic: end\n");
01181 #endif
01182 }
01183
01188 void
01189 optimize_save_old ()
01190 {
01191   unsigned int i, j;
01192 #if DEBUG_OPTIMIZE
01193   fprintf (stderr, "optimize_save_old: start\n");
01194   fprintf (stderr, "optimize_save_old: nsaveds=%u\n", optimize->nsaveds);
01195 #endif
01196   memcpy (optimize->error_old, optimize->error_best,
01197           optimize->nbest * sizeof (double));
01198   for (i = 0; i < optimize->nbest; ++i)
01199     {
01200       j = optimize->simulation_best[i];
01201 #if DEBUG_OPTIMIZE
01202       fprintf (stderr, "optimize_save_old: i=%u j=%u\n", i, j);
01203 #endif
01204       memcpy (optimize->value_old + i * optimize->nvariables,
01205               optimize->value + j * optimize->nvariables,
01206               optimize->nvariables * sizeof (double));
01207     }
01208 #if DEBUG_OPTIMIZE
01209   for (i = 0; i < optimize->nvariables; ++i)
01210     fprintf (stderr, "optimize_save_old: best variable %u=%lg\n",
01211              i, optimize->value_old[i]);
01212   fprintf (stderr, "optimize_save_old: end\n");
01213 #endif
01214 }
01215
01221 void
01222 optimize_merge_old ()
```

```
01223 {
01224   unsigned int i, j, k;
01225   double v[optimize->nbest * optimize->nvariables], e[optimize->
      nbest],
01226     *enew, *eold;
01227 #if DEBUG_OPTIMIZE
01228   fprintf (stderr, "optimize_merge_old: start\n");
01229 #endif
01230   enew = optimize->error_best;
01231   eold = optimize->error_old;
01232   i = j = k = 0;
01233   do
01234     {
01235       if (*enew < *eold)
01236         {
01237           memcpy (v + k * optimize->nvariables,
01238                   optimize->value
01239                   + optimize->simulation_best[i] * optimize->
      nvariables,
01240                   optimize->nvariables * sizeof (double));
01241           e[k] = *enew;
01242           ++k;
01243           ++enew;
01244           ++i;
01245         }
01246       else
01247         {
01248           memcpy (v + k * optimize->nvariables,
01249                   optimize->value_old + j * optimize->nvariables,
01250                   optimize->nvariables * sizeof (double));
01251           e[k] = *eold;
01252           ++k;
01253           ++eold;
01254           ++j;
01255         }
01256     }
01257   while (k < optimize->nbest);
01258   memcpy (optimize->value_old, v, k * optimize->nvariables * sizeof (double));
01259   memcpy (optimize->error_old, e, k * sizeof (double));
01260 #if DEBUG_OPTIMIZE
01261   fprintf (stderr, "optimize_merge_old: end\n");
01262 #endif
01263 }
01264
01270 void
01271 optimize_refine ()
01272 {
01273   unsigned int i, j;
01274   double d;
01275 #if HAVE_MPI
01276   MPI_Status mpi_stat;
01277 #endif
01278 #if DEBUG_OPTIMIZE
01279   fprintf (stderr, "optimize_refine: start\n");
01280 #endif
01281 #if HAVE_MPI
01282   if (!optimize->mpi_rank)
01283     {
01284 #endif
01285       for (j = 0; j < optimize->nvariables; ++j)
01286         {
01287           optimize->rangemin[j] = optimize->rangemax[j]
01288             = optimize->value_old[j];
01289         }
01290       for (i = 0; ++i < optimize->nbest;)
01291         {
01292           for (j = 0; j < optimize->nvariables; ++j)
01293             {
01294               optimize->rangemin[j]
01295                 = fmin (optimize->rangemin[j],
01296                         optimize->value_old[i * optimize->nvariables + j]);
01297               optimize->rangemax[j]
01298                 = fmax (optimize->rangemax[j],
01299                         optimize->value_old[i * optimize->nvariables + j]);
01300             }
01301         }
01302       for (j = 0; j < optimize->nvariables; ++j)
01303         {
01304           d = optimize->tolerance
01305             * (optimize->rangemax[j] - optimize->rangemin[j]);
01306           switch (optimize->algorithm)
01307             {
01308             case ALGORITHM_MONTE_CARLO:
01309               d *= 0.5;
01310               break;
01311             default:
01312               if (optimize->nsweeps[j] > 1)
```

```
01313                 d /= optimize->nsweeps[j] - 1;
01314               else
01315                 d = 0.;
01316             }
01317           optimize->rangemin[j] -= d;
01318           optimize->rangemin[j]
01319             = fmax (optimize->rangemin[j], optimize->rangeminabs[j]);
01320           optimize->rangemax[j] += d;
01321           optimize->rangemax[j]
01322             = fmin (optimize->rangemax[j], optimize->rangemaxabs[j]);
01323           printf ("%s min=%lg max=%lg\n", optimize->label[j],
01324                   optimize->rangemin[j], optimize->rangemax[j]);
01325           fprintf (optimize->file_result, "%s min=%lg max=%lg\n",
01326                    optimize->label[j], optimize->rangemin[j],
01327                    optimize->rangemax[j]);
01328         }
01329 #if HAVE_MPI
01330       for (i = 1; i < ntasks; ++i)
01331         {
01332           MPI_Send (optimize->rangemin, optimize->nvariables, MPI_DOUBLE, i,
01333                     1, MPI_COMM_WORLD);
01334           MPI_Send (optimize->rangemax, optimize->nvariables, MPI_DOUBLE, i,
01335                     1, MPI_COMM_WORLD);
01336         }
01337     }
01338   else
01339     {
01340       MPI_Recv (optimize->rangemin, optimize->nvariables, MPI_DOUBLE, 0, 1,
01341                 MPI_COMM_WORLD, &mpi_stat);
01342       MPI_Recv (optimize->rangemax, optimize->nvariables, MPI_DOUBLE, 0, 1,
01343                 MPI_COMM_WORLD, &mpi_stat);
01344     }
01345 #endif
01346 #if DEBUG_OPTIMIZE
01347   fprintf (stderr, "optimize_refine: end\n");
01348 #endif
01349 }
01350
01355 void
01356 optimize_step ()
01357 {
01358 #if DEBUG_OPTIMIZE
01359   fprintf (stderr, "optimize_step: start\n");
01360 #endif
01361   optimize_algorithm ();
01362   if (optimize->nsteps)
01363     optimize_direction ();
01364 #if DEBUG_OPTIMIZE
01365   fprintf (stderr, "optimize_step: end\n");
01366 #endif
01367 }
01368
01373 void
01374 optimize_iterate ()
01375 {
01376   unsigned int i;
01377 #if DEBUG_OPTIMIZE
01378   fprintf (stderr, "optimize_iterate: start\n");
01379 #endif
01380   optimize->error_old = (double *) g_malloc (optimize->nbest * sizeof (double));
01381   optimize->value_old =
01382     (double *) g_malloc (optimize->nbest * optimize->nvariables *
01383                          sizeof (double));
01384   optimize_step ();
01385   optimize_save_old ();
01386   optimize_refine ();
01387   optimize_print ();
01388   for (i = 1; i < optimize->niterations && !optimize->stop; ++i)
01389     {
01390       optimize_step ();
01391       optimize_merge_old ();
01392       optimize_refine ();
01393       optimize_print ();
01394     }
01395 #if DEBUG_OPTIMIZE
01396   fprintf (stderr, "optimize_iterate: end\n");
01397 #endif
01398 }
01399
01404 void
01405 optimize_free ()
01406 {
01407   unsigned int i, j;
01408 #if DEBUG_OPTIMIZE
01409   fprintf (stderr, "optimize_free: start\n");
01410 #endif
01411   for (j = 0; j < optimize->ninputs; ++j)
```

```
01412     {
01413       for (i = 0; i < optimize->nexperiments; ++i)
01414         g_mapped_file_unref (optimize->file[j][i]);
01415       g_free (optimize->file[j]);
01416     }
01417   g_free (optimize->error_old);
01418   g_free (optimize->value_old);
01419   g_free (optimize->value);
01420   g_free (optimize->genetic_variable);
01421 #if DEBUG_OPTIMIZE
01422   fprintf (stderr, "optimize_free: end\n");
01423 #endif
01424 }
01425
01430 void
01431 optimize_open ()
01432 {
01433   GTimeZone *tz;
01434   GDateTime *t0, *t;
01435   unsigned int i, j;
01436
01437 #if DEBUG_OPTIMIZE
01438   char *buffer;
01439   fprintf (stderr, "optimize_open: start\n");
01440 #endif
01441
01442   // Getting initial time
01443 #if DEBUG_OPTIMIZE
01444   fprintf (stderr, "optimize_open: getting initial time\n");
01445 #endif
01446   tz = g_time_zone_new_utc ();
01447   t0 = g_date_time_new_now (tz);
01448
01449   // Obtaining and initing the pseudo-random numbers generator seed
01450 #if DEBUG_OPTIMIZE
01451   fprintf (stderr, "optimize_open: getting initial seed\n");
01452 #endif
01453   if (optimize->seed == DEFAULT_RANDOM_SEED)
01454     optimize->seed = input->seed;
01455   gsl_rng_set (optimize->rng, optimize->seed);
01456
01457   // Replacing the working directory
01458 #if DEBUG_OPTIMIZE
01459   fprintf (stderr, "optimize_open: replacing the working directory\n");
01460 #endif
01461   g_chdir (input->directory);
01462
01463   // Getting results file names
01464   optimize->result = input->result;
01465   optimize->variables = input->variables;
01466
01467   // Obtaining the simulator file
01468   optimize->simulator = input->simulator;
01469
01470   // Obtaining the evaluator file
01471   optimize->evaluator = input->evaluator;
01472
01473   // Reading the algorithm
01474   optimize->algorithm = input->algorithm;
01475   switch (optimize->algorithm)
01476     {
01477     case ALGORITHM_MONTE_CARLO:
01478       optimize_algorithm = optimize_MonteCarlo;
01479       break;
01480     case ALGORITHM_SWEEP:
01481       optimize_algorithm = optimize_sweep;
01482       break;
01483     default:
01484       optimize_algorithm = optimize_genetic;
01485       optimize->mutation_ratio = input->mutation_ratio;
01486       optimize->reproduction_ratio = input->
      reproduction_ratio;
01487       optimize->adaptation_ratio = input->adaptation_ratio;
01488     }
01489   optimize->nvariables = input->nvariables;
01490   optimize->nsimulations = input->nsimulations;
01491   optimize->niterations = input->niterations;
01492   optimize->nbest = input->nbest;
01493   optimize->tolerance = input->tolerance;
01494   optimize->nsteps = input->nsteps;
01495   optimize->nestimates = 0;
01496   optimize->threshold = input->threshold;
01497   optimize->stop = 0;
01498   if (input->nsteps)
01499     {
01500       optimize->relaxation = input->relaxation;
01501       switch (input->direction)
```

```
01502         {
01503         case DIRECTION_METHOD_COORDINATES:
01504           optimize->nestimates = 2 * optimize->nvariables;
01505           optimize_estimate_direction =
      optimize_estimate_direction_coordinates;
01506           break;
01507         default:
01508           optimize->nestimates = input->nestimates;
01509           optimize_estimate_direction =
      optimize_estimate_direction_random;
01510         }
01511     }
01512
01513 #if DEBUG_OPTIMIZE
01514   fprintf (stderr, "optimize_open: nbest=%u\n", optimize->nbest);
01515 #endif
01516   optimize->simulation_best
01517     = (unsigned int *) alloca (optimize->nbest * sizeof (unsigned int));
01518   optimize->error_best = (double *) alloca (optimize->nbest * sizeof (double));
01519
01520   // Reading the experimental data
01521 #if DEBUG_OPTIMIZE
01522   buffer = g_get_current_dir ();
01523   fprintf (stderr, "optimize_open: current directory=%s\n", buffer);
01524   g_free (buffer);
01525 #endif
01526   optimize->nexperiments = input->nexperiments;
01527   optimize->ninputs = input->experiment->ninputs;
01528   optimize->experiment
01529     = (char **) alloca (input->nexperiments * sizeof (char *));
01530   optimize->weight = (double *) alloca (input->nexperiments * sizeof (double));
01531   for (i = 0; i < input->experiment->ninputs; ++i)
01532     optimize->file[i] = (GMappedFile **)
01533       g_malloc (input->nexperiments * sizeof (GMappedFile *));
01534   for (i = 0; i < input->nexperiments; ++i)
01535     {
01536 #if DEBUG_OPTIMIZE
01537       fprintf (stderr, "optimize_open: i=%u\n", i);
01538 #endif
01539       optimize->experiment[i] = input->experiment[i].
      name;
01540       optimize->weight[i] = input->experiment[i].weight;
01541 #if DEBUG_OPTIMIZE
01542       fprintf (stderr, "optimize_open: experiment=%s weight=%lg\n",
01543                optimize->experiment[i], optimize->weight[i]);
01544 #endif
01545       for (j = 0; j < input->experiment->ninputs; ++j)
01546         {
01547 #if DEBUG_OPTIMIZE
01548           fprintf (stderr, "optimize_open: stencil%u\n", j + 1);
01549 #endif
01550           optimize->file[j][i]
01551             = g_mapped_file_new (input->experiment[i].stencil[j], 0, NULL);
01552         }
01553     }
01554
01555   // Reading the variables data
01556 #if DEBUG_OPTIMIZE
01557   fprintf (stderr, "optimize_open: reading variables\n");
01558 #endif
01559   optimize->label = (char **) alloca (input->nvariables * sizeof (char *));
01560   j = input->nvariables * sizeof (double);
01561   optimize->rangemin = (double *) alloca (j);
01562   optimize->rangeminabs = (double *) alloca (j);
01563   optimize->rangemax = (double *) alloca (j);
01564   optimize->rangemaxabs = (double *) alloca (j);
01565   optimize->step = (double *) alloca (j);
01566   j = input->nvariables * sizeof (unsigned int);
01567   optimize->precision = (unsigned int *) alloca (j);
01568   optimize->nsweeps = (unsigned int *) alloca (j);
01569   optimize->nbits = (unsigned int *) alloca (j);
01570   for (i = 0; i < input->nvariables; ++i)
01571     {
01572       optimize->label[i] = input->variable[i].name;
01573       optimize->rangemin[i] = input->variable[i].rangemin;
01574       optimize->rangeminabs[i] = input->variable[i].
      rangeminabs;
01575       optimize->rangemax[i] = input->variable[i].rangemax;
01576       optimize->rangemaxabs[i] = input->variable[i].
      rangemaxabs;
01577       optimize->precision[i] = input->variable[i].
      precision;
01578       optimize->step[i] = input->variable[i].step;
01579       optimize->nsweeps[i] = input->variable[i].nsweeps;
01580       optimize->nbits[i] = input->variable[i].nbits;
01581     }
01582   if (input->algorithm == ALGORITHM_SWEEP)
```

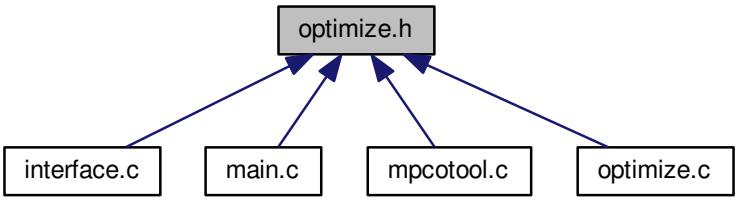
```
01583     {
01584       optimize->nsimulations = 1;
01585       for (i = 0; i < input->nvariables; ++i)
01586         {
01587           if (input->algorithm == ALGORITHM_SWEEP)
01588             {
01589               optimize->nsimulations *= optimize->nsweeps[i];
01590 #if DEBUG_OPTIMIZE
01591               fprintf (stderr, "optimize_open: nsweeps=%u nsimulations=%u\n",
01592                        optimize->nsweeps[i], optimize->nsimulations);
01593 #endif
01594             }
01595         }
01596     }
01597   if (optimize->nsteps)
01598     optimize->direction
01599       = (double *) alloca (optimize->nvariables * sizeof (double));
01600
01601   // Setting error norm
01602   switch (input->norm)
01603     {
01604     case ERROR_NORM_EUCLIDIAN:
01605       optimize_norm = optimize_norm_euclidian;
01606       break;
01607     case ERROR_NORM_MAXIMUM:
01608       optimize_norm = optimize_norm_maximum;
01609       break;
01610     case ERROR_NORM_P:
01611       optimize_norm = optimize_norm_p;
01612       optimize->p = input->p;
01613       break;
01614     default:
01615       optimize_norm = optimize_norm_taxicab;
01616     }
01617
01618   // Allocating values
01619 #if DEBUG_OPTIMIZE
01620   fprintf (stderr, "optimize_open: allocating variables\n");
01621   fprintf (stderr, "optimize_open: nvariables=%u algorithm=%u\n",
01622            optimize->nvariables, optimize->algorithm);
01623 #endif
01624   optimize->genetic_variable = NULL;
01625   if (optimize->algorithm == ALGORITHM_GENETIC)
01626     {
01627       optimize->genetic_variable = (GeneticVariable *)
01628         g_malloc (optimize->nvariables * sizeof (GeneticVariable));
01629       for (i = 0; i < optimize->nvariables; ++i)
01630         {
01631 #if DEBUG_OPTIMIZE
01632           fprintf (stderr, "optimize_open: i=%u min=%lg max=%lg nbits=%u\n",
01633                    i, optimize->rangemin[i], optimize->rangemax[i],
01634                    optimize->nbits[i]);
01635 #endif
01636           optimize->genetic_variable[i].minimum = optimize->
    rangemin[i];
01637           optimize->genetic_variable[i].maximum = optimize->
    rangemax[i];
01638           optimize->genetic_variable[i].nbits = optimize->nbits[i];
01639         }
01640     }
01641 #if DEBUG_OPTIMIZE
01642   fprintf (stderr, "optimize_open: nvariables=%u nsimulations=%u\n",
01643            optimize->nvariables, optimize->nsimulations);
01644 #endif
01645   optimize->value = (double *)
01646     g_malloc ((optimize->nsimulations
01647                + optimize->nestimates * optimize->nsteps)
01648               * optimize->nvariables * sizeof (double));
01649
01650   // Calculating simulations to perform for each task
01651 #if HAVE_MPI
01652 #if DEBUG_OPTIMIZE
01653   fprintf (stderr, "optimize_open: rank=%u ntasks=%u\n",
01654            optimize->mpi_rank, ntasks);
01655 #endif
01656   optimize->nstart = optimize->mpi_rank * optimize->nsimulations /
    ntasks;
01657   optimize->nend = (1 + optimize->mpi_rank) * optimize->nsimulations /
    ntasks;
01658   if (optimize->nsteps)
01659     {
01660       optimize->nstart_direction
01661         = optimize->mpi_rank * optimize->nestimates / ntasks;
01662       optimize->nend_direction
01663         = (1 + optimize->mpi_rank) * optimize->nestimates /
    ntasks;
01664     }
```

```
01665 #else
01666   optimize->nstart = 0;
01667   optimize->nend = optimize->nsimulations;
01668   if (optimize->nsteps)
01669     {
01670       optimize->nstart_direction = 0;
01671       optimize->nend_direction = optimize->nestimates;
01672     }
01673 #endif
01674 #if DEBUG_OPTIMIZE
01675   fprintf (stderr, "optimize_open: nstart=%u nend=%u\n", optimize->nstart,
01676            optimize->nend);
01677 #endif
01678
01679   // Calculating simulations to perform for each thread
01680   optimize->thread
01681     = (unsigned int *) alloca ((1 + nthreads) * sizeof (unsigned int));
01682   for (i = 0; i <= nthreads; ++i)
01683     {
01684       optimize->thread[i] = optimize->nstart
01685         + i * (optimize->nend - optimize->nstart) / nthreads;
01686 #if DEBUG_OPTIMIZE
01687       fprintf (stderr, "optimize_open: i=%u thread=%u\n", i,
01688                optimize->thread[i]);
01689 #endif
01690     }
01691   if (optimize->nsteps)
01692     optimize->thread_direction = (unsigned int *)
01693       alloca ((1 + nthreads_direction) * sizeof (unsigned int));
01694
01695   // Opening result files
01696   optimize->file_result = g_fopen (optimize->result, "w");
01697   optimize->file_variables = g_fopen (optimize->variables, "w");
01698
01699   // Performing the algorithm
01700   switch (optimize->algorithm)
01701     {
01702       // Genetic algorithm
01703     case ALGORITHM_GENETIC:
01704       optimize_genetic ();
01705       break;
01706
01707       // Iterative algorithm
01708     default:
01709       optimize_iterate ();
01710     }
01711
01712   // Getting calculation time
01713   t = g_date_time_new_now (tz);
01714   optimize->calculation_time = 0.000001 * g_date_time_difference (t, t0);
01715   g_date_time_unref (t);
01716   g_date_time_unref (t0);
01717   g_time_zone_unref (tz);
01718   printf ("%s = %.6lg s\n", _("Calculation time"), optimize->calculation_time);
01719   fprintf (optimize->file_result, "%s = %.6lg s\n",
01720            _("Calculation time"), optimize->calculation_time);
01721
01722   // Closing result files
01723   fclose (optimize->file_variables);
01724   fclose (optimize->file_result);
01725
01726 #if DEBUG_OPTIMIZE
01727   fprintf (stderr, "optimize_open: end\n");
01728 #endif
01729 }
```

4.19 optimize.h File Reference

Header file to define the optimization functions.

This graph shows which files directly or indirectly include this file:



Data Structures

- struct Optimize

  Struct to define the optimization ation data.
- struct ParallelData

  Struct to pass to the GThreads parallelized function.

Functions

- void optimize_input (unsigned int simulation, char *input, GMappedFile *stencil)

  Function to write the simulation input file.
- double optimize_parse (unsigned int simulation, unsigned int experiment)

  Function to parse input files, simulating and calculating the \ objective function.
- double optimize_norm_euclidian (unsigned int simulation)

  Function to calculate the Euclidian error norm.
- double optimize_norm_maximum (unsigned int simulation)

  Function to calculate the maximum error norm.
- double optimize_norm_p (unsigned int simulation)

  Function to calculate the P error norm.
- double optimize_norm_taxicab (unsigned int simulation)

  Function to calculate the taxicab error norm.
- void optimize_print ()

  Function to print the results.
- void optimize_save_variables (unsigned int simulation, double error)

  Function to save in a file the variables and the error.
- void optimize_best (unsigned int simulation, double value)

  Function to save the best simulations.
- void optimize_sequential ()

  Function to optimize sequentially.
- void * optimize_thread (ParallelData *data)

  Function to optimize on a thread.
- void optimize_merge (unsigned int nsaveds, unsigned int *simulation_best, double *error_best)

  Function to merge the 2 optimization results.
- void optimize_synchronise ()

  Function to synchronise the optimization results of MPI tasks.

- void optimize_sweep ()

  Function to optimize with the sweep algorithm.
- void optimize_MonteCarlo ()

  Function to optimize with the Monte-Carlo algorithm.
- void optimize_best_direction (unsigned int simulation, double value)

  Function to save the best simulation in a direction search method.
- void optimize_direction_sequential (unsigned int simulation)

  Function to estimate the direction search sequentially.
- void * optimize_direction_thread (ParallelData *data)

  Function to estimate the direction search on a thread.
- double optimize_estimate_direction_random (unsigned int variable, unsigned int estimate)

  Function to estimate a component of the direction search vector.
- double optimize_estimate_direction_coordinates (unsigned int variable, unsigned int estimate)

  Function to estimate a component of the direction search vector.
- void optimize_step_direction (unsigned int simulation)

  Function to do a step of the direction search method.
- void optimize_direction ()

  Function to optimize with a direction search method.
- double optimize_genetic_objective (**Entity** *entity)

  Function to calculate the objective function of an entity.
- void optimize_genetic ()

  Function to optimize with the genetic algorithm.
- void optimize_save_old ()

  Function to save the best results on iterative methods.
- void optimize_merge_old ()

  Function to merge the best results with the previous step best results on iterative methods.
- void optimize_refine ()

  Function to refine the search ranges of the variables in iterative algorithms.
- void optimize_step ()

  Function to do a step of the iterative algorithm.
- void optimize_iterate ()

  Function to iterate the algorithm.
- void optimize_free ()

  Function to free the memory used by the Optimize struct.
- void optimize_open ()

  Function to open and perform a optimization.

Variables

- int **ntasks**
- unsigned int **nthreads**
- unsigned int nthreads_direction

  Number of threads for the direction search method.
- GMutex **mutex** [1]
- void(* optimize_algorithm)()

  Pointer to the function to perform a optimization algorithm step.
- double(* optimize_estimate_direction)(unsigned int variable, unsigned int estimate)

  Pointer to the function to estimate the direction.
- double(* optimize_norm)(unsigned int simulation)

  Pointer to the error norm function.
- Optimize optimize [1]

  Optimization data.

4.19.1 Detailed Description

Header file to define the optimization functions.

Authors

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Copyright

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Definition in file optimize.h.

4.19.2 Function Documentation

4.19.2.1 optimize_best()

```
void optimize_best (
             unsigned int simulation,
             double value )
```

Function to save the best simulations.

Parameters

simulation	Simulation number.
value	Objective function value.

Definition at line 470 of file optimize.c.

```
00471 {
00472   unsigned int i, j;
00473   double e;
00474 #if DEBUG_OPTIMIZE
00475   fprintf (stderr, "optimize_best: start\n");
00476   fprintf (stderr, "optimize_best: nsaveds=%u nbest=%u\n",
00477            optimize->nsaveds, optimize->nbest);
00478 #endif
00479   if (optimize->nsaveds < optimize->nbest
00480       || value < optimize->error_best[optimize->nsaveds - 1])
00481     {
00482       if (optimize->nsaveds < optimize->nbest)
00483         ++optimize->nsaveds;
00484       optimize->error_best[optimize->nsaveds - 1] = value;
00485       optimize->simulation_best[optimize->nsaveds - 1] = simulation;
00486       for (i = optimize->nsaveds; --i;)
00487         {
00488           if (optimize->error_best[i] < optimize->
      error_best[i - 1])
00489             {
00490               j = optimize->simulation_best[i];
00491               e = optimize->error_best[i];
00492               optimize->simulation_best[i] = optimize->
      simulation_best[i - 1];
```

```
00493               optimize->error_best[i] = optimize->
      error_best[i - 1];
00494               optimize->simulation_best[i - 1] = j;
00495               optimize->error_best[i - 1] = e;
00496             }
00497           else
00498             break;
00499         }
00500     }
00501 #if DEBUG_OPTIMIZE
00502   fprintf (stderr, "optimize_best: end\n");
00503 #endif
00504 }
```

4.19.2.2 optimize_best_direction()

```
void optimize_best_direction (
              unsigned int simulation,
              double value )
```

Function to save the best simulation in a direction search method.

Parameters

simulation	Simulation number.
value	Objective function value.

Definition at line 797 of file optimize.c.

```
00798 {
00799 #if DEBUG_OPTIMIZE
00800   fprintf (stderr, "optimize_best_direction: start\n");
00801   fprintf (stderr,
00802            "optimize_best_direction: simulation=%u value=%.14le best=%.14le\n",
00803            simulation, value, optimize->error_best[0]);
00804 #endif
00805   if (value < optimize->error_best[0])
00806     {
00807       optimize->error_best[0] = value;
00808       optimize->simulation_best[0] = simulation;
00809 #if DEBUG_OPTIMIZE
00810       fprintf (stderr,
00811                "optimize_best_direction: BEST simulation=%u value=%.14le\n",
00812                simulation, value);
00813 #endif
00814     }
00815 #if DEBUG_OPTIMIZE
00816   fprintf (stderr, "optimize_best_direction: end\n");
00817 #endif
00818 }
```

4.19.2.3 optimize_direction_sequential()

```
void optimize_direction_sequential (
              unsigned int simulation )
```

Function to estimate the direction search sequentially.

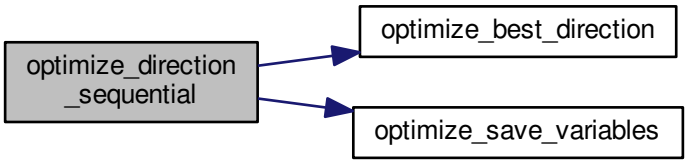
Parameters

simulation	Simulation number.

Definition at line 827 of file optimize.c.

```
00828 {
00829   unsigned int i, j;
00830   double e;
00831 #if DEBUG_OPTIMIZE
00832   fprintf (stderr, "optimize_direction_sequential: start\n");
00833   fprintf (stderr, "optimize_direction_sequential: nstart_direction=%u "
00834            "nend_direction=%u\n",
00835            optimize->nstart_direction, optimize->
      nend_direction);
00836 #endif
00837   for (i = optimize->nstart_direction; i < optimize->nend_direction; ++i)
00838     {
00839       j = simulation + i;
00840       e = optimize_norm (j);
00841       optimize_best_direction (j, e);
00842       optimize_save_variables (j, e);
00843       if (e < optimize->threshold)
00844         {
00845           optimize->stop = 1;
00846           break;
00847         }
00848 #if DEBUG_OPTIMIZE
00849       fprintf (stderr, "optimize_direction_sequential: i=%u e=%lg\n", i, e);
00850 #endif
00851     }
00852 #if DEBUG_OPTIMIZE
00853   fprintf (stderr, "optimize_direction_sequential: end\n");
00854 #endif
00855 }
```

Here is the call graph for this function:



4.19.2.4 optimize_direction_thread()

```
void* optimize_direction_thread (
              ParallelData * data )
```

Function to estimate the direction search on a thread.

Parameters

data	Function data.

Returns

NULL

Definition at line 865 of file optimize.c.

```
00866 {
00867   unsigned int i, thread;
00868   double e;
00869 #if DEBUG_OPTIMIZE
00870   fprintf (stderr, "optimize_direction_thread: start\n");
00871 #endif
00872   thread = data->thread;
00873 #if DEBUG_OPTIMIZE
00874   fprintf (stderr, "optimize_direction_thread: thread=%u start=%u end=%u\n",
00875            thread,
00876            optimize->thread_direction[thread],
00877            optimize->thread_direction[thread + 1]);
00878 #endif
00879   for (i = optimize->thread_direction[thread];
00880        i < optimize->thread_direction[thread + 1]; ++i)
00881     {
00882       e = optimize_norm (i);
00883       g_mutex_lock (mutex);
00884       optimize_best_direction (i, e);
00885       optimize_save_variables (i, e);
00886       if (e < optimize->threshold)
00887         optimize->stop = 1;
00888       g_mutex_unlock (mutex);
00889       if (optimize->stop)
00890         break;
00891 #if DEBUG_OPTIMIZE
00892       fprintf (stderr, "optimize_direction_thread: i=%u e=%lg\n", i, e);
00893 #endif
00894     }
00895 #if DEBUG_OPTIMIZE
00896   fprintf (stderr, "optimize_direction_thread: end\n");
00897 #endif
00898   g_thread_exit (NULL);
00899   return NULL;
00900 }
```

4.19.2.5 optimize_estimate_direction_coordinates()

```
double optimize_estimate_direction_coordinates (
            unsigned int variable,
            unsigned int estimate )
```

Function to estimate a component of the direction search vector.

Parameters

variable	Variable number.
estimate	Estimate number.

Definition at line 939 of file optimize.c.

```
00941 {
00942   double x;
00943 #if DEBUG_OPTIMIZE
00944   fprintf (stderr, "optimize_estimate_direction_coordinates: start\n");
00945 #endif
00946   x = optimize->direction[variable];
00947   if (estimate >= (2 * variable) && estimate < (2 * variable + 2))
00948     {
00949       if (estimate & 1)
00950         x += optimize->step[variable];
00951       else
00952         x -= optimize->step[variable];
00953     }
00954 #if DEBUG_OPTIMIZE
00955   fprintf (stderr,
00956            "optimize_estimate_direction_coordinates: direction%u=%lg\n",
00957            variable, x);
00958   fprintf (stderr, "optimize_estimate_direction_coordinates: end\n");
00959 #endif
00960   return x;
00961 }
```

4.19.2.6 optimize_estimate_direction_random()

```
double optimize_estimate_direction_random (
             unsigned int variable,
             unsigned int estimate )
```

Function to estimate a component of the direction search vector.

Parameters

variable	Variable number.
estimate	Estimate number.

Definition at line 912 of file optimize.c.

```
00914 {
00915   double x;
00916 #if DEBUG_OPTIMIZE
00917   fprintf (stderr, "optimize_estimate_direction_random: start\n");
00918 #endif
00919   x = optimize->direction[variable]
00920     + (1. - 2. * gsl_rng_uniform (optimize->rng)) * optimize->
      step[variable];
00921 #if DEBUG_OPTIMIZE
00922   fprintf (stderr, "optimize_estimate_direction_random: direction%u=%lg\n",
00923            variable, x);
00924   fprintf (stderr, "optimize_estimate_direction_random: end\n");
00925 #endif
00926   return x;
00927 }
```

4.19.2.7 optimize_genetic_objective()

```
double optimize_genetic_objective (
               Entity * entity )
```

Function to calculate the objective function of an entity.

Parameters

entity	entity data.

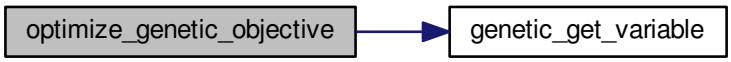
Returns

objective function value.

Definition at line 1106 of file optimize.c.

```
01107 {
01108   unsigned int j;
01109   double objective;
01110   char buffer[64];
01111 #if DEBUG_OPTIMIZE
01112   fprintf (stderr, "optimize_genetic_objective: start\n");
01113 #endif
01114   for (j = 0; j < optimize->nvariables; ++j)
01115     {
01116       optimize->value[entity->id * optimize->nvariables + j]
01117         = genetic_get_variable (entity, optimize->genetic_variable + j);
01118     }
01119   objective = optimize_norm (entity->id);
01120   g_mutex_lock (mutex);
01121   for (j = 0; j < optimize->nvariables; ++j)
01122     {
01123       snprintf (buffer, 64, "%s ", format[optimize->precision[j]]);
01124       fprintf (optimize->file_variables, buffer,
01125                genetic_get_variable (entity, optimize->genetic_variable + j));
01126     }
01127   fprintf (optimize->file_variables, "%.14le\n", objective);
01128   g_mutex_unlock (mutex);
01129 #if DEBUG_OPTIMIZE
01130   fprintf (stderr, "optimize_genetic_objective: end\n");
01131 #endif
01132   return objective;
01133 }
```

Here is the call graph for this function:



4.19.2.8 optimize_input()

```
void optimize_input (
             unsigned int simulation,
             char * input,
             GMappedFile * stencil )
```

Function to write the simulation input file.

Parameters

simulation	Simulation number.
input	Input file name.
stencil	Template of the input file name.

Definition at line 101 of file optimize.c.

```
00102 {
00103   unsigned int i;
00104   char buffer[32], value[32], *buffer2, *buffer3, *content;
00105   FILE *file;
00106   gsize length;
00107   GRegex *regex;
00108
00109 #if DEBUG_OPTIMIZE
00110   fprintf (stderr, "optimize_input: start\n");
00111 #endif
00112
00113   // Checking the file
00114   if (!stencil)
00115     goto optimize_input_end;
00116
00117   // Opening stencil
00118   content = g_mapped_file_get_contents (stencil);
00119   length = g_mapped_file_get_length (stencil);
00120 #if DEBUG_OPTIMIZE
00121   fprintf (stderr, "optimize_input: length=%lu\ncontent:\n%s", length, content);
00122 #endif
00123   file = g_fopen (input, "w");
00124
00125   // Parsing stencil
00126   for (i = 0; i < optimize->nvariables; ++i)
00127     {
00128 #if DEBUG_OPTIMIZE
00129       fprintf (stderr, "optimize_input: variable=%u\n", i);
00130 #endif
00131       snprintf (buffer, 32, "@variable%u@", i + 1);
00132       regex = g_regex_new (buffer, (GRegexCompileFlags) 0, (GRegexMatchFlags) 0,
00133                            NULL);
00134       if (i == 0)
00135         {
00136           buffer2 = g_regex_replace_literal (regex, content, length, 0,
00137                                              optimize->label[i],
00138                                              (GRegexMatchFlags) 0, NULL);
00139 #if DEBUG_OPTIMIZE
00140           fprintf (stderr, "optimize_input: buffer2\n%s", buffer2);
00141 #endif
00142         }
00143       else
00144         {
00145           length = strlen (buffer3);
00146           buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
00147                                              optimize->label[i],
00148                                              (GRegexMatchFlags) 0, NULL);
00149           g_free (buffer3);
00150         }
00151       g_regex_unref (regex);
00152       length = strlen (buffer2);
00153       snprintf (buffer, 32, "@value%u@", i + 1);
00154       regex = g_regex_new (buffer, (GRegexCompileFlags) 0, (GRegexMatchFlags) 0,
00155                            NULL);
00156       snprintf (value, 32, format[optimize->precision[i]],
00157                 optimize->value[simulation * optimize->
      nvariables + i]);
00158
00159 #if DEBUG_OPTIMIZE
00160       fprintf (stderr, "optimize_input: value=%s\n", value);
00161 #endif
00162       buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
00163                                          (GRegexMatchFlags) 0, NULL);
00164       g_free (buffer2);
00165       g_regex_unref (regex);
00166     }
00167
00168   // Saving input file
00169   fwrite (buffer3, strlen (buffer3), sizeof (char), file);
00170   g_free (buffer3);
00171   fclose (file);
00172
```

```
00173 optimize_input_end:
00174 #if DEBUG_OPTIMIZE
00175   fprintf (stderr, "optimize_input: end\n");
00176 #endif
00177   return;
00178 }
```

4.19.2.9 optimize_merge()

```
void optimize_merge (
             unsigned int nsaveds,
             unsigned int * simulation_best,
             double * error_best )
```

Function to merge the 2 optimization results.

Parameters

nsaveds	Number of saved results.
simulation_best	Array of best simulation numbers.
error_best	Array of best objective function values.

Definition at line 593 of file optimize.c.

```
00595 {
00596   unsigned int i, j, k, s[optimize->nbest];
00597   double e[optimize->nbest];
00598 #if DEBUG_OPTIMIZE
00599   fprintf (stderr, "optimize_merge: start\n");
00600 #endif
00601   i = j = k = 0;
00602   do
00603     {
00604       if (i == optimize->nsaveds)
00605         {
00606           s[k] = simulation_best[j];
00607           e[k] = error_best[j];
00608           ++j;
00609           ++k;
00610           if (j == nsaveds)
00611             break;
00612         }
00613       else if (j == nsaveds)
00614         {
00615           s[k] = optimize->simulation_best[i];
00616           e[k] = optimize->error_best[i];
00617           ++i;
00618           ++k;
00619           if (i == optimize->nsaveds)
00620             break;
00621         }
00622       else if (optimize->error_best[i] > error_best[j])
00623         {
00624           s[k] = simulation_best[j];
00625           e[k] = error_best[j];
00626           ++j;
00627           ++k;
00628         }
00629       else
00630         {
00631           s[k] = optimize->simulation_best[i];
00632           e[k] = optimize->error_best[i];
00633           ++i;
00634           ++k;
00635         }
00636     }
00637   while (k < optimize->nbest);
```

```
00638   optimize->nsaveds = k;
00639   memcpy (optimize->simulation_best, s, k * sizeof (unsigned int));
00640   memcpy (optimize->error_best, e, k * sizeof (double));
00641 #if DEBUG_OPTIMIZE
00642   fprintf (stderr, "optimize_merge: end\n");
00643 #endif
00644 }
```

4.19.2.10 optimize_norm_euclidian()

```
double optimize_norm_euclidian (
             unsigned int simulation )
```

Function to calculate the Euclidian error norm.

Parameters

simulation	simulation number.

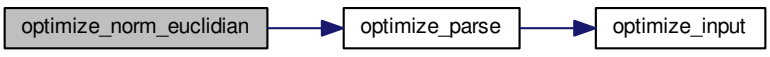
Returns

Euclidian error norm.

Definition at line 302 of file optimize.c.

```
00303 {
00304   double e, ei;
00305   unsigned int i;
00306 #if DEBUG_OPTIMIZE
00307   fprintf (stderr, "optimize_norm_euclidian: start\n");
00308 #endif
00309   e = 0.;
00310   for (i = 0; i < optimize->nexperiments; ++i)
00311     {
00312       ei = optimize_parse (simulation, i);
00313       e += ei * ei;
00314     }
00315   e = sqrt (e);
00316 #if DEBUG_OPTIMIZE
00317   fprintf (stderr, "optimize_norm_euclidian: error=%lg\n", e);
00318   fprintf (stderr, "optimize_norm_euclidian: end\n");
00319 #endif
00320   return e;
00321 }
```

Here is the call graph for this function:



4.19.2.11 optimize_norm_maximum()

```
double optimize_norm_maximum (
            unsigned int simulation )
```

Function to calculate the maximum error norm.

Parameters

simulation	simulation number.

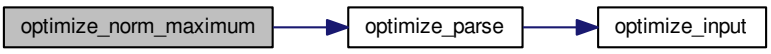
Returns

Maximum error norm.

Definition at line 331 of file optimize.c.

```
00332 {
00333   double e, ei;
00334   unsigned int i;
00335 #if DEBUG_OPTIMIZE
00336   fprintf (stderr, "optimize_norm_maximum: start\n");
00337 #endif
00338   e = 0.;
00339   for (i = 0; i < optimize->nexperiments; ++i)
00340     {
00341       ei = fabs (optimize_parse (simulation, i));
00342       e = fmax (e, ei);
00343     }
00344 #if DEBUG_OPTIMIZE
00345   fprintf (stderr, "optimize_norm_maximum: error=%lg\n", e);
00346   fprintf (stderr, "optimize_norm_maximum: end\n");
00347 #endif
00348   return e;
00349 }
```

Here is the call graph for this function:



4.19.2.12 optimize_norm_p()

```
double optimize_norm_p (
            unsigned int simulation )
```

Function to calculate the P error norm.

Parameters

simulation	simulation number.

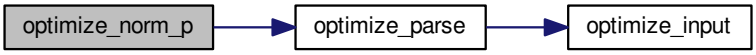
Returns

P error norm.

Definition at line 359 of file optimize.c.

```
00360 {
00361   double e, ei;
00362   unsigned int i;
00363 #if DEBUG_OPTIMIZE
00364   fprintf (stderr, "optimize_norm_p: start\n");
00365 #endif
00366   e = 0.;
00367   for (i = 0; i < optimize->nexperiments; ++i)
00368     {
00369       ei = fabs (optimize_parse (simulation, i));
00370       e += pow (ei, optimize->p);
00371     }
00372   e = pow (e, 1. / optimize->p);
00373 #if DEBUG_OPTIMIZE
00374   fprintf (stderr, "optimize_norm_p: error=%lg\n", e);
00375   fprintf (stderr, "optimize_norm_p: end\n");
00376 #endif
00377   return e;
00378 }
```

Here is the call graph for this function:



4.19.2.13 optimize_norm_taxicab()

```
double optimize_norm_taxicab (
             unsigned int simulation )
```

Function to calculate the taxicab error norm.

Parameters

simulation	simulation number.

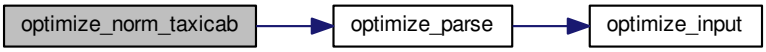
Returns

Taxicab error norm.

Definition at line 388 of file optimize.c.

```
00389 {
00390   double e;
00391   unsigned int i;
00392 #if DEBUG_OPTIMIZE
00393   fprintf (stderr, "optimize_norm_taxicab: start\n");
00394 #endif
00395   e = 0.;
00396   for (i = 0; i < optimize->nexperiments; ++i)
00397     e += fabs (optimize_parse (simulation, i));
00398 #if DEBUG_OPTIMIZE
00399   fprintf (stderr, "optimize_norm_taxicab: error=%lg\n", e);
00400   fprintf (stderr, "optimize_norm_taxicab: end\n");
00401 #endif
00402   return e;
00403 }
```

Here is the call graph for this function:



4.19.2.14 optimize_parse()

```
double optimize_parse (
              unsigned int simulation,
              unsigned int experiment )
```

Function to parse input files, simulating and calculating the \ objective function.

Parameters

simulation	Simulation number.
experiment	Experiment number.

Returns

Objective function value.

Definition at line 191 of file optimize.c.

```
00192 {
00193   unsigned int i;
00194   double e;
```

```
00195   char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
00196     *buffer3, *buffer4;
00197   FILE *file_result;
00198
00199 #if DEBUG_OPTIMIZE
00200   fprintf (stderr, "optimize_parse: start\n");
00201   fprintf (stderr, "optimize_parse: simulation=%u experiment=%u\n",
00202            simulation, experiment);
00203 #endif
00204
00205   // Opening input files
00206   for (i = 0; i < optimize->ninputs; ++i)
00207     {
00208       snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
00209 #if DEBUG_OPTIMIZE
00210       fprintf (stderr, "optimize_parse: i=%u input=%s\n", i, &input[i][0]);
00211 #endif
00212       optimize_input (simulation, &input[i][0], optimize->
      file[i][experiment]);
00213     }
00214   for (; i < MAX_NINPUTS; ++i)
00215     strcpy (&input[i][0], "");
00216 #if DEBUG_OPTIMIZE
00217   fprintf (stderr, "optimize_parse: parsing end\n");
00218 #endif
00219
00220   // Performing the simulation
00221   snprintf (output, 32, "output-%u-%u", simulation, experiment);
00222   buffer2 = g_path_get_dirname (optimize->simulator);
00223   buffer3 = g_path_get_basename (optimize->simulator);
00224   buffer4 = g_build_filename (buffer2, buffer3, NULL);
00225   snprintf (buffer, 512, "\"%s\" %s %s %s %s %s %s %s %s %s",
00226             buffer4, input[0], input[1], input[2], input[3], input[4],
00227             input[5], input[6], input[7], output);
00228   g_free (buffer4);
00229   g_free (buffer3);
00230   g_free (buffer2);
00231 #if DEBUG_OPTIMIZE
00232   fprintf (stderr, "optimize_parse: %s\n", buffer);
00233 #endif
00234   system (buffer);
00235
00236   // Checking the objective value function
00237   if (optimize->evaluator)
00238     {
00239       snprintf (result, 32, "result-%u-%u", simulation, experiment);
00240       buffer2 = g_path_get_dirname (optimize->evaluator);
00241       buffer3 = g_path_get_basename (optimize->evaluator);
00242       buffer4 = g_build_filename (buffer2, buffer3, NULL);
00243       snprintf (buffer, 512, "\"%s\" %s %s %s",
00244                 buffer4, output, optimize->experiment[experiment], result);
00245       g_free (buffer4);
00246       g_free (buffer3);
00247       g_free (buffer2);
00248 #if DEBUG_OPTIMIZE
00249       fprintf (stderr, "optimize_parse: %s\n", buffer);
00250       fprintf (stderr, "optimize_parse: result=%s\n", result);
00251 #endif
00252       system (buffer);
00253       file_result = g_fopen (result, "r");
00254       e = atof (fgets (buffer, 512, file_result));
00255       fclose (file_result);
00256     }
00257   else
00258     {
00259 #if DEBUG_OPTIMIZE
00260       fprintf (stderr, "optimize_parse: output=%s\n", output);
00261 #endif
00262       strcpy (result, "");
00263       file_result = g_fopen (output, "r");
00264       e = atof (fgets (buffer, 512, file_result));
00265       fclose (file_result);
00266     }
00267
00268   // Removing files
00269 #if !DEBUG_OPTIMIZE
00270   for (i = 0; i < optimize->ninputs; ++i)
00271     {
00272       if (optimize->file[i][0])
00273         {
00274           snprintf (buffer, 512, RM " %s", &input[i][0]);
00275           system (buffer);
00276         }
00277     }
00278   snprintf (buffer, 512, RM " %s %s", output, result);
00279   system (buffer);
00280 #endif
```

```
00281
00282   // Processing pending events
00283   if (show_pending)
00284     show_pending ();
00285
00286 #if DEBUG_OPTIMIZE
00287   fprintf (stderr, "optimize_parse: end\n");
00288 #endif
00289
00290   // Returning the objective function
00291   return e * optimize->weight[experiment];
00292 }
```

Here is the call graph for this function:

4.19.2.15 optimize_save_variables()

```
void optimize_save_variables (
              unsigned int simulation,
              double error )
```

Function to save in a file the variables and the error.

Parameters

simulation	Simulation number.
error	Error value.

Definition at line 441 of file optimize.c.

```
00442 {
00443   unsigned int i;
00444   char buffer[64];
00445 #if DEBUG_OPTIMIZE
00446   fprintf (stderr, "optimize_save_variables: start\n");
00447 #endif
00448   for (i = 0; i < optimize->nvariables; ++i)
00449     {
00450       snprintf (buffer, 64, "%s ", format[optimize->precision[i]]);
00451       fprintf (optimize->file_variables, buffer,
00452                optimize->value[simulation * optimize->
      nvariables + i]);
00453     }
00454   fprintf (optimize->file_variables, "%.14le\n", error);
00455   fflush (optimize->file_variables);
00456 #if DEBUG_OPTIMIZE
00457   fprintf (stderr, "optimize_save_variables: end\n");
00458 #endif
00459 }
```

4.19.2.16 optimize_step_direction()

```
void optimize_step_direction (
             unsigned int simulation )
```

Function to do a step of the direction search method.

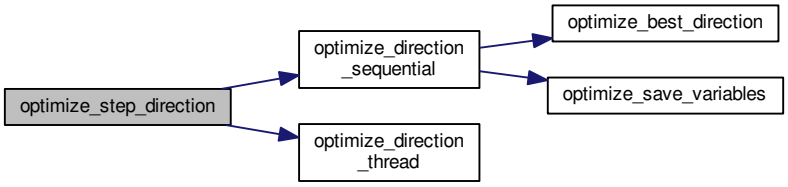
Parameters

simulation	Simulation number.

Definition at line 970 of file optimize.c.

```
00971 {
00972   GThread *thread[nthreads_direction];
00973   ParallelData data[nthreads_direction];
00974   unsigned int i, j, k, b;
00975 #if DEBUG_OPTIMIZE
00976   fprintf (stderr, "optimize_step_direction: start\n");
00977 #endif
00978   for (i = 0; i < optimize->nestimates; ++i)
00979     {
00980       k = (simulation + i) * optimize->nvariables;
00981       b = optimize->simulation_best[0] * optimize->
      nvariables;
00982 #if DEBUG_OPTIMIZE
00983       fprintf (stderr, "optimize_step_direction: simulation=%u best=%u\n",
00984                simulation + i, optimize->simulation_best[0]);
00985 #endif
00986       for (j = 0; j < optimize->nvariables; ++j, ++k, ++b)
00987         {
00988 #if DEBUG_OPTIMIZE
00989           fprintf (stderr,
00990                    "optimize_step_direction: estimate=%u best%u=%.14le\n",
00991                    i, j, optimize->value[b]);
00992 #endif
00993           optimize->value[k]
00994             = optimize->value[b] + optimize_estimate_direction (j,
      i);
00995           optimize->value[k] = fmin (fmax (optimize->value[k],
00996                                            optimize->rangeminabs[j]),
00997                                      optimize->rangemaxabs[j]);
00998 #if DEBUG_OPTIMIZE
00999           fprintf (stderr,
01000                    "optimize_step_direction: estimate=%u variable%u=%.14le\n",
01001                    i, j, optimize->value[k]);
01002 #endif
01003         }
01004     }
01005   if (nthreads_direction == 1)
01006     optimize_direction_sequential (simulation);
01007   else
01008     {
01009       for (i = 0; i <= nthreads_direction; ++i)
01010         {
01011           optimize->thread_direction[i]
01012             = simulation + optimize->nstart_direction
01013             + i * (optimize->nend_direction - optimize->
      nstart_direction)
01014               / nthreads_direction;
01015 #if DEBUG_OPTIMIZE
01016           fprintf (stderr,
01017                    "optimize_step_direction: i=%u thread_direction=%u\n",
01018                    i, optimize->thread_direction[i]);
01019 #endif
01020         }
01021       for (i = 0; i < nthreads_direction; ++i)
01022         {
01023           data[i].thread = i;
01024           thread[i] = g_thread_new
01025             (NULL, (GThreadFunc) optimize_direction_thread, &data[i]);
01026         }
01027       for (i = 0; i < nthreads_direction; ++i)
01028         g_thread_join (thread[i]);
01029     }
01030 #if DEBUG_OPTIMIZE
01031   fprintf (stderr, "optimize_step_direction: end\n");
01032 #endif
01033 }
```

Here is the call graph for this function:



4.19.2.17 optimize_thread()

```
void* optimize_thread (
            ParallelData * data )
```

Function to optimize on a thread.

Parameters

data	Function data.

Returns

NULL

Definition at line 547 of file optimize.c.

```
00548 {
00549   unsigned int i, thread;
00550   double e;
00551 #if DEBUG_OPTIMIZE
00552   fprintf (stderr, "optimize_thread: start\n");
00553 #endif
00554   thread = data->thread;
00555 #if DEBUG_OPTIMIZE
00556   fprintf (stderr, "optimize_thread: thread=%u start=%u end=%u\n", thread,
00557            optimize->thread[thread], optimize->thread[thread + 1]);
00558 #endif
00559   for (i = optimize->thread[thread]; i < optimize->thread[thread + 1]; ++i)
00560     {
00561       e = optimize_norm (i);
00562       g_mutex_lock (mutex);
00563       optimize_best (i, e);
00564       optimize_save_variables (i, e);
00565       if (e < optimize->threshold)
00566         optimize->stop = 1;
00567       g_mutex_unlock (mutex);
00568       if (optimize->stop)
00569         break;
00570 #if DEBUG_OPTIMIZE
00571       fprintf (stderr, "optimize_thread: i=%u e=%lg\n", i, e);
00572 #endif
00573     }
00574 #if DEBUG_OPTIMIZE
00575   fprintf (stderr, "optimize_thread: end\n");
00576 #endif
00577   g_thread_exit (NULL);
00578   return NULL;
00579 }
```

4.20 optimize.h

```
00001 /*
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
00007
00008 Copyright 2012-2017, AUTHORS.
00009
00010 Redistribution and use in source and binary forms, with or without modification,
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00012
00013   1. Redistributions of source code must retain the above copyright notice,
00014     this list of conditions and the following disclaimer.
00015
00016   2. Redistributions in binary form must reproduce the above copyright notice,
00017     this list of conditions and the following disclaimer in the
00018     documentation and/or other materials provided with the distribution.
00019
00020 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00021 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00022 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00023 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00024 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00025 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00026 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #ifndef OPTIMIZE__H
00039 #define OPTIMIZE__H 1
00040
00045 typedef struct
00046 {
00047   GMappedFile **file[MAX_NINPUTS];
00048   char **experiment;
00049   char **label;
00050   gsl_rng *rng;
00051   GeneticVariable *genetic_variable;
00053   FILE *file_result;
00054   FILE *file_variables;
00055   char *result;
00056   char *variables;
00057   char *simulator;
00058   char *evaluator;
00060   double *value;
00061   double *rangemin;
00062   double *rangemax;
00063   double *rangeminabs;
00064   double *rangemaxabs;
00065   double *error_best;
00066   double *weight;
00067   double *step;
00069   double *direction;
00070   double *value_old;
00072   double *error_old;
00074   unsigned int *precision;
00075   unsigned int *nsweeps;
00076   unsigned int *nbits;
00078   unsigned int *thread;
00080   unsigned int *thread_direction;
00083   unsigned int *simulation_best;
00084   double tolerance;
00085   double mutation_ratio;
00086   double reproduction_ratio;
00087   double adaptation_ratio;
00088   double relaxation;
00089   double calculation_time;
00090   double p;
00091   double threshold;
00092   unsigned long int seed;
00094   unsigned int nvariables;
00095   unsigned int nexperiments;
00096   unsigned int ninputs;
00097   unsigned int nsimulations;
00098   unsigned int nsteps;
00100   unsigned int nestimates;
00102   unsigned int algorithm;
00103   unsigned int nstart;
00104   unsigned int nend;
00105   unsigned int nstart_direction;
00107   unsigned int nend_direction;
```

```
00109   unsigned int niterations;
00110   unsigned int nbest;
00111   unsigned int nsaveds;
00112   unsigned int stop;
00113 #if HAVE_MPI
00114   int mpi_rank;
00115 #endif
00116 } Optimize;
00117
00122 typedef struct
00123 {
00124   unsigned int thread;
00125 } ParallelData;
00126
00127 // Global variables
00128 extern int ntasks;
00129 extern unsigned int nthreads;
00130 extern unsigned int nthreads_direction;
00131 extern GMutex mutex[1];
00132 extern void (*optimize_algorithm) ();
00133 extern double (*optimize_estimate_direction) (unsigned int variable,
00134                                               unsigned int estimate);
00135 extern double (*optimize_norm) (unsigned int simulation);
00136 extern Optimize optimize[1];
00137
00138 // Public functions
00139 void optimize_input (unsigned int simulation, char *input,
00140                      GMappedFile * stencil);
00141 double optimize_parse (unsigned int simulation, unsigned int experiment);
00142 double optimize_norm_euclidian (unsigned int simulation);
00143 double optimize_norm_maximum (unsigned int simulation);
00144 double optimize_norm_p (unsigned int simulation);
00145 double optimize_norm_taxicab (unsigned int simulation);
00146 void optimize_print ();
00147 void optimize_save_variables (unsigned int simulation, double error);
00148 void optimize_best (unsigned int simulation, double value);
00149 void optimize_sequential ();
00150 void *optimize_thread (ParallelData * data);
00151 void optimize_merge (unsigned int nsaveds, unsigned int *simulation_best,
00152                      double *error_best);
00153 #if HAVE_MPI
00154 void optimize_synchronise ();
00155 #endif
00156 void optimize_sweep ();
00157 void optimize_MonteCarlo ();
00158 void optimize_best_direction (unsigned int simulation, double value);
00159 void optimize_direction_sequential (unsigned int simulation);
00160 void *optimize_direction_thread (ParallelData * data);
00161 double optimize_estimate_direction_random (unsigned int variable,
00162                                            unsigned int estimate);
00163 double optimize_estimate_direction_coordinates (unsigned int
      variable,
00164                                                 unsigned int estimate);
00165 void optimize_step_direction (unsigned int simulation);
00166 void optimize_direction ();
00167 double optimize_genetic_objective (Entity * entity);
00168 void optimize_genetic ();
00169 void optimize_save_old ();
00170 void optimize_merge_old ();
00171 void optimize_refine ();
00172 void optimize_step ();
00173 void optimize_iterate ();
00174 void optimize_free ();
00175 void optimize_open ();
00176
00177 #endif
```

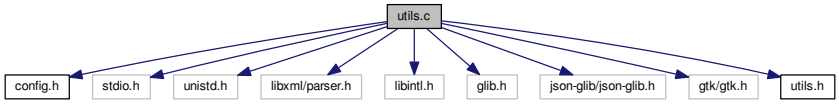
4.21 utils.c File Reference

Source file to define some useful functions.

```
#include "config.h"
#include <stdio.h>
#include <unistd.h>
#include <libxml/parser.h>
#include <libintl.h>
#include <glib.h>
```

```
#include <json-glib/json-glib.h>
#include <gtk/gtk.h>
#include "utils.h"
```

Include dependency graph for utils.c:



Functions

- void show_message (char *title, char *msg, int type)

  Function to show a dialog with a message.
- void show_error (char *msg)

  Function to show a dialog with an error message.
- int xml_node_get_int (xmlNode *node, const xmlChar *prop, int *error_code)

  Function to get an integer number of a XML node property.
- unsigned int xml_node_get_uint (xmlNode *node, const xmlChar *prop, int *error_code)

  Function to get an unsigned integer number of a XML node property.
- unsigned int xml_node_get_uint_with_default (xmlNode *node, const xmlChar *prop, unsigned int default_value, int *error_code)

  Function to get an unsigned integer number of a XML node property with a default value.
- double xml_node_get_float (xmlNode *node, const xmlChar *prop, int *error_code)

  Function to get a floating point number of a XML node property.
- double xml_node_get_float_with_default (xmlNode *node, const xmlChar *prop, double default_value, int *error_code)

  Function to get a floating point number of a XML node property with a default value.
- void xml_node_set_int (xmlNode *node, const xmlChar *prop, int value)

  Function to set an integer number in a XML node property.
- void xml_node_set_uint (xmlNode *node, const xmlChar *prop, unsigned int value)

  Function to set an unsigned integer number in a XML node property.
- void xml_node_set_float (xmlNode *node, const xmlChar *prop, double value)

  Function to set a floating point number in a XML node property.
- int json_object_get_int (JsonObject *object, const char *prop, int *error_code)

  Function to get an integer number of a JSON object property.
- unsigned int json_object_get_uint (JsonObject *object, const char *prop, int *error_code)

  Function to get an unsigned integer number of a JSON object property.
- unsigned int json_object_get_uint_with_default (JsonObject *object, const char *prop, unsigned int default_value, int *error_code)

  Function to get an unsigned integer number of a JSON object property with a default value.
- double json_object_get_float (JsonObject *object, const char *prop, int *error_code)

  Function to get a floating point number of a JSON object property.
- double json_object_get_float_with_default (JsonObject *object, const char *prop, double default_value, int *error_code)

  Function to get a floating point number of a JSON object property with a default value.
- void json_object_set_int (JsonObject *object, const char *prop, int value)

  Function to set an integer number in a JSON object property.
- void json_object_set_uint (JsonObject *object, const char *prop, unsigned int value)

Function to set an unsigned integer number in a JSON object property.

- void json_object_set_float (JsonObject *object, const char *prop, double value)

  Function to set a floating point number in a JSON object property.
- int cores_number ()

  Function to obtain the cores number.
- void process_pending ()

  Function to process events on long computation.
- unsigned int gtk_array_get_active (GtkRadioButton *array[ ], unsigned int n)

  Function to get the active GtkRadioButton.

Variables

- GtkWindow * main_window

  Main GtkWindow.
- char * error_message

  Error message.
- void(* show_pending)() = NULL

  Pointer to the function to show pending events.

4.21.1 Detailed Description

Source file to define some useful functions.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file utils.c.

4.21.2 Function Documentation

4.21.2.1 cores_number()

```
int cores_number ( )
```

Function to obtain the cores number.

Returns

Cores number.

Definition at line 531 of file utils.c.

```
00532 {
00533 #ifdef G_OS_WIN32
00534   SYSTEM_INFO sysinfo;
00535   GetSystemInfo (&sysinfo);
00536   return sysinfo.dwNumberOfProcessors;
00537 #else
00538   return (int) sysconf (_SC_NPROCESSORS_ONLN);
00539 #endif
00540 }
```

4.21.2.2 gtk_array_get_active()

```
unsigned int gtk_array_get_active (
            GtkRadioButton * array[],
            unsigned int n )
```

Function to get the active GtkRadioButton.

Parameters

array	Array of GtkRadioButtons.
n	Number of GtkRadioButtons.

Returns

Active GtkRadioButton.

Definition at line 566 of file utils.c.

```
00567 {
00568   unsigned int i;
00569   for (i = 0; i < n; ++i)
00570     if (gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (array[i])))
00571       break;
00572   return i;
00573 }
```

4.21.2.3 json_object_get_float()

```
double json_object_get_float (
            JsonObject * object,
            const char * prop,
            int * error_code )
```

Function to get a floating point number of a JSON object property.

Parameters

object	JSON object.
prop	JSON property.
error_code	Error code.

Returns

Floating point number value.

Definition at line 421 of file utils.c.

```
00422 {
```

```
00423   const char *buffer;
00424   double x = 0.;
00425   buffer = json_object_get_string_member (object, prop);
00426   if (!buffer)
00427     *error_code = 1;
00428   else
00429     {
00430       if (sscanf (buffer, "%lf", &x) != 1)
00431         *error_code = 2;
00432       else
00433         *error_code = 0;
00434     }
00435   return x;
00436 }
```

4.21.2.4 json_object_get_float_with_default()

```
double json_object_get_float_with_default (
              JsonObject * object,
              const char * prop,
              double default_value,
              int * error_code )
```

Function to get a floating point number of a JSON object property with a default value.

Parameters

object	JSON object.
prop	JSON property.
default_value	default value.
error_code	Error code.

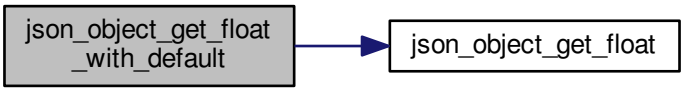
Returns

Floating point number value.

Definition at line 454 of file utils.c.

```
00456 {
00457   double x;
00458   if (json_object_get_member (object, prop))
00459     x = json_object_get_float (object, prop, error_code);
00460   else
00461     {
00462       x = default_value;
00463       *error_code = 0;
00464     }
00465   return x;
00466 }
```

Here is the call graph for this function:



4.21.2.5 json_object_get_int()

```
int json_object_get_int (
            JsonObject * object,
            const char * prop,
            int * error_code )
```

Function to get an integer number of a JSON object property.

Parameters

object	JSON object.
prop	JSON property.
error_code	Error code.

Returns

Integer number value.

Definition at line 331 of file utils.c.

```
00332 {
00333   const char *buffer;
00334   int i = 0;
00335   buffer = json_object_get_string_member (object, prop);
00336   if (!buffer)
00337     *error_code = 1;
00338   else
00339     {
00340       if (sscanf (buffer, "%d", &i) != 1)
00341         *error_code = 2;
00342       else
00343         *error_code = 0;
00344     }
00345   return i;
00346 }
```

4.21.2.6 json_object_get_uint()

```
int json_object_get_uint (
              JsonObject * object,
              const char * prop,
              int * error_code )
```

Function to get an unsigned integer number of a JSON object property.

Parameters

object	JSON object.
prop	JSON property.
error_code	Error code.

Returns

Unsigned integer number value.

Definition at line 361 of file utils.c.

```
00362 {
00363   const char *buffer;
00364   unsigned int i = 0;
00365   buffer = json_object_get_string_member (object, prop);
00366   if (!buffer)
00367     *error_code = 1;
00368   else
00369     {
00370       if (sscanf (buffer, "%u", &i) != 1)
00371         *error_code = 2;
00372       else
00373         *error_code = 0;
00374     }
00375   return i;
00376 }
```

4.21.2.7 json_object_get_uint_with_default()

```
int json_object_get_uint_with_default (
              JsonObject * object,
              const char * prop,
              unsigned int default_value,
              int * error_code )
```

Function to get an unsigned integer number of a JSON object property with a default value.

Parameters

object	JSON object.
prop	JSON property.
default_value	default value.
error_code	Error code.

Returns

Unsigned integer number value.

Definition at line 394 of file utils.c.

```
00396 {
00397   unsigned int i;
00398   if (json_object_get_member (object, prop))
00399     i = json_object_get_uint (object, prop, error_code);
00400   else
00401     {
00402       i = default_value;
00403       *error_code = 0;
00404     }
00405   return i;
00406 }
```

Here is the call graph for this function:

4.21.2.8 json_object_set_float()

```
void json_object_set_float (
             JsonObject * object,
             const char * prop,
             double value )
```

Function to set a floating point number in a JSON object property.

Parameters

object	JSON object.
prop	JSON property.
value	Floating point number value.

Definition at line 518 of file utils.c.

```
00519 {
00520   char buffer[64];
00521   snprintf (buffer, 64, "%.14lg", value);
00522   json_object_set_string_member (object, prop, buffer);
00523 }
```

4.21.2.9 json_object_set_int()

```
void json_object_set_int (
            JsonObject * object,
            const char * prop,
            int value )
```

Function to set an integer number in a JSON object property.

Parameters

object	JSON object.
prop	JSON property.
value	Integer number value.

Definition at line 480 of file utils.c.

```
00481 {
00482   char buffer[64];
00483   snprintf (buffer, 64, "%d", value);
00484   json_object_set_string_member (object, prop, buffer);
00485 }
```

4.21.2.10 json_object_set_uint()

```
void json_object_set_uint (
            JsonObject * object,
            const char * prop,
            unsigned int value )
```

Function to set an unsigned integer number in a JSON object property.

Parameters

object	JSON object.
prop	JSON property.
value	Unsigned integer number value.

Definition at line 499 of file utils.c.

```
00500 {
00501   char buffer[64];
00502   snprintf (buffer, 64, "%u", value);
00503   json_object_set_string_member (object, prop, buffer);
00504 }
```

4.21.2.11 show_error()

```
void show_error (
             char * msg )
```

Function to show a dialog with an error message.

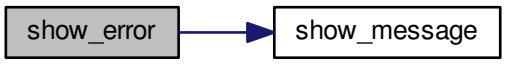
Parameters

msg	Error message.

Definition at line 104 of file utils.c.

```
00105 {
00106   show_message (_("ERROR!"), msg, ERROR_TYPE);
00107 }
```

Here is the call graph for this function:



4.21.2.12 show_message()

```
void show_message (
             char * title,
             char * msg,
             int type )
```

Function to show a dialog with a message.

Parameters

title	Title.
msg	Message.
type	Message type.

Definition at line 73 of file utils.c.

```
00074 {
00075 #if HAVE_GTK
```

```
00076   GtkMessageDialog *dlg;
00077
00078   // Creating the dialog
00079   dlg = (GtkMessageDialog *)
00080     gtk_message_dialog_new (main_window, GTK_DIALOG_MODAL,
00081                             (GtkMessageType) type, GTK_BUTTONS_OK, "%s", msg);
00082
00083   // Setting the dialog title
00084   gtk_window_set_title (GTK_WINDOW (dlg), title);
00085
00086   // Showing the dialog and waiting response
00087   gtk_dialog_run (GTK_DIALOG (dlg));
00088
00089   // Closing and freeing memory
00090   gtk_widget_destroy (GTK_WIDGET (dlg));
00091
00092 #else
00093   printf ("%s: %s\n", title, msg);
00094 #endif
00095 }
```

4.21.2.13 xml_node_get_float()

```
double xml_node_get_float (
            xmlNode * node,
            const xmlChar * prop,
            int * error_code )
```

Function to get a floating point number of a XML node property.

Parameters

node	XML node.
prop	XML property.
error_code	Error code.

Returns

Floating point number value.

Definition at line 214 of file utils.c.

```
00215 {
00216   double x = 0.;
00217   xmlChar *buffer;
00218   buffer = xmlGetProp (node, prop);
00219   if (!buffer)
00220     *error_code = 1;
00221   else
00222     {
00223       if (sscanf ((char *) buffer, "%lf", &x) != 1)
00224         *error_code = 2;
00225       else
00226         *error_code = 0;
00227       xmlFree (buffer);
00228     }
00229   return x;
00230 }
```

4.21.2.14 xml_node_get_float_with_default()

```
double xml_node_get_float_with_default (
            xmlNode * node,
            const xmlChar * prop,
            double default_value,
            int * error_code )
```

Function to get a floating point number of a XML node property with a default value.

Parameters

node	XML node.
prop	XML property.
default_value	default value.
error_code	Error code.

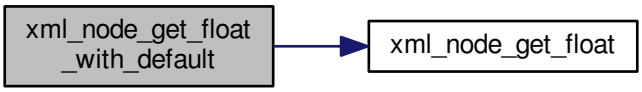
Returns

Floating point number value.

Definition at line 248 of file utils.c.

```
00250 {
00251   double x;
00252   if (xmlHasProp (node, prop))
00253     x = xml_node_get_float (node, prop, error_code);
00254   else
00255     {
00256       x = default_value;
00257       *error_code = 0;
00258     }
00259   return x;
00260 }
```

Here is the call graph for this function:



4.21.2.15 xml_node_get_int()

```
int xml_node_get_int (
            xmlNode * node,
            const xmlChar * prop,
            int * error_code )
```

Function to get an integer number of a XML node property.

Parameters

node	XML node.
prop	XML property.
error_code	Error code.

Returns

Integer number value.

Definition at line 122 of file utils.c.

```
00123 {
00124   int i = 0;
00125   xmlChar *buffer;
00126   buffer = xmlGetProp (node, prop);
00127   if (!buffer)
00128     *error_code = 1;
00129   else
00130     {
00131       if (sscanf ((char *) buffer, "%d", &i) != 1)
00132         *error_code = 2;
00133       else
00134         *error_code = 0;
00135       xmlFree (buffer);
00136     }
00137   return i;
00138 }
```

4.21.2.16 xml_node_get_uint()

```
int xml_node_get_uint (
              xmlNode * node,
              const xmlChar * prop,
              int * error_code )
```

Function to get an unsigned integer number of a XML node property.

Parameters

node	XML node.
prop	XML property.
error_code	Error code.

Returns

Unsigned integer number value.

Definition at line 153 of file utils.c.

```
00154 {
00155   unsigned int i = 0;
00156   xmlChar *buffer;
00157   buffer = xmlGetProp (node, prop);
```

```
00158   if (!buffer)
00159     *error_code = 1;
00160   else
00161     {
00162       if (sscanf ((char *) buffer, "%u", &i) != 1)
00163         *error_code = 2;
00164       else
00165         *error_code = 0;
00166       xmlFree (buffer);
00167     }
00168   return i;
00169 }
```

4.21.2.17 xml_node_get_uint_with_default()

```
int xml_node_get_uint_with_default (
             xmlNode * node,
             const xmlChar * prop,
             unsigned int default_value,
             int * error_code )
```

Function to get an unsigned integer number of a XML node property with a default value.

Parameters

node	XML node.
prop	XML property.
default_value	default value.
error_code	Error code.

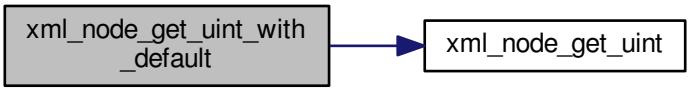
Returns

Unsigned integer number value.

Definition at line 187 of file utils.c.

```
00189 {
00190   unsigned int i;
00191   if (xmlHasProp (node, prop))
00192     i = xml_node_get_uint (node, prop, error_code);
00193   else
00194     {
00195       i = default_value;
00196       *error_code = 0;
00197     }
00198   return i;
00199 }
```

Here is the call graph for this function:



4.21.2.18 xml_node_set_float()

```
void xml_node_set_float (
             xmlNode * node,
             const xmlChar * prop,
             double value )
```

Function to set a floating point number in a XML node property.

Parameters

node	XML node.
prop	XML property.
value	Floating point number value.

Definition at line 311 of file utils.c.

```
00312 {
00313   xmlChar buffer[64];
00314   snprintf ((char *) buffer, 64, "%.14lg", value);
00315   xmlSetProp (node, prop, buffer);
00316 }
```

4.21.2.19 xml_node_set_int()

```
void xml_node_set_int (
             xmlNode * node,
             const xmlChar * prop,
             int value )
```

Function to set an integer number in a XML node property.

Parameters

node	XML node.
prop	XML property.
value	Integer number value.

Definition at line 273 of file utils.c.

```
00274 {
00275   xmlChar buffer[64];
00276   snprintf ((char *) buffer, 64, "%d", value);
00277   xmlSetProp (node, prop, buffer);
00278 }
```

4.21.2.20 xml_node_set_uint()

```
void xml_node_set_uint (
              xmlNode * node,
              const xmlChar * prop,
              unsigned int value )
```

Function to set an unsigned integer number in a XML node property.

Parameters

node	XML node.
prop	XML property.
value	Unsigned integer number value.

Definition at line 292 of file utils.c.

```
00293 {
00294   xmlChar buffer[64];
00295   snprintf ((char *) buffer, 64, "%u", value);
00296   xmlSetProp (node, prop, buffer);
00297 }
```

4.22 utils.c

```
00001 /*
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
00007
00008 Copyright 2012-2017, AUTHORS.
00009
00010 Redistribution and use in source and binary forms, with or without modification,
00011 are permitted provided that the following conditions are met:
00012
00013     1. Redistributions of source code must retain the above copyright notice,
00014        this list of conditions and the following disclaimer.
00015
00016     2. Redistributions in binary form must reproduce the above copyright notice,
00017        this list of conditions and the following disclaimer in the
00018        documentation and/or other materials provided with the distribution.
00019
00020 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00021 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00022 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00023 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00024 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00025 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00026 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #define _GNU_SOURCE
00039 #include "config.h"
00040 #include <stdio.h>
00041 #include <unistd.h>
00042 #include <libxml/parser.h>
00043 #include <libintl.h>
00044 #include <glib.h>
00045 #include <json-glib/json-glib.h>
00046 #ifdef G_OS_WIN32
00047 #include <windows.h>
00048 #endif
00049 #if HAVE_GTK
00050 #include <gtk/gtk.h>
```

```
00051 #endif
00052 #include "utils.h"
00053
00054 #if HAVE_GTK
00055 GtkWindow *main_window;
00056 #endif
00057
00058 char *error_message;
00059 void (*show_pending) () = NULL;
00061
00072 void
00073 show_message (char *title, char *msg, int type)
00074 {
00075 #if HAVE_GTK
00076   GtkMessageDialog *dlg;
00077
00078   // Creating the dialog
00079   dlg = (GtkMessageDialog *)
00080     gtk_message_dialog_new (main_window, GTK_DIALOG_MODAL,
00081                             (GtkMessageType) type, GTK_BUTTONS_OK, "%s", msg);
00082
00083   // Setting the dialog title
00084   gtk_window_set_title (GTK_WINDOW (dlg), title);
00085
00086   // Showing the dialog and waiting response
00087   gtk_dialog_run (GTK_DIALOG (dlg));
00088
00089   // Closing and freeing memory
00090   gtk_widget_destroy (GTK_WIDGET (dlg));
00091
00092 #else
00093   printf ("%s: %s\n", title, msg);
00094 #endif
00095 }
00096
00103 void
00104 show_error (char *msg)
00105 {
00106   show_message (_("ERROR!"), msg, ERROR_TYPE);
00107 }
00108
00121 int
00122 xml_node_get_int (xmlNode * node, const xmlChar * prop, int *error_code)
00123 {
00124   int i = 0;
00125   xmlChar *buffer;
00126   buffer = xmlGetProp (node, prop);
00127   if (!buffer)
00128     *error_code = 1;
00129   else
00130     {
00131       if (sscanf ((char *) buffer, "%d", &i) != 1)
00132         *error_code = 2;
00133       else
00134         *error_code = 0;
00135       xmlFree (buffer);
00136     }
00137   return i;
00138 }
00139
00152 unsigned int
00153 xml_node_get_uint (xmlNode * node, const xmlChar * prop, int *error_code)
00154 {
00155   unsigned int i = 0;
00156   xmlChar *buffer;
00157   buffer = xmlGetProp (node, prop);
00158   if (!buffer)
00159     *error_code = 1;
00160   else
00161     {
00162       if (sscanf ((char *) buffer, "%u", &i) != 1)
00163         *error_code = 2;
00164       else
00165         *error_code = 0;
00166       xmlFree (buffer);
00167     }
00168   return i;
00169 }
00170
00186 unsigned int
00187 xml_node_get_uint_with_default (xmlNode * node, const xmlChar * prop,
00188                                 unsigned int default_value, int *error_code)
00189 {
00190   unsigned int i;
00191   if (xmlHasProp (node, prop))
00192     i = xml_node_get_uint (node, prop, error_code);
00193   else
```

```
00194     {
00195       i = default_value;
00196       *error_code = 0;
00197     }
00198   return i;
00199 }
00200
00213 double
00214 xml_node_get_float (xmlNode * node, const xmlChar * prop, int *error_code)
00215 {
00216   double x = 0.;
00217   xmlChar *buffer;
00218   buffer = xmlGetProp (node, prop);
00219   if (!buffer)
00220     *error_code = 1;
00221   else
00222     {
00223       if (sscanf ((char *) buffer, "%lf", &x) != 1)
00224         *error_code = 2;
00225       else
00226         *error_code = 0;
00227       xmlFree (buffer);
00228     }
00229   return x;
00230 }
00231
00247 double
00248 xml_node_get_float_with_default (xmlNode * node, const xmlChar * prop,
00249                                  double default_value, int *error_code)
00250 {
00251   double x;
00252   if (xmlHasProp (node, prop))
00253     x = xml_node_get_float (node, prop, error_code);
00254   else
00255     {
00256       x = default_value;
00257       *error_code = 0;
00258     }
00259   return x;
00260 }
00261
00272 void
00273 xml_node_set_int (xmlNode * node, const xmlChar * prop, int value)
00274 {
00275   xmlChar buffer[64];
00276   snprintf ((char *) buffer, 64, "%d", value);
00277   xmlSetProp (node, prop, buffer);
00278 }
00279
00291 void
00292 xml_node_set_uint (xmlNode * node, const xmlChar * prop, unsigned int value)
00293 {
00294   xmlChar buffer[64];
00295   snprintf ((char *) buffer, 64, "%u", value);
00296   xmlSetProp (node, prop, buffer);
00297 }
00298
00310 void
00311 xml_node_set_float (xmlNode * node, const xmlChar * prop, double value)
00312 {
00313   xmlChar buffer[64];
00314   snprintf ((char *) buffer, 64, "%.14lg", value);
00315   xmlSetProp (node, prop, buffer);
00316 }
00317
00330 int
00331 json_object_get_int (JsonObject * object, const char *prop, int *error_code)
00332 {
00333   const char *buffer;
00334   int i = 0;
00335   buffer = json_object_get_string_member (object, prop);
00336   if (!buffer)
00337     *error_code = 1;
00338   else
00339     {
00340       if (sscanf (buffer, "%d", &i) != 1)
00341         *error_code = 2;
00342       else
00343         *error_code = 0;
00344     }
00345   return i;
00346 }
00347
00360 unsigned int
00361 json_object_get_uint (JsonObject * object, const char *prop, int *error_code)
00362 {
00363   const char *buffer;
```

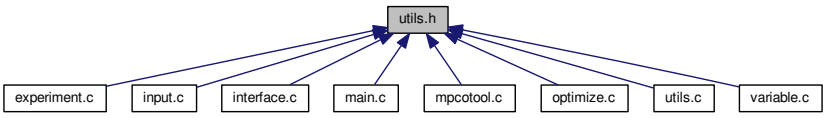
```
00364   unsigned int i = 0;
00365   buffer = json_object_get_string_member (object, prop);
00366   if (!buffer)
00367     *error_code = 1;
00368   else
00369     {
00370       if (sscanf (buffer, "%u", &i) != 1)
00371         *error_code = 2;
00372       else
00373         *error_code = 0;
00374     }
00375   return i;
00376 }
00377
00393 unsigned int
00394 json_object_get_uint_with_default (JsonObject * object, const char *prop,
00395                                    unsigned int default_value, int *error_code)
00396 {
00397   unsigned int i;
00398   if (json_object_get_member (object, prop))
00399     i = json_object_get_uint (object, prop, error_code);
00400   else
00401     {
00402       i = default_value;
00403       *error_code = 0;
00404     }
00405   return i;
00406 }
00407
00420 double
00421 json_object_get_float (JsonObject * object, const char *prop, int *error_code)
00422 {
00423   const char *buffer;
00424   double x = 0.;
00425   buffer = json_object_get_string_member (object, prop);
00426   if (!buffer)
00427     *error_code = 1;
00428   else
00429     {
00430       if (sscanf (buffer, "%lf", &x) != 1)
00431         *error_code = 2;
00432       else
00433         *error_code = 0;
00434     }
00435   return x;
00436 }
00437
00453 double
00454 json_object_get_float_with_default (JsonObject * object, const char *prop
      ,
00455                                     double default_value, int *error_code)
00456 {
00457   double x;
00458   if (json_object_get_member (object, prop))
00459     x = json_object_get_float (object, prop, error_code);
00460   else
00461     {
00462       x = default_value;
00463       *error_code = 0;
00464     }
00465   return x;
00466 }
00467
00479 void
00480 json_object_set_int (JsonObject * object, const char *prop, int value)
00481 {
00482   char buffer[64];
00483   snprintf (buffer, 64, "%d", value);
00484   json_object_set_string_member (object, prop, buffer);
00485 }
00486
00498 void
00499 json_object_set_uint (JsonObject * object, const char *prop, unsigned int value)
00500 {
00501   char buffer[64];
00502   snprintf (buffer, 64, "%u", value);
00503   json_object_set_string_member (object, prop, buffer);
00504 }
00505
00517 void
00518 json_object_set_float (JsonObject * object, const char *prop, double value)
00519 {
00520   char buffer[64];
00521   snprintf (buffer, 64, "%.14lg", value);
00522   json_object_set_string_member (object, prop, buffer);
00523 }
00524
```

```
00530 int
00531 cores_number ()
00532 {
00533 #ifdef G_OS_WIN32
00534   SYSTEM_INFO sysinfo;
00535   GetSystemInfo (&sysinfo);
00536   return sysinfo.dwNumberOfProcessors;
00537 #else
00538   return (int) sysconf (_SC_NPROCESSORS_ONLN);
00539 #endif
00540 }
00541
00542 #if HAVE_GTK
00543
00548 void
00549 process_pending ()
00550 {
00551   while (gtk_events_pending ())
00552     gtk_main_iteration ();
00553 }
00554
00565 unsigned int
00566 gtk_array_get_active (GtkRadioButton * array[], unsigned int n)
00567 {
00568   unsigned int i;
00569   for (i = 0; i < n; ++i)
00570     if (gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (array[i])))
00571       break;
00572   return i;
00573 }
00574
00575 #endif
```

4.23 utils.h File Reference

Header file to define some useful functions.

This graph shows which files directly or indirectly include this file:



Macros

- #define ERROR_TYPE GTK_MESSAGE_ERROR

  Macro to define the error message type.
- #define INFO_TYPE GTK_MESSAGE_INFO

  Macro to define the information message type.

Functions

- void show_message (char *title, char *msg, int type)

  Function to show a dialog with a message.
- void show_error (char *msg)

  Function to show a dialog with an error message.
- int xml_node_get_int (xmlNode *node, const xmlChar *prop, int *error_code)

Function to get an integer number of a XML node property.

- unsigned int xml_node_get_uint (xmlNode *node, const xmlChar *prop, int *error_code)

  Function to get an unsigned integer number of a XML node property.
- unsigned int xml_node_get_uint_with_default (xmlNode *node, const xmlChar *prop, unsigned int default_value, int *error_code)

  Function to get an unsigned integer number of a XML node property with a default value.
- double xml_node_get_float (xmlNode *node, const xmlChar *prop, int *error_code)

  Function to get a floating point number of a XML node property.
- double xml_node_get_float_with_default (xmlNode *node, const xmlChar *prop, double default_value, int *error_code)

  Function to get a floating point number of a XML node property with a default value.
- void xml_node_set_int (xmlNode *node, const xmlChar *prop, int value)

  Function to set an integer number in a XML node property.
- void xml_node_set_uint (xmlNode *node, const xmlChar *prop, unsigned int value)

  Function to set an unsigned integer number in a XML node property.
- void xml_node_set_float (xmlNode *node, const xmlChar *prop, double value)

  Function to set a floating point number in a XML node property.
- int json_object_get_int (JsonObject *object, const char *prop, int *error_code)

  Function to get an integer number of a JSON object property.
- unsigned int json_object_get_uint (JsonObject *object, const char *prop, int *error_code)

  Function to get an unsigned integer number of a JSON object property.
- unsigned int json_object_get_uint_with_default (JsonObject *object, const char *prop, unsigned int default_value, int *error_code)

  Function to get an unsigned integer number of a JSON object property with a default value.
- double json_object_get_float (JsonObject *object, const char *prop, int *error_code)

  Function to get a floating point number of a JSON object property.
- double json_object_get_float_with_default (JsonObject *object, const char *prop, double default_value, int *error_code)

  Function to get a floating point number of a JSON object property with a default value.
- void json_object_set_int (JsonObject *object, const char *prop, int value)

  Function to set an integer number in a JSON object property.
- void json_object_set_uint (JsonObject *object, const char *prop, unsigned int value)

  Function to set an unsigned integer number in a JSON object property.
- void json_object_set_float (JsonObject *object, const char *prop, double value)

  Function to set a floating point number in a JSON object property.
- int cores_number ()

  Function to obtain the cores number.
- void process_pending ()

  Function to process events on long computation.
- unsigned int gtk_array_get_active (GtkRadioButton *array[ ], unsigned int n)

  Function to get the active GtkRadioButton.

Variables

- GtkWindow * main_window

  Main GtkWindow.
- char * error_message

  Error message.
- void(* show_pending)()

  Pointer to the function to show pending events.

4.23.1 Detailed Description

Header file to define some useful functions.

Authors

Javier Burguete.

Copyright

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Definition in file utils.h.

4.23.2 Function Documentation

4.23.2.1 cores_number()

```
int cores_number ( )
```

Function to obtain the cores number.

Returns

Cores number.

Definition at line 531 of file utils.c.

```
00532 {
00533 #ifdef G_OS_WIN32
00534   SYSTEM_INFO sysinfo;
00535   GetSystemInfo (&sysinfo);
00536   return sysinfo.dwNumberOfProcessors;
00537 #else
00538   return (int) sysconf (_SC_NPROCESSORS_ONLN);
00539 #endif
00540 }
```

4.23.2.2 gtk_array_get_active()

```
unsigned int gtk_array_get_active (
             GtkRadioButton * array[],
             unsigned int n )
```

Function to get the active GtkRadioButton.

Parameters

array	Array of GtkRadioButtons.
n	Number of GtkRadioButtons.

Returns

Active GtkRadioButton.

Definition at line 566 of file utils.c.

```
00567 {
00568   unsigned int i;
00569   for (i = 0; i < n; ++i)
00570     if (gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (array[i])))
00571       break;
00572   return i;
00573 }
```

4.23.2.3 json_object_get_float()

```
double json_object_get_float (
            JsonObject * object,
            const char * prop,
            int * error_code )
```

Function to get a floating point number of a JSON object property.

Parameters

object	JSON object.
prop	JSON property.
error_code	Error code.

Returns

Floating point number value.

Definition at line 421 of file utils.c.

```
00422 {
00423   const char *buffer;
00424   double x = 0.;
00425   buffer = json_object_get_string_member (object, prop);
00426   if (!buffer)
00427     *error_code = 1;
00428   else
00429     {
00430       if (sscanf (buffer, "%lf", &x) != 1)
00431         *error_code = 2;
00432       else
00433         *error_code = 0;
00434     }
00435   return x;
00436 }
```

4.23.2.4 json_object_get_float_with_default()

```
double json_object_get_float_with_default (
            JsonObject * object,
            const char * prop,
            double default_value,
            int * error_code )
```

Function to get a floating point number of a JSON object property with a default value.

Parameters

object	JSON object.
prop	JSON property.
default_value	default value.
error_code	Error code.

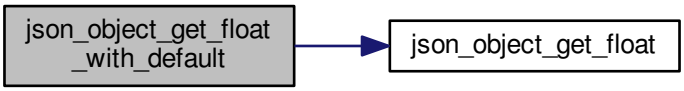
Returns

Floating point number value.

Definition at line 454 of file utils.c.

```
00456 {
00457   double x;
00458   if (json_object_get_member (object, prop))
00459     x = json_object_get_float (object, prop, error_code);
00460   else
00461     {
00462       x = default_value;
00463       *error_code = 0;
00464     }
00465   return x;
00466 }
```

Here is the call graph for this function:



4.23.2.5 json_object_get_int()

```
int json_object_get_int (
            JsonObject * object,
            const char * prop,
            int * error_code )
```

Function to get an integer number of a JSON object property.

Parameters

object	JSON object.
prop	JSON property.
error_code	Error code.

Returns

Integer number value.

Definition at line 331 of file utils.c.

```
00332 {
00333   const char *buffer;
00334   int i = 0;
00335   buffer = json_object_get_string_member (object, prop);
00336   if (!buffer)
00337     *error_code = 1;
00338   else
00339     {
00340       if (sscanf (buffer, "%d", &i) != 1)
00341         *error_code = 2;
00342       else
00343         *error_code = 0;
00344     }
00345   return i;
00346 }
```

4.23.2.6 json_object_get_uint()

```
unsigned int json_object_get_uint (
              JsonObject * object,
              const char * prop,
              int * error_code )
```

Function to get an unsigned integer number of a JSON object property.

Parameters

object	JSON object.
prop	JSON property.
error_code	Error code.

Returns

Unsigned integer number value.

Definition at line 361 of file utils.c.

```
00362 {
00363   const char *buffer;
00364   unsigned int i = 0;
00365   buffer = json_object_get_string_member (object, prop);
```

```
00366   if (!buffer)
00367     *error_code = 1;
00368   else
00369     {
00370       if (sscanf (buffer, "%u", &i) != 1)
00371         *error_code = 2;
00372       else
00373         *error_code = 0;
00374     }
00375   return i;
00376 }
```

4.23.2.7 json_object_get_uint_with_default()

```
unsigned int json_object_get_uint_with_default (
              JsonObject * object,
              const char * prop,
              unsigned int default_value,
              int * error_code )
```

Function to get an unsigned integer number of a JSON object property with a default value.

Parameters

object	JSON object.
prop	JSON property.
default_value	default value.
error_code	Error code.

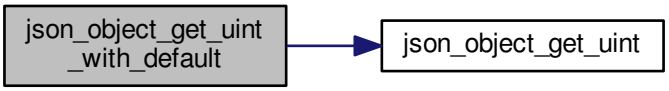
Returns

Unsigned integer number value.

Definition at line 394 of file utils.c.

```
00396 {
00397   unsigned int i;
00398   if (json_object_get_member (object, prop))
00399     i = json_object_get_uint (object, prop, error_code);
00400   else
00401     {
00402       i = default_value;
00403       *error_code = 0;
00404     }
00405   return i;
00406 }
```

Here is the call graph for this function:



4.23.2.8 json_object_set_float()

```
void json_object_set_float (
            JsonObject * object,
            const char * prop,
            double value )
```

Function to set a floating point number in a JSON object property.

Parameters

object	JSON object.
prop	JSON property.
value	Floating point number value.

Definition at line 518 of file utils.c.

```
00519 {
00520   char buffer[64];
00521   snprintf (buffer, 64, "%.14lg", value);
00522   json_object_set_string_member (object, prop, buffer);
00523 }
```

4.23.2.9 json_object_set_int()

```
void json_object_set_int (
            JsonObject * object,
            const char * prop,
            int value )
```

Function to set an integer number in a JSON object property.

Parameters

object	JSON object.
prop	JSON property.
value	Integer number value.

Definition at line 480 of file utils.c.

```
00481 {
00482   char buffer[64];
00483   snprintf (buffer, 64, "%d", value);
00484   json_object_set_string_member (object, prop, buffer);
00485 }
```

4.23.2.10 json_object_set_uint()

```
void json_object_set_uint (
            JsonObject * object,
            const char * prop,
            unsigned int value )
```

Function to set an unsigned integer number in a JSON object property.

Parameters

object	JSON object.
prop	JSON property.
value	Unsigned integer number value.

Definition at line 499 of file utils.c.

```
00500 {
00501   char buffer[64];
00502   snprintf (buffer, 64, "%u", value);
00503   json_object_set_string_member (object, prop, buffer);
00504 }
```

4.23.2.11 show_error()

```
void show_error (
            char * msg )
```

Function to show a dialog with an error message.

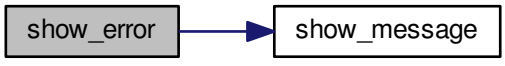
Parameters

msg	Error message.

Definition at line 104 of file utils.c.

```
00105 {
00106   show_message (_("ERROR!"), msg, ERROR_TYPE);
00107 }
```

Here is the call graph for this function:



4.23.2.12 show_message()

```
void show_message (
            char * title,
            char * msg,
            int type )
```

Function to show a dialog with a message.

Parameters

title	Title.
msg	Message.
type	Message type.

Definition at line 73 of file utils.c.

```
00074 {
00075 #if HAVE_GTK
00076   GtkMessageDialog *dlg;
00077
00078   // Creating the dialog
00079   dlg = (GtkMessageDialog *)
00080     gtk_message_dialog_new (main_window, GTK_DIALOG_MODAL,
00081                             (GtkMessageType) type, GTK_BUTTONS_OK, "%s", msg);
00082
00083   // Setting the dialog title
00084   gtk_window_set_title (GTK_WINDOW (dlg), title);
00085
00086   // Showing the dialog and waiting response
00087   gtk_dialog_run (GTK_DIALOG (dlg));
00088
00089   // Closing and freeing memory
00090   gtk_widget_destroy (GTK_WIDGET (dlg));
00091
00092 #else
00093   printf ("%s: %s\n", title, msg);
00094 #endif
00095 }
```

4.23.2.13 xml_node_get_float()

```
double xml_node_get_float (
            xmlNode * node,
            const xmlChar * prop,
            int * error_code )
```

Function to get a floating point number of a XML node property.

Parameters

node	XML node.
prop	XML property.
error_code	Error code.

Returns

Floating point number value.

Definition at line 214 of file utils.c.

```
00215 {
00216   double x = 0.;
00217   xmlChar *buffer;
00218   buffer = xmlGetProp (node, prop);
00219   if (!buffer)
00220     *error_code = 1;
00221   else
00222     {
00223       if (sscanf ((char *) buffer, "%lf", &x) != 1)
00224         *error_code = 2;
00225       else
00226         *error_code = 0;
00227       xmlFree (buffer);
00228     }
00229   return x;
00230 }
```

4.23.2.14 xml_node_get_float_with_default()

```
double xml_node_get_float_with_default (
              xmlNode * node,
              const xmlChar * prop,
              double default_value,
              int * error_code )
```

Function to get a floating point number of a XML node property with a default value.

Parameters

node	XML node.
prop	XML property.
default_value	default value.
error_code	Error code.

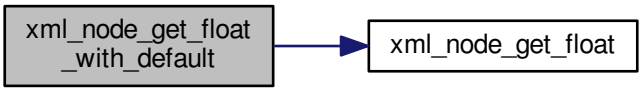
Returns

Floating point number value.

Definition at line 248 of file utils.c.

```
00250 {
00251   double x;
00252   if (xmlHasProp (node, prop))
00253     x = xml_node_get_float (node, prop, error_code);
00254   else
00255     {
00256       x = default_value;
00257       *error_code = 0;
00258     }
00259   return x;
00260 }
```

Here is the call graph for this function:



4.23.2.15 xml_node_get_int()

```
int xml_node_get_int (
              xmlNode * node,
              const xmlChar * prop,
              int * error_code )
```

Function to get an integer number of a XML node property.

Parameters

node	XML node.
prop	XML property.
error_code	Error code.

Returns

Integer number value.

Definition at line 122 of file utils.c.

```
00123 {
00124   int i = 0;
00125   xmlChar *buffer;
00126   buffer = xmlGetProp (node, prop);
00127   if (!buffer)
00128     *error_code = 1;
00129   else
00130     {
00131       if (sscanf ((char *) buffer, "%d", &i) != 1)
00132         *error_code = 2;
00133       else
00134         *error_code = 0;
00135       xmlFree (buffer);
00136     }
00137   return i;
00138 }
```

4.23.2.16 xml_node_get_uint()

```
unsigned int xml_node_get_uint (
            xmlNode * node,
            const xmlChar * prop,
            int * error_code )
```

Function to get an unsigned integer number of a XML node property.

Parameters

node	XML node.
prop	XML property.
error_code	Error code.

Returns

Unsigned integer number value.

Definition at line 153 of file utils.c.

```
00154 {
00155   unsigned int i = 0;
00156   xmlChar *buffer;
00157   buffer = xmlGetProp (node, prop);
00158   if (!buffer)
00159     *error_code = 1;
00160   else
00161     {
00162       if (sscanf ((char *) buffer, "%u", &i) != 1)
00163         *error_code = 2;
00164       else
00165         *error_code = 0;
00166       xmlFree (buffer);
00167     }
00168   return i;
00169 }
```

4.23.2.17 xml_node_get_uint_with_default()

```
unsigned int xml_node_get_uint_with_default (
            xmlNode * node,
            const xmlChar * prop,
            unsigned int default_value,
            int * error_code )
```

Function to get an unsigned integer number of a XML node property with a default value.

Parameters

node	XML node.
prop	XML property.
default_value	default value.
error_code	Error code.

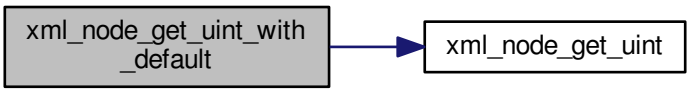
Returns

Unsigned integer number value.

Definition at line 187 of file utils.c.

```
00189 {
00190   unsigned int i;
00191   if (xmlHasProp (node, prop))
00192     i = xml_node_get_uint (node, prop, error_code);
00193   else
00194     {
00195       i = default_value;
00196       *error_code = 0;
00197     }
00198   return i;
00199 }
```

Here is the call graph for this function:



4.23.2.18 xml_node_set_float()

```
void xml_node_set_float (
              xmlNode * node,
              const xmlChar * prop,
              double value )
```

Function to set a floating point number in a XML node property.

Parameters

node	XML node.
prop	XML property.
value	Floating point number value.

Definition at line 311 of file utils.c.

```
00312 {
00313   xmlChar buffer[64];
00314   snprintf ((char *) buffer, 64, "%.14lg", value);
00315   xmlSetProp (node, prop, buffer);
00316 }
```

4.23.2.19 xml_node_set_int()

```
void xml_node_set_int (
            xmlNode * node,
            const xmlChar * prop,
            int value )
```

Function to set an integer number in a XML node property.

Parameters

node	XML node.
prop	XML property.
value	Integer number value.

Definition at line 273 of file utils.c.

```
00274 {
00275   xmlChar buffer[64];
00276   snprintf ((char *) buffer, 64, "%d", value);
00277   xmlSetProp (node, prop, buffer);
00278 }
```

4.23.2.20 xml_node_set_uint()

```
void xml_node_set_uint (
            xmlNode * node,
            const xmlChar * prop,
            unsigned int value )
```

Function to set an unsigned integer number in a XML node property.

Parameters

node	XML node.
prop	XML property.
value	Unsigned integer number value.

Definition at line 292 of file utils.c.

```
00293 {
00294   xmlChar buffer[64];
00295   snprintf ((char *) buffer, 64, "%u", value);
00296   xmlSetProp (node, prop, buffer);
00297 }
```

4.24 utils.h

```
00001 /*
```

```
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
00007
00008 Copyright 2012-2017, AUTHORS.
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00013   1. Redistributions of source code must retain the above copyright notice,
00014     this list of conditions and the following disclaimer.
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00022 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00023 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00024 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00025 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00026 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #ifndef UTILS__H
00039 #define UTILS__H 1
00040
00047 #if HAVE_GTK
00048 #define ERROR_TYPE GTK_MESSAGE_ERROR
00049 #define INFO_TYPE GTK_MESSAGE_INFO
00050 extern GtkWindow *main_window;
00051 #else
00052 #define ERROR_TYPE 0
00053 #define INFO_TYPE 0
00054 #endif
00055
00056 extern char *error_message;
00057 extern void (*show_pending) ();
00058
00059 // Public functions
00060 void show_message (char *title, char *msg, int type);
00061 void show_error (char *msg);
00062 int xml_node_get_int (xmlNode * node, const xmlChar * prop, int *error_code);
00063 unsigned int xml_node_get_uint (xmlNode * node, const xmlChar * prop,
00064                                 int *error_code);
00065 unsigned int xml_node_get_uint_with_default (xmlNode * node,
00066                                              const xmlChar * prop,
00067                                              unsigned int default_value,
00068                                              int *error_code);
00069 double xml_node_get_float (xmlNode * node, const xmlChar * prop,
00070                            int *error_code);
00071 double xml_node_get_float_with_default (xmlNode * node, const xmlChar * prop
    ,
00072                                         double default_value, int *error_code);
00073 void xml_node_set_int (xmlNode * node, const xmlChar * prop, int value);
00074 void xml_node_set_uint (xmlNode * node, const xmlChar * prop,
00075                         unsigned int value);
00076 void xml_node_set_float (xmlNode * node, const xmlChar * prop, double value);
00077 int json_object_get_int (JsonObject * object, const char *prop,
00078                          int *error_code);
00079 unsigned int json_object_get_uint (JsonObject * object, const char *prop,
00080                                    int *error_code);
00081 unsigned int json_object_get_uint_with_default (JsonObject * object,
00082                                                 const char *prop,
00083                                                 unsigned int default_value,
00084                                                 int *error_code);
00085 double json_object_get_float (JsonObject * object, const char *prop,
00086                               int *error_code);
00087 double json_object_get_float_with_default (JsonObject * object,
00088                                            const char *prop,
00089                                            double default_value,
00090                                            int *error_code);
00091 void json_object_set_int (JsonObject * object, const char *prop, int value);
00092 void json_object_set_uint (JsonObject * object, const char *prop,
00093                            unsigned int value);
00094 void json_object_set_float (JsonObject * object, const char *prop,
00095                             double value);
00096 int cores_number ();
00097 #if HAVE_GTK
00098 void process_pending ();
00099 unsigned int gtk_array_get_active (GtkRadioButton * array[], unsigned int n);
```

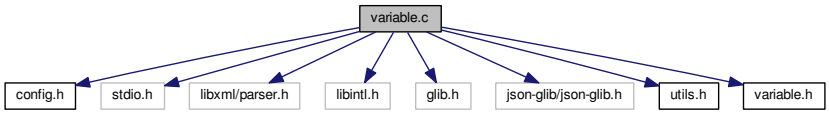
```
00100 #endif
00101
00102 #endif
```

4.25 variable.c File Reference

Source file to define the variable data.

```
#include "config.h"
#include <stdio.h>
#include <libxml/parser.h>
#include <libintl.h>
#include <glib.h>
#include <json-glib/json-glib.h>
#include "utils.h"
#include "variable.h"
```

Include dependency graph for variable.c:



Macros

- #define DEBUG_VARIABLE 0

  Macro to debug variable functions.

Functions

- void variable_new (Variable *variable)

  Function to create a new Variable struct.
- void variable_free (Variable *variable, unsigned int type)

  Function to free the memory of a Variable struct.
- void variable_error (Variable *variable, char *message)

  Function to print a message error opening an Variable struct.
- int variable_open_xml (Variable *variable, xmlNode *node, unsigned int algorithm, unsigned int nsteps)

  Function to open the variable file.
- int variable_open_json (Variable *variable, JsonNode *node, unsigned int algorithm, unsigned int nsteps)

  Function to open the variable file.

Variables

- const char * format [NPRECISIONS]

  Array of C-strings with variable formats.
- const double precision [NPRECISIONS]

  Array of variable precisions.

4.25.1 Detailed Description

Source file to define the variable data.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file variable.c.

4.25.2 Function Documentation

4.25.2.1 variable_error()

```
void variable_error (
            Variable * variable,
            char * message )
```

Function to print a message error opening an Variable struct.

Parameters

variable	Variable struct.
message	Error message.

Definition at line 110 of file variable.c.

```
00111 {
00112   char buffer[64];
00113   if (!variable->name)
00114     snprintf (buffer, 64, "%s: %s", _("Variable"), message);
00115   else
00116     snprintf (buffer, 64, "%s %s: %s", _("Variable"), variable->name, message);
00117   error_message = g_strdup (buffer);
00118 }
```

4.25.2.2 variable_free()

```
void variable_free (
            Variable * variable,
            unsigned int type )
```

Function to free the memory of a Variable struct.

Parameters

variable	Variable struct.
type	Type of input file.

Definition at line 87 of file variable.c.

```
00088 {
00089 #if DEBUG_VARIABLE
00090   fprintf (stderr, "variable_free: start\n");
00091 #endif
00092   if (type == INPUT_TYPE_XML)
00093     xmlFree (variable->name);
00094   else
00095     g_free (variable->name);
00096 #if DEBUG_VARIABLE
00097   fprintf (stderr, "variable_free: end\n");
00098 #endif
00099 }
```

4.25.2.3 variable_new()

```
void variable_new (
             Variable * variable )
```

Function to create a new Variable struct.

Parameters

variable	Variable struct.

Definition at line 67 of file variable.c.

```
00068 {
00069 #if DEBUG_VARIABLE
00070   fprintf (stderr, "variable_new: start\n");
00071 #endif
00072   variable->name = NULL;
00073 #if DEBUG_VARIABLE
00074   fprintf (stderr, "variable_new: end\n");
00075 #endif
00076 }
```

4.25.2.4 variable_open_json()

```
int variable_open_json (
             Variable * variable,
             JsonNode * node,
             unsigned int algorithm,
             unsigned int nsteps )
```

Function to open the variable file.

Parameters

variable	Variable struct.
node	XML node.
algorithm	Algorithm type.
nsteps	Number of steps to do the direction search method.

Returns

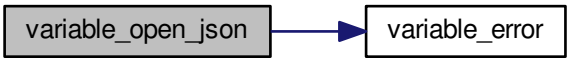
1 on success, 0 on error.

Definition at line 301 of file variable.c.

```
00303 {
00304   JsonObject *object;
00305   const char *label;
00306   int error_code;
00307 #if DEBUG_VARIABLE
00308   fprintf (stderr, "variable_open_json: start\n");
00309 #endif
00310   object = json_node_get_object (node);
00311   label = json_object_get_string_member (object, LABEL_NAME);
00312   if (!label)
00313     {
00314       variable_error (variable, _("no name"));
00315       goto exit_on_error;
00316     }
00317   variable->name = g_strdup (label);
00318   if (json_object_get_member (object, LABEL_MINIMUM))
00319     {
00320       variable->rangemin
00321         = json_object_get_float (object, LABEL_MINIMUM, &error_code);
00322       if (error_code)
00323         {
00324           variable_error (variable, _("bad minimum"));
00325           goto exit_on_error;
00326         }
00327       variable->rangeminabs
00328         = json_object_get_float_with_default (object,
    LABEL_ABSOLUTE_MINIMUM,
00329                                               -G_MAXDOUBLE, &error_code);
00330       if (error_code)
00331         {
00332           variable_error (variable, _("bad absolute minimum"));
00333           goto exit_on_error;
00334         }
00335       if (variable->rangemin < variable->rangeminabs)
00336         {
00337           variable_error (variable, _("minimum range not allowed"));
00338           goto exit_on_error;
00339         }
00340     }
00341   else
00342     {
00343       variable_error (variable, _("no minimum range"));
00344       goto exit_on_error;
00345     }
00346   if (json_object_get_member (object, LABEL_MAXIMUM))
00347     {
00348       variable->rangemax
00349         = json_object_get_float (object, LABEL_MAXIMUM, &error_code);
00350       if (error_code)
00351         {
00352           variable_error (variable, _("bad maximum"));
00353           goto exit_on_error;
00354         }
00355       variable->rangemaxabs
00356         = json_object_get_float_with_default (object,
    LABEL_ABSOLUTE_MAXIMUM,
00357                                               G_MAXDOUBLE, &error_code);
00358       if (error_code)
00359         {
00360           variable_error (variable, _("bad absolute maximum"));
00361           goto exit_on_error;
00362         }
00363       if (variable->rangemax > variable->rangemaxabs)
00364         {
```

```
00365           variable_error (variable, _("maximum range not allowed"));
00366           goto exit_on_error;
00367         }
00368       if (variable->rangemax < variable->rangemin)
00369         {
00370           variable_error (variable, _("bad range"));
00371           goto exit_on_error;
00372         }
00373     }
00374   else
00375     {
00376       variable_error (variable, _("no maximum range"));
00377       goto exit_on_error;
00378     }
00379   variable->precision
00380     = json_object_get_uint_with_default (object,
      LABEL_PRECISION,
00381                                          DEFAULT_PRECISION, &error_code);
00382   if (error_code || variable->precision >= NPRECISIONS)
00383     {
00384       variable_error (variable, _("bad precision"));
00385       goto exit_on_error;
00386     }
00387   if (algorithm == ALGORITHM_SWEEP)
00388     {
00389       if (json_object_get_member (object, LABEL_NSWEEPS))
00390         {
00391           variable->nsweeps
00392             = json_object_get_uint (object, LABEL_NSWEEPS, &error_code);
00393           if (error_code || !variable->nsweeps)
00394             {
00395               variable_error (variable, _("bad sweeps"));
00396               goto exit_on_error;
00397             }
00398         }
00399       else
00400         {
00401           variable_error (variable, _("no sweeps number"));
00402           goto exit_on_error;
00403         }
00404 #if DEBUG_VARIABLE
00405       fprintf (stderr, "variable_open_json: nsweeps=%u\n", variable->nsweeps);
00406 #endif
00407     }
00408   if (algorithm == ALGORITHM_GENETIC)
00409     {
00410       // Obtaining bits representing each variable
00411       if (json_object_get_member (object, LABEL_NBITS))
00412         {
00413           variable->nbits
00414             = json_object_get_uint (object, LABEL_NBITS, &error_code);
00415           if (error_code || !variable->nbits)
00416             {
00417               variable_error (variable, _("invalid bits number"));
00418               goto exit_on_error;
00419             }
00420         }
00421       else
00422         {
00423           variable_error (variable, _("no bits number"));
00424           goto exit_on_error;
00425         }
00426     }
00427   else if (nsteps)
00428     {
00429       variable->step = json_object_get_float (object,
      LABEL_STEP, &error_code);
00430       if (error_code || variable->step < 0.)
00431         {
00432           variable_error (variable, _("bad step size"));
00433           goto exit_on_error;
00434         }
00435     }
00436
00437 #if DEBUG_VARIABLE
00438   fprintf (stderr, "variable_open_json: end\n");
00439 #endif
00440   return 1;
00441 exit_on_error:
00442   variable_free (variable, INPUT_TYPE_JSON);
00443 #if DEBUG_VARIABLE
00444   fprintf (stderr, "variable_open_json: end\n");
00445 #endif
00446   return 0;
00447 }
```

Here is the call graph for this function:



4.25.2.5 variable_open_xml()

```
int variable_open_xml (
              Variable * variable,
              xmlNode * node,
              unsigned int algorithm,
              unsigned int nsteps )
```

Function to open the variable file.

Parameters

variable	Variable struct.
node	XML node.
algorithm	Algorithm type.
nsteps	Number of steps to do the direction search method.

Returns

1 on success, 0 on error.

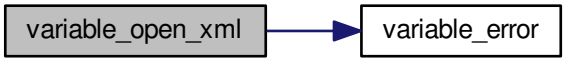
Definition at line 135 of file variable.c.

```
00137 {
00138   int error_code;
00139
00140 #if DEBUG_VARIABLE
00141   fprintf (stderr, "variable_open_xml: start\n");
00142 #endif
00143
00144   variable->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
00145   if (!variable->name)
00146     {
00147       variable_error (variable, _("no name"));
00148       goto exit_on_error;
00149     }
00150   if (xmlHasProp (node, (const xmlChar *) LABEL_MINIMUM))
00151     {
00152       variable->rangemin
00153         = xml_node_get_float (node, (const xmlChar *) LABEL_MINIMUM,
00154                               &error_code);
00155       if (error_code)
00156         {
00157           variable_error (variable, _("bad minimum"));
00158           goto exit_on_error;
```

```
00159         }
00160       variable->rangeminabs = xml_node_get_float_with_default
00161         (node, (const xmlChar *) LABEL_ABSOLUTE_MINIMUM, -G_MAXDOUBLE,
00162          &error_code);
00163       if (error_code)
00164         {
00165           variable_error (variable, _("bad absolute minimum"));
00166           goto exit_on_error;
00167         }
00168       if (variable->rangemin < variable->rangeminabs)
00169         {
00170           variable_error (variable, _("minimum range not allowed"));
00171           goto exit_on_error;
00172         }
00173     }
00174   else
00175     {
00176       variable_error (variable, _("no minimum range"));
00177       goto exit_on_error;
00178     }
00179   if (xmlHasProp (node, (const xmlChar *) LABEL_MAXIMUM))
00180     {
00181       variable->rangemax
00182         = xml_node_get_float (node, (const xmlChar *) LABEL_MAXIMUM,
00183                               &error_code);
00184       if (error_code)
00185         {
00186           variable_error (variable, _("bad maximum"));
00187           goto exit_on_error;
00188         }
00189       variable->rangemaxabs = xml_node_get_float_with_default
00190         (node, (const xmlChar *) LABEL_ABSOLUTE_MAXIMUM, G_MAXDOUBLE,
00191          &error_code);
00192       if (error_code)
00193         {
00194           variable_error (variable, _("bad absolute maximum"));
00195           goto exit_on_error;
00196         }
00197       if (variable->rangemax > variable->rangemaxabs)
00198         {
00199           variable_error (variable, _("maximum range not allowed"));
00200           goto exit_on_error;
00201         }
00202       if (variable->rangemax < variable->rangemin)
00203         {
00204           variable_error (variable, _("bad range"));
00205           goto exit_on_error;
00206         }
00207     }
00208   else
00209     {
00210       variable_error (variable, _("no maximum range"));
00211       goto exit_on_error;
00212     }
00213   variable->precision
00214     = xml_node_get_uint_with_default (node, (const xmlChar *)
    LABEL_PRECISION,
00215                                       DEFAULT_PRECISION, &error_code);
00216   if (error_code || variable->precision >= NPRECISIONS)
00217     {
00218       variable_error (variable, _("bad precision"));
00219       goto exit_on_error;
00220     }
00221   if (algorithm == ALGORITHM_SWEEP)
00222     {
00223       if (xmlHasProp (node, (const xmlChar *) LABEL_NSWEEPS))
00224         {
00225           variable->nsweeps
00226             = xml_node_get_uint (node, (const xmlChar *) LABEL_NSWEEPS,
00227                                  &error_code);
00228           if (error_code || !variable->nsweeps)
00229             {
00230               variable_error (variable, _("bad sweeps"));
00231               goto exit_on_error;
00232             }
00233         }
00234       else
00235         {
00236           variable_error (variable, _("no sweeps number"));
00237           goto exit_on_error;
00238         }
00239 #if DEBUG_VARIABLE
00240       fprintf (stderr, "variable_open_xml: nsweeps=%u\n", variable->nsweeps);
00241 #endif
00242     }
00243   if (algorithm == ALGORITHM_GENETIC)
00244     {
```

```
00245       // Obtaining bits representing each variable
00246       if (xmlHasProp (node, (const xmlChar *) LABEL_NBITS))
00247         {
00248           variable->nbits
00249             = xml_node_get_uint (node, (const xmlChar *) LABEL_NBITS,
00250                                  &error_code);
00251           if (error_code || !variable->nbits)
00252             {
00253               variable_error (variable, _("invalid bits number"));
00254               goto exit_on_error;
00255             }
00256         }
00257       else
00258         {
00259           variable_error (variable, _("no bits number"));
00260           goto exit_on_error;
00261         }
00262     }
00263   else if (nsteps)
00264     {
00265       variable->step
00266         = xml_node_get_float (node, (const xmlChar *)
      LABEL_STEP, &error_code);
00267       if (error_code || variable->step < 0.)
00268         {
00269           variable_error (variable, _("bad step size"));
00270           goto exit_on_error;
00271         }
00272     }
00273
00274 #if DEBUG_VARIABLE
00275   fprintf (stderr, "variable_open_xml: end\n");
00276 #endif
00277   return 1;
00278 exit_on_error:
00279   variable_free (variable, INPUT_TYPE_XML);
00280 #if DEBUG_VARIABLE
00281   fprintf (stderr, "variable_open_xml: end\n");
00282 #endif
00283   return 0;
00284 }
```

Here is the call graph for this function:



4.25.3 Variable Documentation

4.25.3.1 format

```
const char* format[NPRECISIONS]
```

Initial value:

```
= {
  "%.0lf", "%.1lf", "%.2lf", "%.3lf", "%.4lf", "%.5lf", "%.6lf", "%.7lf",
  "%.8lf", "%.9lf", "%.10lf", "%.11lf", "%.12lf", "%.13lf", "%.14lf"
}
```

Array of C-strings with variable formats.

Definition at line 50 of file variable.c.

4.25.3.2 precision

```
const double precision[NPRECISIONS]
```

Initial value:

```
= {
  1., 0.1, 0.01, 1e-3, 1e-4, 1e-5, 1e-6, 1e-7, 1e-8, 1e-9, 1e-10, 1e-11,
  1e-12, 1e-13, 1e-14
}
```

Array of variable precisions.

Definition at line 55 of file variable.c.

4.26 variable.c

```
00001 /*
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
00007
00008 Copyright 2012-2017, AUTHORS.
00009
00010 Redistribution and use in source and binary forms, with or without modification,
00011 are permitted provided that the following conditions are met:
00012
00013     1. Redistributions of source code must retain the above copyright notice,
00014        this list of conditions and the following disclaimer.
00015
00016     2. Redistributions in binary form must reproduce the above copyright notice,
00017        this list of conditions and the following disclaimer in the
00018        documentation and/or other materials provided with the distribution.
00019
00020 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00021 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00022 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00023 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00024 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00025 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00026 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #define _GNU_SOURCE
00039 #include "config.h"
00040 #include <stdio.h>
00041 #include <libxml/parser.h>
00042 #include <libintl.h>
00043 #include <glib.h>
00044 #include <json-glib/json-glib.h>
00045 #include "utils.h"
00046 #include "variable.h"
00047
00048 #define DEBUG_VARIABLE 0
00049
00050 const char *format[NPRECISIONS] = {
00051   "%.0lf", "%.1lf", "%.2lf", "%.3lf", "%.4lf", "%.5lf", "%.6lf", "%.7lf",
00052   "%.8lf", "%.9lf", "%.10lf", "%.11lf", "%.12lf", "%.13lf", "%.14lf"
00053 };
00054
00055 const double precision[NPRECISIONS] = {
00056   1., 0.1, 0.01, 1e-3, 1e-4, 1e-5, 1e-6, 1e-7, 1e-8, 1e-9, 1e-10, 1e-11,
00057   1e-12, 1e-13, 1e-14
00058 };
00059
00066 void
00067 variable_new (Variable * variable)
00068 {
00069 #if DEBUG_VARIABLE
```

```
00070   fprintf (stderr, "variable_new: start\n");
00071 #endif
00072   variable->name = NULL;
00073 #if DEBUG_VARIABLE
00074   fprintf (stderr, "variable_new: end\n");
00075 #endif
00076 }
00077
00086 void
00087 variable_free (Variable * variable, unsigned int type)
00088 {
00089 #if DEBUG_VARIABLE
00090   fprintf (stderr, "variable_free: start\n");
00091 #endif
00092   if (type == INPUT_TYPE_XML)
00093     xmlFree (variable->name);
00094   else
00095     g_free (variable->name);
00096 #if DEBUG_VARIABLE
00097   fprintf (stderr, "variable_free: end\n");
00098 #endif
00099 }
00100
00109 void
00110 variable_error (Variable * variable, char *message)
00111 {
00112   char buffer[64];
00113   if (!variable->name)
00114     snprintf (buffer, 64, "%s: %s", _("Variable"), message);
00115   else
00116     snprintf (buffer, 64, "%s %s: %s", _("Variable"), variable->name, message);
00117   error_message = g_strdup (buffer);
00118 }
00119
00134 int
00135 variable_open_xml (Variable * variable, xmlNode * node,
00136                    unsigned int algorithm, unsigned int nsteps)
00137 {
00138   int error_code;
00139
00140 #if DEBUG_VARIABLE
00141   fprintf (stderr, "variable_open_xml: start\n");
00142 #endif
00143
00144   variable->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
00145   if (!variable->name)
00146     {
00147       variable_error (variable, _("no name"));
00148       goto exit_on_error;
00149     }
00150   if (xmlHasProp (node, (const xmlChar *) LABEL_MINIMUM))
00151     {
00152       variable->rangemin
00153         = xml_node_get_float (node, (const xmlChar *) LABEL_MINIMUM,
00154                               &error_code);
00155       if (error_code)
00156         {
00157           variable_error (variable, _("bad minimum"));
00158           goto exit_on_error;
00159         }
00160       variable->rangeminabs = xml_node_get_float_with_default
00161         (node, (const xmlChar *) LABEL_ABSOLUTE_MINIMUM, -G_MAXDOUBLE,
00162          &error_code);
00163       if (error_code)
00164         {
00165           variable_error (variable, _("bad absolute minimum"));
00166           goto exit_on_error;
00167         }
00168       if (variable->rangemin < variable->rangeminabs)
00169         {
00170           variable_error (variable, _("minimum range not allowed"));
00171           goto exit_on_error;
00172         }
00173     }
00174   else
00175     {
00176       variable_error (variable, _("no minimum range"));
00177       goto exit_on_error;
00178     }
00179   if (xmlHasProp (node, (const xmlChar *) LABEL_MAXIMUM))
00180     {
00181       variable->rangemax
00182         = xml_node_get_float (node, (const xmlChar *) LABEL_MAXIMUM,
00183                               &error_code);
00184       if (error_code)
00185         {
00186           variable_error (variable, _("bad maximum"));
```

```
00187           goto exit_on_error;
00188         }
00189       variable->rangemaxabs = xml_node_get_float_with_default
00190         (node, (const xmlChar *) LABEL_ABSOLUTE_MAXIMUM, G_MAXDOUBLE,
00191          &error_code);
00192       if (error_code)
00193         {
00194           variable_error (variable, _("bad absolute maximum"));
00195           goto exit_on_error;
00196         }
00197       if (variable->rangemax > variable->rangemaxabs)
00198         {
00199           variable_error (variable, _("maximum range not allowed"));
00200           goto exit_on_error;
00201         }
00202       if (variable->rangemax < variable->rangemin)
00203         {
00204           variable_error (variable, _("bad range"));
00205           goto exit_on_error;
00206         }
00207     }
00208   else
00209     {
00210       variable_error (variable, _("no maximum range"));
00211       goto exit_on_error;
00212     }
00213   variable->precision
00214     = xml_node_get_uint_with_default (node, (const xmlChar *)
    LABEL_PRECISION,
00215                                       DEFAULT_PRECISION, &error_code);
00216   if (error_code || variable->precision >= NPRECISIONS)
00217     {
00218       variable_error (variable, _("bad precision"));
00219       goto exit_on_error;
00220     }
00221   if (algorithm == ALGORITHM_SWEEP)
00222     {
00223       if (xmlHasProp (node, (const xmlChar *) LABEL_NSWEEPS))
00224         {
00225           variable->nsweeps
00226             = xml_node_get_uint (node, (const xmlChar *) LABEL_NSWEEPS,
00227                                  &error_code);
00228           if (error_code || !variable->nsweeps)
00229             {
00230               variable_error (variable, _("bad sweeps"));
00231               goto exit_on_error;
00232             }
00233         }
00234       else
00235         {
00236           variable_error (variable, _("no sweeps number"));
00237           goto exit_on_error;
00238         }
00239 #if DEBUG_VARIABLE
00240       fprintf (stderr, "variable_open_xml: nsweeps=%u\n", variable->nsweeps);
00241 #endif
00242     }
00243   if (algorithm == ALGORITHM_GENETIC)
00244     {
00245       // Obtaining bits representing each variable
00246       if (xmlHasProp (node, (const xmlChar *) LABEL_NBITS))
00247         {
00248           variable->nbits
00249             = xml_node_get_uint (node, (const xmlChar *) LABEL_NBITS,
00250                                  &error_code);
00251           if (error_code || !variable->nbits)
00252             {
00253               variable_error (variable, _("invalid bits number"));
00254               goto exit_on_error;
00255             }
00256         }
00257       else
00258         {
00259           variable_error (variable, _("no bits number"));
00260           goto exit_on_error;
00261         }
00262     }
00263   else if (nsteps)
00264     {
00265       variable->step
00266         = xml_node_get_float (node, (const xmlChar *)
    LABEL_STEP, &error_code);
00267       if (error_code || variable->step < 0.)
00268         {
00269           variable_error (variable, _("bad step size"));
00270           goto exit_on_error;
00271         }
```

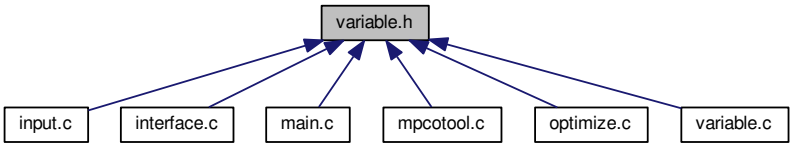
```
00272     }
00273
00274 #if DEBUG_VARIABLE
00275   fprintf (stderr, "variable_open_xml: end\n");
00276 #endif
00277   return 1;
00278 exit_on_error:
00279   variable_free (variable, INPUT_TYPE_XML);
00280 #if DEBUG_VARIABLE
00281   fprintf (stderr, "variable_open_xml: end\n");
00282 #endif
00283   return 0;
00284 }
00285
00300 int
00301 variable_open_json (Variable * variable, JsonNode * node,
00302                     unsigned int algorithm, unsigned int nsteps)
00303 {
00304   JsonObject *object;
00305   const char *label;
00306   int error_code;
00307 #if DEBUG_VARIABLE
00308   fprintf (stderr, "variable_open_json: start\n");
00309 #endif
00310   object = json_node_get_object (node);
00311   label = json_object_get_string_member (object, LABEL_NAME);
00312   if (!label)
00313     {
00314       variable_error (variable, _("no name"));
00315       goto exit_on_error;
00316     }
00317   variable->name = g_strdup (label);
00318   if (json_object_get_member (object, LABEL_MINIMUM))
00319     {
00320       variable->rangemin
00321         = json_object_get_float (object, LABEL_MINIMUM, &error_code);
00322       if (error_code)
00323         {
00324           variable_error (variable, _("bad minimum"));
00325           goto exit_on_error;
00326         }
00327       variable->rangeminabs
00328         = json_object_get_float_with_default (object,
    LABEL_ABSOLUTE_MINIMUM,
00329                                               -G_MAXDOUBLE, &error_code);
00330       if (error_code)
00331         {
00332           variable_error (variable, _("bad absolute minimum"));
00333           goto exit_on_error;
00334         }
00335       if (variable->rangemin < variable->rangeminabs)
00336         {
00337           variable_error (variable, _("minimum range not allowed"));
00338           goto exit_on_error;
00339         }
00340     }
00341   else
00342     {
00343       variable_error (variable, _("no minimum range"));
00344       goto exit_on_error;
00345     }
00346   if (json_object_get_member (object, LABEL_MAXIMUM))
00347     {
00348       variable->rangemax
00349         = json_object_get_float (object, LABEL_MAXIMUM, &error_code);
00350       if (error_code)
00351         {
00352           variable_error (variable, _("bad maximum"));
00353           goto exit_on_error;
00354         }
00355       variable->rangemaxabs
00356         = json_object_get_float_with_default (object,
    LABEL_ABSOLUTE_MAXIMUM,
00357                                               G_MAXDOUBLE, &error_code);
00358       if (error_code)
00359         {
00360           variable_error (variable, _("bad absolute maximum"));
00361           goto exit_on_error;
00362         }
00363       if (variable->rangemax > variable->rangemaxabs)
00364         {
00365           variable_error (variable, _("maximum range not allowed"));
00366           goto exit_on_error;
00367         }
00368       if (variable->rangemax < variable->rangemin)
00369         {
00370           variable_error (variable, _("bad range"));
```

```
00371           goto exit_on_error;
00372         }
00373     }
00374   else
00375     {
00376       variable_error (variable, _("no maximum range"));
00377       goto exit_on_error;
00378     }
00379   variable->precision
00380     = json_object_get_uint_with_default (object,
      LABEL_PRECISION,
00381                                          DEFAULT_PRECISION, &error_code);
00382   if (error_code || variable->precision >= NPRECISIONS)
00383     {
00384       variable_error (variable, _("bad precision"));
00385       goto exit_on_error;
00386     }
00387   if (algorithm == ALGORITHM_SWEEP)
00388     {
00389       if (json_object_get_member (object, LABEL_NSWEEPS))
00390         {
00391           variable->nsweeps
00392             = json_object_get_uint (object, LABEL_NSWEEPS, &error_code);
00393           if (error_code || !variable->nsweeps)
00394             {
00395               variable_error (variable, _("bad sweeps"));
00396               goto exit_on_error;
00397             }
00398         }
00399       else
00400         {
00401           variable_error (variable, _("no sweeps number"));
00402           goto exit_on_error;
00403         }
00404 #if DEBUG_VARIABLE
00405       fprintf (stderr, "variable_open_json: nsweeps=%u\n", variable->nsweeps);
00406 #endif
00407     }
00408   if (algorithm == ALGORITHM_GENETIC)
00409     {
00410       // Obtaining bits representing each variable
00411       if (json_object_get_member (object, LABEL_NBITS))
00412         {
00413           variable->nbits
00414             = json_object_get_uint (object, LABEL_NBITS, &error_code);
00415           if (error_code || !variable->nbits)
00416             {
00417               variable_error (variable, _("invalid bits number"));
00418               goto exit_on_error;
00419             }
00420         }
00421       else
00422         {
00423           variable_error (variable, _("no bits number"));
00424           goto exit_on_error;
00425         }
00426     }
00427   else if (nsteps)
00428     {
00429       variable->step = json_object_get_float (object,
      LABEL_STEP, &error_code);
00430       if (error_code || variable->step < 0.)
00431         {
00432           variable_error (variable, _("bad step size"));
00433           goto exit_on_error;
00434         }
00435     }
00436
00437 #if DEBUG_VARIABLE
00438   fprintf (stderr, "variable_open_json: end\n");
00439 #endif
00440   return 1;
00441 exit_on_error:
00442   variable_free (variable, INPUT_TYPE_JSON);
00443 #if DEBUG_VARIABLE
00444   fprintf (stderr, "variable_open_json: end\n");
00445 #endif
00446   return 0;
00447 }
```

4.27 variable.h File Reference

Header file to define the variable data.

This graph shows which files directly or indirectly include this file:



Data Structures

- struct Variable

  Struct to define the variable data.

Enumerations

- enum Algorithm { ALGORITHM_MONTE_CARLO = 0, ALGORITHM_SWEEP = 1, ALGORITHM_GENETIC = 2 }

  Enum to define the algorithms.

Functions

- void variable_new (Variable *variable)

  Function to create a new Variable struct.
- void variable_free (Variable *variable, unsigned int type)

  Function to free the memory of a Variable struct.
- void variable_error (Variable *variable, char *message)

  Function to print a message error opening an Variable struct.
- int variable_open_xml (Variable *variable, xmlNode *node, unsigned int algorithm, unsigned int nsteps)

  Function to open the variable file.
- int variable_open_json (Variable *variable, JsonNode *node, unsigned int algorithm, unsigned int nsteps)

  Function to open the variable file.

Variables

- const char * format [NPRECISIONS]

  Array of C-strings with variable formats.
- const double precision [NPRECISIONS]

  Array of variable precisions.

4.27.1 Detailed Description

Header file to define the variable data.

Authors

Javier Burguete.

Copyright

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Definition in file variable.h.

4.27.2 Enumeration Type Documentation

4.27.2.1 Algorithm

```
enum Algorithm
```

Enum to define the algorithms.

Enumerator

ALGORITHM_MONTE_CARLO	Monte-Carlo algorithm.
ALGORITHM_SWEEP	Sweep algorithm.
ALGORITHM_GENETIC	Genetic algorithm.

Definition at line 45 of file variable.h.

```
00046 {
00047   ALGORITHM_MONTE_CARLO = 0,
00048   ALGORITHM_SWEEP = 1,
00049   ALGORITHM_GENETIC = 2
00050 };
```

4.27.3 Function Documentation

4.27.3.1 variable_error()

```
void variable_error (
            Variable * variable,
            char * message )
```

Function to print a message error opening an Variable struct.

Parameters

variable	Variable struct.
message	Error message.

Definition at line 110 of file variable.c.

```
00111 {
00112   char buffer[64];
00113   if (!variable->name)
00114     snprintf (buffer, 64, "%s: %s", _("Variable"), message);
00115   else
00116     snprintf (buffer, 64, "%s %s: %s", _("Variable"), variable->name, message);
00117   error_message = g_strdup (buffer);
00118 }
```

4.27.3.2 variable_free()

```
void variable_free (
            Variable * variable,
            unsigned int type )
```

Function to free the memory of a Variable struct.

Parameters

variable	Variable struct.
type	Type of input file.

Definition at line 87 of file variable.c.

```
00088 {
00089 #if DEBUG_VARIABLE
00090   fprintf (stderr, "variable_free: start\n");
00091 #endif
00092   if (type == INPUT_TYPE_XML)
00093     xmlFree (variable->name);
00094   else
00095     g_free (variable->name);
00096 #if DEBUG_VARIABLE
00097   fprintf (stderr, "variable_free: end\n");
00098 #endif
00099 }
```

4.27.3.3 variable_new()

```
void variable_new (
            Variable * variable )
```

Function to create a new Variable struct.

Parameters

variable	Variable struct.

Definition at line 67 of file variable.c.

```
00068 {
00069 #if DEBUG_VARIABLE
00070   fprintf (stderr, "variable_new: start\n");
00071 #endif
00072   variable->name = NULL;
00073 #if DEBUG_VARIABLE
00074   fprintf (stderr, "variable_new: end\n");
00075 #endif
00076 }
```

4.27.3.4 variable_open_json()

```
int variable_open_json (
              Variable * variable,
              JsonNode * node,
              unsigned int algorithm,
              unsigned int nsteps )
```

Function to open the variable file.

Parameters

variable	Variable struct.
node	XML node.
algorithm	Algorithm type.
nsteps	Number of steps to do the direction search method.

Returns

1 on success, 0 on error.

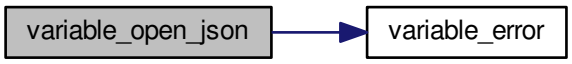
Definition at line 301 of file variable.c.

```
00303 {
00304   JsonObject *object;
00305   const char *label;
00306   int error_code;
00307 #if DEBUG_VARIABLE
00308   fprintf (stderr, "variable_open_json: start\n");
00309 #endif
00310   object = json_node_get_object (node);
00311   label = json_object_get_string_member (object, LABEL_NAME);
00312   if (!label)
00313     {
00314       variable_error (variable, _("no name"));
00315       goto exit_on_error;
00316     }
00317   variable->name = g_strdup (label);
00318   if (json_object_get_member (object, LABEL_MINIMUM))
00319     {
00320       variable->rangemin
```

```
00321         = json_object_get_float (object, LABEL_MINIMUM, &error_code);
00322       if (error_code)
00323         {
00324           variable_error (variable, _("bad minimum"));
00325           goto exit_on_error;
00326         }
00327       variable->rangeminabs
00328         = json_object_get_float_with_default (object,
    LABEL_ABSOLUTE_MINIMUM,
00329                                               -G_MAXDOUBLE, &error_code);
00330       if (error_code)
00331         {
00332           variable_error (variable, _("bad absolute minimum"));
00333           goto exit_on_error;
00334         }
00335       if (variable->rangemin < variable->rangeminabs)
00336         {
00337           variable_error (variable, _("minimum range not allowed"));
00338           goto exit_on_error;
00339         }
00340     }
00341   else
00342     {
00343       variable_error (variable, _("no minimum range"));
00344       goto exit_on_error;
00345     }
00346   if (json_object_get_member (object, LABEL_MAXIMUM))
00347     {
00348       variable->rangemax
00349         = json_object_get_float (object, LABEL_MAXIMUM, &error_code);
00350       if (error_code)
00351         {
00352           variable_error (variable, _("bad maximum"));
00353           goto exit_on_error;
00354         }
00355       variable->rangemaxabs
00356         = json_object_get_float_with_default (object,
    LABEL_ABSOLUTE_MAXIMUM,
00357                                               G_MAXDOUBLE, &error_code);
00358       if (error_code)
00359         {
00360           variable_error (variable, _("bad absolute maximum"));
00361           goto exit_on_error;
00362         }
00363       if (variable->rangemax > variable->rangemaxabs)
00364         {
00365           variable_error (variable, _("maximum range not allowed"));
00366           goto exit_on_error;
00367         }
00368       if (variable->rangemax < variable->rangemin)
00369         {
00370           variable_error (variable, _("bad range"));
00371           goto exit_on_error;
00372         }
00373     }
00374   else
00375     {
00376       variable_error (variable, _("no maximum range"));
00377       goto exit_on_error;
00378     }
00379   variable->precision
00380     = json_object_get_uint_with_default (object,
    LABEL_PRECISION,
00381                                          DEFAULT_PRECISION, &error_code);
00382   if (error_code || variable->precision >= NPRECISIONS)
00383     {
00384       variable_error (variable, _("bad precision"));
00385       goto exit_on_error;
00386     }
00387   if (algorithm == ALGORITHM_SWEEP)
00388     {
00389       if (json_object_get_member (object, LABEL_NSWEEPS))
00390         {
00391           variable->nsweeps
00392             = json_object_get_uint (object, LABEL_NSWEEPS, &error_code);
00393           if (error_code || !variable->nsweeps)
00394             {
00395               variable_error (variable, _("bad sweeps"));
00396               goto exit_on_error;
00397             }
00398         }
00399       else
00400         {
00401           variable_error (variable, _("no sweeps number"));
00402           goto exit_on_error;
00403         }
00404 #if DEBUG_VARIABLE
```

```
00405       fprintf (stderr, "variable_open_json: nsweeps=%u\n", variable->nsweeps);
00406 #endif
00407     }
00408   if (algorithm == ALGORITHM_GENETIC)
00409     {
00410       // Obtaining bits representing each variable
00411       if (json_object_get_member (object, LABEL_NBITS))
00412         {
00413           variable->nbits
00414             = json_object_get_uint (object, LABEL_NBITS, &error_code);
00415           if (error_code || !variable->nbits)
00416             {
00417               variable_error (variable, _("invalid bits number"));
00418               goto exit_on_error;
00419             }
00420         }
00421       else
00422         {
00423           variable_error (variable, _("no bits number"));
00424           goto exit_on_error;
00425         }
00426     }
00427   else if (nsteps)
00428     {
00429       variable->step = json_object_get_float (object,
      LABEL_STEP, &error_code);
00430       if (error_code || variable->step < 0.)
00431         {
00432           variable_error (variable, _("bad step size"));
00433           goto exit_on_error;
00434         }
00435     }
00436
00437 #if DEBUG_VARIABLE
00438   fprintf (stderr, "variable_open_json: end\n");
00439 #endif
00440   return 1;
00441 exit_on_error:
00442   variable_free (variable, INPUT_TYPE_JSON);
00443 #if DEBUG_VARIABLE
00444   fprintf (stderr, "variable_open_json: end\n");
00445 #endif
00446   return 0;
00447 }
```

Here is the call graph for this function:



4.27.3.5 variable_open_xml()

```
int variable_open_xml (
             Variable * variable,
             xmlNode * node,
             unsigned int algorithm,
             unsigned int nsteps )
```

Function to open the variable file.

Parameters

variable	Variable struct.
node	XML node.
algorithm	Algorithm type.
nsteps	Number of steps to do the direction search method.

Returns

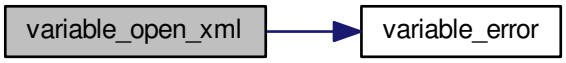
1 on success, 0 on error.

Definition at line 135 of file variable.c.

```
00137 {
00138   int error_code;
00139
00140 #if DEBUG_VARIABLE
00141   fprintf (stderr, "variable_open_xml: start\n");
00142 #endif
00143
00144   variable->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
00145   if (!variable->name)
00146     {
00147       variable_error (variable, _("no name"));
00148       goto exit_on_error;
00149     }
00150   if (xmlHasProp (node, (const xmlChar *) LABEL_MINIMUM))
00151     {
00152       variable->rangemin
00153         = xml_node_get_float (node, (const xmlChar *) LABEL_MINIMUM,
00154                               &error_code);
00155       if (error_code)
00156         {
00157           variable_error (variable, _("bad minimum"));
00158           goto exit_on_error;
00159         }
00160       variable->rangeminabs = xml_node_get_float_with_default
00161         (node, (const xmlChar *) LABEL_ABSOLUTE_MINIMUM, -G_MAXDOUBLE,
00162          &error_code);
00163       if (error_code)
00164         {
00165           variable_error (variable, _("bad absolute minimum"));
00166           goto exit_on_error;
00167         }
00168       if (variable->rangemin < variable->rangeminabs)
00169         {
00170           variable_error (variable, _("minimum range not allowed"));
00171           goto exit_on_error;
00172         }
00173     }
00174   else
00175     {
00176       variable_error (variable, _("no minimum range"));
00177       goto exit_on_error;
00178     }
00179   if (xmlHasProp (node, (const xmlChar *) LABEL_MAXIMUM))
00180     {
00181       variable->rangemax
00182         = xml_node_get_float (node, (const xmlChar *) LABEL_MAXIMUM,
00183                               &error_code);
00184       if (error_code)
00185         {
00186           variable_error (variable, _("bad maximum"));
00187           goto exit_on_error;
00188         }
00189       variable->rangemaxabs = xml_node_get_float_with_default
00190         (node, (const xmlChar *) LABEL_ABSOLUTE_MAXIMUM, G_MAXDOUBLE,
00191          &error_code);
00192       if (error_code)
00193         {
00194           variable_error (variable, _("bad absolute maximum"));
00195           goto exit_on_error;
00196         }
00197       if (variable->rangemax > variable->rangemaxabs)
00198         {
00199           variable_error (variable, _("maximum range not allowed"));
00200           goto exit_on_error;
```

```
00201         }
00202       if (variable->rangemax < variable->rangemin)
00203         {
00204           variable_error (variable, _("bad range"));
00205           goto exit_on_error;
00206         }
00207     }
00208   else
00209     {
00210       variable_error (variable, _("no maximum range"));
00211       goto exit_on_error;
00212     }
00213   variable->precision
00214     = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_PRECISION,
00215                                       DEFAULT_PRECISION, &error_code);
00216   if (error_code || variable->precision >= NPRECISIONS)
00217     {
00218       variable_error (variable, _("bad precision"));
00219       goto exit_on_error;
00220     }
00221   if (algorithm == ALGORITHM_SWEEP)
00222     {
00223       if (xmlHasProp (node, (const xmlChar *) LABEL_NSWEEPS))
00224         {
00225           variable->nsweeps
00226             = xml_node_get_uint (node, (const xmlChar *) LABEL_NSWEEPS,
00227                                  &error_code);
00228           if (error_code || !variable->nsweeps)
00229             {
00230               variable_error (variable, _("bad sweeps"));
00231               goto exit_on_error;
00232             }
00233         }
00234       else
00235         {
00236           variable_error (variable, _("no sweeps number"));
00237           goto exit_on_error;
00238         }
00239 #if DEBUG_VARIABLE
00240       fprintf (stderr, "variable_open_xml: nsweeps=%u\n", variable->nsweeps);
00241 #endif
00242     }
00243   if (algorithm == ALGORITHM_GENETIC)
00244     {
00245       // Obtaining bits representing each variable
00246       if (xmlHasProp (node, (const xmlChar *) LABEL_NBITS))
00247         {
00248           variable->nbits
00249             = xml_node_get_uint (node, (const xmlChar *) LABEL_NBITS,
00250                                  &error_code);
00251           if (error_code || !variable->nbits)
00252             {
00253               variable_error (variable, _("invalid bits number"));
00254               goto exit_on_error;
00255             }
00256         }
00257       else
00258         {
00259           variable_error (variable, _("no bits number"));
00260           goto exit_on_error;
00261         }
00262     }
00263   else if (nsteps)
00264     {
00265       variable->step
00266         = xml_node_get_float (node, (const xmlChar *)
      LABEL_STEP, &error_code);
00267       if (error_code || variable->step < 0.)
00268         {
00269           variable_error (variable, _("bad step size"));
00270           goto exit_on_error;
00271         }
00272     }
00273
00274 #if DEBUG_VARIABLE
00275   fprintf (stderr, "variable_open_xml: end\n");
00276 #endif
00277   return 1;
00278 exit_on_error:
00279   variable_free (variable, INPUT_TYPE_XML);
00280 #if DEBUG_VARIABLE
00281   fprintf (stderr, "variable_open_xml: end\n");
00282 #endif
00283   return 0;
00284 }
```

Here is the call graph for this function:



4.28 variable.h

```
00001 /*
00002 MPCOTool:
00003 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00004 calibrations or optimizations of empirical parameters.
00005
00006 AUTHORS: Javier Burguete and Borja Latorre.
00007
00008 Copyright 2012-2017, AUTHORS.
00009
00010 Redistribution and use in source and binary forms, with or without modification,
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00012
00013   1. Redistributions of source code must retain the above copyright notice,
00014     this list of conditions and the following disclaimer.
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00016   2. Redistributions in binary form must reproduce the above copyright notice,
00017     this list of conditions and the following disclaimer in the
00018     documentation and/or other materials provided with the distribution.
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00020 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00021 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00022 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00023 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00024 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00025 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00026 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00027 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00028 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00029 OF SUCH DAMAGE.
00030 */
00031
00038 #ifndef VARIABLE__H
00039 #define VARIABLE__H 1
00040
00045 enum Algorithm
00046 {
00047   ALGORITHM_MONTE_CARLO = 0,
00048   ALGORITHM_SWEEP = 1,
00049   ALGORITHM_GENETIC = 2
00050 };
00051
00056 typedef struct
00057 {
00058   char *name;
00059   double rangemin;
00060   double rangemax;
00061   double rangeminabs;
00062   double rangemaxabs;
00063   double step;
00064   unsigned int precision;
00065   unsigned int nsweeps;
00066   unsigned int nbits;
00067 } Variable;
00068
00069 extern const char *format[NPRECISIONS];
00070 extern const double precision[NPRECISIONS];
00071
00072 // Public functions
00073 void variable_new (Variable * variable);
00074 void variable_free (Variable * variable, unsigned int type);
00075 void variable_error (Variable * variable, char *message);
00076 int variable_open_xml (Variable * variable, xmlNode * node,
```

```
00077                         unsigned int algorithm, unsigned int nsteps);
00078 int variable_open_json (Variable * variable, JsonNode * node,
00079                          unsigned int algorithm, unsigned int nsteps);
00080
00081 #endif
```

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