MPCOTool

3.2.0

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Chapter 1

MPCOTool

The Multi-Purposes Calibration and Optimization Tool. A software to perform calibrations or optimizations of empirical parameters.

VERSIONS

- 3.2.0: Stable and recommended version.
- 3.3.0: Developing version to do new features.

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TOOLS AND LIBRARIES REQUIRED TO BUILD THE EXECUTABLE

- gcc or clang (to compile the source code)
- make (to build the executable file)
- autoconf (to generate the Makefile in different operative systems)
- automake (to check the operative system)
- pkg-config (to find the libraries to compile)
- gsl (to generate random numbers)
- libxml (to deal with XML files)
- glib (extended utilities of C to work with data, lists, mapped files, regular expressions, using multicores in shared memory machines, ...)
- json-glib (to deal with JSON files)
- genetic (genetic algorithm)

OPTIONAL TOOLS AND LIBRARIES

- `gettext` (to work with different locales)
- `gtk+3` (to create the interactive GUI tool)
- `openmpi` or `mpich` (to run in parallelized tasks on multiple computers)
- `doxygen` (standard comments format to generate documentation)
- `latex` (to build the PDF manuals)

FILES

The source code has to have the following files:

- 3.2.0/configure.ac: configure generator.
- 3.2.0/Makefile.in: Makefile generator.
- 3.2.0/config.h.in: config header generator.
- 3.2.0/mpcotool.c: main source code.
- 3.2.0/mpcotool.h: main header code.
- 3.2.0/mpcotool.ico: icon file.
- 3.2.0/interface.h: interface header code.
- 3.2.0/build: script to build all.
- 3.2.0/logo.png: logo figure.
- 3.2.0/Doxyfile: configuration file to generate doxygen documentation.
- TODO: tasks to do.
- README.md: this file.
- license.md: license file.
- tests/testX/∗: several tests to check the program working.
- locales/∗/LC_MESSAGES/mpcotool.po: translation files.
- manuals/∗.eps: manual figures in EPS format.
- manuals/∗.png: manual figures in PNG format.
- manuals/∗.tex: documentation source files.
- applications/∗/∗: several practical application cases.
- check_errors/∗.xml: several mistaken files to check error handling.

BUILDING INSTRUCTIONS

This software has been built and tested in the following operative systems. Probably, it can be built in other systems, distributions, or versions but it has not been tested.

Debian 8 (Linux, kFreeBSD or Hurd)

DragonFly BSD 4.6

Dyson Illumos

FreeBSD 11.0

Linux Mint DE 2

OpenSUSE Linux Tumbleweed

Ubuntu Linux 16.10

1. Download the latest `genetic` doing on a terminal:

   $ git clone `https://github.com/jburguete/genetic.git`

2. Download this repository:

   $ git clone `https://github.com/jburguete/mpcotool.git`

3. Link the latest genetic version to genetic:

   $ cd mpcotool/3.2.0
   $ ln -s ../../genetic/2.0.1 genetic

4. Build doing on a terminal:

   $ ./build

Fedora Linux 25

1. In order to use OpenMPI compilation do in a terminal (in 64 bits version):

   $ export PATH=$PATH:/usr/lib64/openmpi/bin

2. Then, follow steps 1 to 4 of the previous Debian 8 section.

Microsoft Windows 7

Microsoft Windows 8.1

Microsoft Windows 10

1. Install `MSYS2` and the required libraries and utilities. You can follow detailed instructions in `install-unix`
2. Then, in a MSYS2 terminal, follow steps 1 to 4 of the previous Debian 8 section.
3. Optional Windows binary package can be built doing in the terminal:

   $ make windist

NetBSD 7.0

1. MPI does not work. Follow steps 1 to 3 of the previous Debian 8 section and do in the terminal:

   $ CC=/usr/pkg/gcc5/bin/gcc ./build

OpenBSD 6.0

1. Select adequate versions:

   $ export AUTOCONF_VERSION=2.69 AUTOMAKE_VERSION=1.15

2. Then, in a terminal, follow steps 1 to 4 of the previous Debian 8 section.

OpenIndiana Hipster

1. In order to use OpenMPI compilation do in a terminal:

   $ export PATH=/usr/lib/openmpi/gcc/bin:$PATH

2. Then, follow steps 1 to 4 of the previous Debian 8 section.

Building no-GUI version on servers

On servers or clusters, where no-GUI with MPI parallelization is desirable, replace the 4th step of the previous Debian 8 section by:

$ ./build_without_gui

MAKING MANUALS INSTRUCTIONS

On UNIX type systems you need `texlive` installed. On Windows systems you need `MiKTeX`. In order to compile the manuals you can type on a terminal:

$ make manuals

MAKING TESTS INSTRUCTIONS

In order to build the tests follow the next instructions:

1. Link some tests that needs genetic library doing in a terminal (assuming that you are in the directory mpcotool/3.2.0):

   $ cd ../tests/test2
   $ ln -s ../../../genetic/2.0.1 genetic
   $ cd ../test3
   $ ln -s ../../../genetic/2.0.1 genetic
   $ cd ../test4
   $ ln -s ../../../genetic/2.0.1 genetic

2. Build all tests doing in the same terminal:

   $ cd ../../3.2.0
   $ make tests

USER INSTRUCTIONS

Optional arguments are typed in square brackets.

- Command line in sequential mode (where X is the number of threads to execute and S is a seed for the pseudo-random numbers generator):

  $ ./mpcotoolbin [-nthreads X] [-seed S] input_file.xml [result_file] [variables_file]

- Command line in parallelized mode (where X is the number of threads to open for every node and S is a seed for the pseudo-random numbers generator):

  $ mpirun [MPI options] ./mpcotoolbin [-nthreads X] [-seed S] input_file.xml [result_file] [variables↩ _file]

- The syntax of the simulator has to be:

  $ ./simulator_name input_file_1 [input_file_2] [input_file_3] [input_file_4] output_file

- The syntax of the program to evaluate the objetive function has to be (where the first data in the results file has to be the objective function value):

  $ ./evaluator_name simulated_file data_file results_file

- On UNIX type systems the GUI application can be open doing on a terminal:

  $ ./mpcotool

INPUT FILE FORMAT

The format of the main input file is as:

```
<?xml version="1.0"?>
<optimize simulator="simulator_name" evaluator="evaluator_name" algorithm="algorithm_type" nsimulations=
      "simulations_number" niterations="iterations_number" tolerance="tolerance_value" nbest="best_number"
      npopulation="population_number" ngenerations="generations_number" mutation="mutation_ratio" reproduction=
      "reproduction_ratio" adaptation="adaptation_ratio" direction="direction_search_type" nsteps="steps_number" relaxation=
      "relaxation_parameter" nestimates="estimates_number" threshold="threshold_parameter" norm="norm_type" p=
      "p_parameter" seed="random_seed" result_file="result_file" variables_file="variables_file">
    <experiment name="data_file_1" template1="template_1_1" template2="template_1_2" ... weight="weight_1"/
      >
    ...
    <experiment name="data_file_N" template1="template_N_1" template2="template_N_2" ... weight="weight_N"/
      >
    <variable name="variable_1" minimum="min_value" maximum="max_value" precision="precision_digits" sweeps
      ="sweeps_number" nbits="bits_number" step="step_size"/>
    ...
    <variable name="variable_M" minimum="min_value" maximum="max_value" precision="precision_digits" sweeps
      ="sweeps_number" nbits="bits_number" step="step_size"/>
</optimize>
```

with:

- **simulator**: simulator executable file name.
- **evaluator**: optional. When needed is the evaluator executable file name.
- **seed**: optional. Seed of the pseudo-random numbers generator (default value is 7007).
- **result_file**: optional. It is the name of the optime result file (default name is "result").
- **variables_file**: optional. It is the name of all simulated variables file (default name is "variables").

- **precision**: optional, defined for each variable. Number of precision digits to evaluate the variable. 0 apply for integer numbers (default value is 14).
- **weight**: optional, defined for each experiment. Multiplies the objective value obtained for each experiment in the final objective function value (default value is 1).
- **threshold**: optional, to stop the simulations if objective function value less than the threshold is obtained (default value is 0).
- **algorithm**: optimization algorithm type.
- **norm**: error norm type.

Implemented algorithms are:

- **sweep**: Sweep brute force algorithm. It requires for each variable:
  - *sweeps*: number of sweeps to generate for each variable in every experiment.
    The total number of simulations to run is:

    (number of experiments) x (variable 1 number of sweeps) x ... x (variable n number of sweeps) x (number of iterations)
- **Monte-Carlo**: Monte-Carlo brute force algorithm. It requires on calibrate:
  - *nsimulations*: number of simulations to run in every experiment.
    The total number of simulations to run is:

    (number of experiments) x (number of simulations) x (number of iterations)
- Both brute force algorithms can be iterated to improve convergence by using the following parameters:
  - *nbest*: number of best simulations to calculate convergence interval on next iteration (default 1).
  - *tolerance*: tolerance parameter to increase convergence interval (default 0).
  - *niterations*: number of iterations (default 1).
    It multiplies the total number of simulations:

    x (number of iterations)
- Moreover, both brute force algorithms can be coupled with a direction search method by using:
  - *direction*: method to estimate the optimal direction. Two options are currently available:
    - coordinates: coordinates descent method.
      It increases the total number of simulations by:

      (number of experiments) x (number of iterations) x (number of steps) x 2 x (number of variables)
    - random: random method. It requires:
    - nestimates: number of random checks to estimate the optimal direction.
      It increases the total number of simulations by:

      (number of experiments) x (number of iterations) x (number of steps) x (number of estimates)

  Both methods require also:

  - nsteps: number of steps to perform the direction search method,
  - relaxation: relaxation parameter,

  and for each variable:

  - step: initial step size for the direction search method.
- **genetic**: Genetic algorithm. It requires the following parameters:

  - *npopulation*: number of population.
  - *ngenerations*: number of generations.
  - *mutation*: mutation ratio.
  - *reproduction*: reproduction ratio.
  - *adaptation*: adaptation ratio.

  and for each variable:

  - *nbits*: number of bits to encode each variable.

  The total number of simulations to run is:

  (number of experiments) x (npopulation) x [1 + (ngenerations - 1) x (mutation + reproduction + adaptation)]

Implemented error noms are:

- **euclidian**: Euclidian norm.
- **maximum**: maximum norm.
- **p**: p-norm. It requires the parameter:
  - *p*: p exponent.
- **taxicab**: Taxicab norm.

Alternatively, the input file can be also written in JSON format as:

```
{
    "simulator": "simulator_name",
    "evaluator": "evaluator_name",
    "algorithm": "algorithm_type",
    "nsimulations": "simulations_number",
    "niterations": "iterations_number",
    "tolerance": "tolerance_value",
    "nbest": "best_number",
    "npopulation": "population_number",
    "ngenerations": "generations_number",
    "mutation": "mutation_ratio",
    "reproduction": "reproduction_ratio",
    "adaptation": "adaptation_ratio",
    "direction": "direction_search_type",
    "nsteps": "steps_number",
    "relaxation": "relaxation_parameter",
    "nestimates": "estimates_number",
    "threshold": "threshold_parameter",
    "norm": "norm_type",
    "p": "p_parameter",
    "seed": "random_seed",
    "result_file": "result_file",
    "variables_file": "variables_file",
    "experiments":
    [
        {
            "name": "data_file_1",
            "template1": "template_1_1",
            "template2": "template_1_2",
            ...
            "weight": "weight_1",
        },
        ...
        {
            "name": "data_file_N",
            "template1": "template_N_1",
            "template2": "template_N_2",
            ...
            "weight": "weight_N",
        }
    ],
    "variables":
```

```
    [
        {

            "name": "variable_1",
            "minimum": "min_value",
            "maximum": "max_value",
            "precision": "precision_digits",
            "sweeps": "sweeps_number",
            "nbits": "bits_number",
            "step": "step_size",
        },
        ...
        {
            "name": "variable_M",
            "minimum": "min_value",
            "maximum": "max_value",
            "precision": "precision_digits",
            "sweeps": "sweeps_number",
            "nbits": "bits_number",
            "step": "step_size",
        }
    ]
}
```

SOME EXAMPLES OF INPUT FILES

Example 1

- The simulator program name is: *pivot*
- The syntax is:

  $ ./pivot input_file output_file

- The program to evaluate the objective function is: *compare*
- The syntax is:

  $ ./compare simulated_file data_file result_file

- The calibration is performed with a *sweep brute force algorithm*.
- The experimental data files are:

  27-48.txt
  42.txt
  52.txt
  100.txt

- Templates to get input files to simulator for each experiment are:

  template1.js
  template2.js
  template3.js
  template4.js

- The variables to calibrate, ranges, precision and sweeps number to perform are:

  alpha1, [179.70, 180.20], 2, 5
  alpha2, [179.30, 179.60], 2, 5
  random, [0.00, 0.20], 2, 5
  boot-time, [0.0, 3.0], 1, 5

- Then, the number of simulations to run is: 4x5x5x5x5=2500.
- The input file is:

```
<?xml version="1.0"?>
<optimize simulator="pivot" evaluator="compare" algorithm="sweep">
    <experiment name="27-48.txt" template1="template1.js"/>
    <experiment name="42.txt" template1="template2.js"/>
    <experiment name="52.txt" template1="template3.js"/>
    <experiment name="100.txt" template1="template4.js"/>
    <variable name="alpha1" minimum="179.70" maximum="180.20" precision="2" nsweeps="5"/>
    <variable name="alpha2" minimum="179.30" maximum="179.60" precision="2" nsweeps="5"/>
    <variable name="random" minimum="0.00" maximum="0.20" precision="2" nsweeps="5"/>
    <variable name="boot-time" minimum="0.0" maximum="3.0" precision="1" nsweeps="5"/>
</optimize>
```

- A template file as *template1.js*:

```
{
  "towers" :
  [
    {
      "length"      : 50.11,
      "velocity"    : 0.02738,
      "@variable1@" : @value1@,
      "@variable2@" : @value2@,
      "@variable3@" : @value3@,
      "@variable4@" : @value4@
    },
    {
      "length"    : 50.11,
      "velocity"  : 0.02824,
      "@variable1@" : @value1@,
      "@variable2@" : @value2@,
      "@variable3@" : @value3@,
      "@variable4@" : @value4@
    },
    {
      "length"    : 50.11,
      "velocity"  : 0.03008,
      "@variable1@" : @value1@,
      "@variable2@" : @value2@,
      "@variable3@" : @value3@,
      "@variable4@" : @value4@
    },
    {
      "length"    : 50.11,
      "velocity"  : 0.03753,
      "@variable1@" : @value1@,
      "@variable2@" : @value2@,
      "@variable3@" : @value3@,
      "@variable4@" : @value4@
    }
  ],
  "cycle-time"     : 71.0,
  "plot-time"     : 1.0,
  "comp-time-step": 0.1,
  "active-percent" : 27.48
}
```

- produces simulator input files to reproduce the experimental data file *27-48.txt* as:

```
{
  "towers" :
  [
    {
      "length"      : 50.11,
      "velocity"    : 0.02738,
      "alpha1" : 179.95,
      "alpha2" : 179.45,
      "random" : 0.10,
      "boot-time" : 1.5
    },
    {
      "length"    : 50.11,
      "velocity"  : 0.02824,
      "alpha1" : 179.95,
      "alpha2" : 179.45,
      "random" : 0.10,
      "boot-time" : 1.5
    },
    {
      "length"    : 50.11,
      "velocity"  : 0.03008,
```

```
      "alpha1" : 179.95,
      "alpha2" : 179.45,
      "random" : 0.10,
      "boot-time" : 1.5
    },
    {
      "length"    : 50.11,
      "velocity"  : 0.03753,
      "alpha1" : 179.95,
      "alpha2" : 179.45,
      "random" : 0.10,
      "boot-time" : 1.5
    }
  ],
  "cycle-time"     : 71.0,
  "plot-time"     : 1.0,
  "comp-time-step": 0.1,
  "active-percent" : 27.48
}
```

Chapter 2

Data Structure Index

2.1 Data Structures

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File Index

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Chapter 4

Data Structure Documentation

4.1 Experiment Struct Reference

Struct to define the experiment data.

`#include <experiment.h>`

Data Fields

- char * name

  File name.
- char * template [MAX_NINPUTS]

  Array of template names of input files.
- double weight

  Objective function weight.
- unsigned int ninputs

  Number of input files to the simulator.

4.1.1 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:

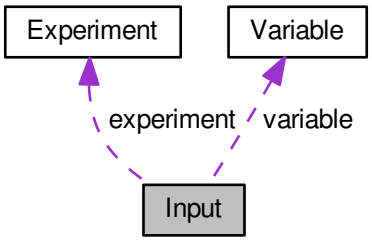
- experiment.h

4.2 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.

4.2.1 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

4.3 Optimize Struct Reference

Struct to define the optimization ation data.

`#include <optimize.h>`

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.

4.3.1 Detailed Description

Struct to define the optimization ation data.

Definition at line 45 of file optimize.h.

4.3.2 Field Documentation

4.3.2.1 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

4.4 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.

4.4.1 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

4.5 ParallelData Struct Reference

Struct to pass to the GThreads parallelized function.

`#include <optimize.h>`

Data Fields

- unsigned int thread
  Thread number.

4.5.1 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

4.6 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.

4.6.1 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

4.7 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.

4.7.1 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:

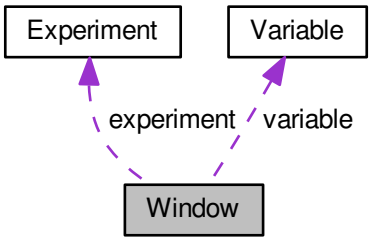
- variable.h

4.8 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.

4.8.1 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

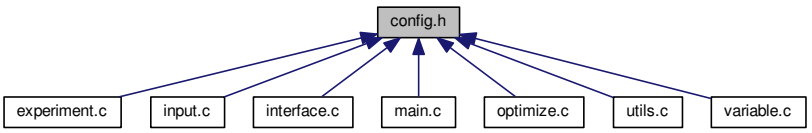
Chapter 5

File Documentation

5.1 config.h File Reference

Configuration header file.

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



Macros

- #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.

5.1.1 Detailed Description

Configuration header file.

Authors

Javier Burguete and Borja Latorre.

Copyright

Copyright 2012-2016, all rights reserved.

Definition in file config.h.

5.1.2 Enumeration Type Documentation

5.1.2.1 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 125 of file config.h.

```
00126 {
00127   INPUT_TYPE_XML = 0,
00128   INPUT_TYPE_JSON = 1
00129 };
```

5.2 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
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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 // Array sizes
00043
00044 #define MAX_NINPUTS 8
00045 #define NALGORITHMS 3
00047 #define NDIRECTIONS 2
00048 #define NNORMS 4
00049 #define NPRECISIONS 15
00050
00051 // Default choices
00052
00053 #define DEFAULT_PRECISION (NPRECISIONS - 1)
00054 #define DEFAULT_RANDOM_SEED 7007
00055 #define DEFAULT_RELAXATION 1.
00056
00057 // Interface labels
00058
00059 #define LOCALE_DIR "locales"
00060 #define PROGRAM_INTERFACE "mpcotool"
00061
00062 // Labels
00063
00064 #define LABEL_ABSOLUTE_MINIMUM "absolute_minimum"
00065 #define LABEL_ABSOLUTE_MAXIMUM "absolute_maximum"
00067 #define LABEL_ADAPTATION "adaptation"
00069 #define LABEL_ALGORITHM "algorithm"
00070 #define LABEL_OPTIMIZE "optimize"
00071 #define LABEL_COORDINATES "coordinates"
00072 #define LABEL_DIRECTION "direction"
00073 #define LABEL_EUCLIDIAN "euclidian"
00074 #define LABEL_EVALUATOR "evaluator"
00075 #define LABEL_EXPERIMENT "experiment"
00076 #define LABEL_EXPERIMENTS "experiments"
00077 #define LABEL_GENETIC "genetic"
00078 #define LABEL_MINIMUM "minimum"
00079 #define LABEL_MAXIMUM "maximum"
00080 #define LABEL_MONTE_CARLO "Monte-Carlo"
00081 #define LABEL_MUTATION "mutation"
00082 #define LABEL_NAME "name"
00083 #define LABEL_NBEST "nbest"
00084 #define LABEL_NBITS "nbits"
00085 #define LABEL_NESTIMATES "nestimates"
00086 #define LABEL_NGENERATIONS "ngenerations"
00087 #define LABEL_NITERATIONS "niterations"
00088 #define LABEL_NORM "norm"
00089 #define LABEL_NPOPULATION "npopulation"
00090 #define LABEL_NSIMULATIONS "nsimulations"
00091 #define LABEL_NSTEPS "nsteps"
00092 #define LABEL_NSWEEPS "nsweeps"
00093 #define LABEL_P "p"
00094 #define LABEL_PRECISION "precision"
00095 #define LABEL_RANDOM "random"
00096 #define LABEL_RELAXATION "relaxation"
00097 #define LABEL_REPRODUCTION "reproduction"
```

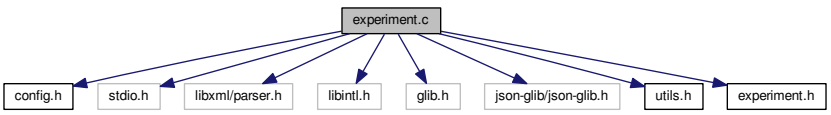
```
00098 #define LABEL_RESULT_FILE "result_file"
00099 #define LABEL_SIMULATOR "simulator"
00100 #define LABEL_SEED "seed"
00101 #define LABEL_STEP "step"
00102 #define LABEL_SWEEP "sweep"
00103 #define LABEL_TAXICAB "taxicab"
00104 #define LABEL_TEMPLATE1 "template1"
00105 #define LABEL_TEMPLATE2 "template2"
00106 #define LABEL_TEMPLATE3 "template3"
00107 #define LABEL_TEMPLATE4 "template4"
00108 #define LABEL_TEMPLATE5 "template5"
00109 #define LABEL_TEMPLATE6 "template6"
00110 #define LABEL_TEMPLATE7 "template7"
00111 #define LABEL_TEMPLATE8 "template8"
00112 #define LABEL_THRESHOLD "threshold"
00113 #define LABEL_TOLERANCE "tolerance"
00114 #define LABEL_VARIABLE "variable"
00115 #define LABEL_VARIABLES "variables"
00116 #define LABEL_VARIABLES_FILE "variables_file"
00117 #define LABEL_WEIGHT "weight"
00118
00119 // Enumerations
00120
00125 enum INPUT_TYPE
00126 {
00127   INPUT_TYPE_XML = 0,
00128   INPUT_TYPE_JSON = 1
00129 };
00130
00131 #endif
```

5.3 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 **_GNU_SOURCE**
- #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 * template [MAX_NINPUTS]

  Array of xmlChar strings with template labels.

5.3.1 Detailed Description

Source file to define the experiment data.

Authors

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Definition in file experiment.c.

5.3.2 Function Documentation

5.3.2.1 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", gettext ("Experiment"), message);
00126   else
00127     snprintf (buffer, 64, "%s %s: %s", gettext ("Experiment"), experiment->name,
00128               message);
00129   error_message = g_strdup (buffer);
00130 }
```

5.3.2.2 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->template[i]);
00098       xmlFree (experiment->name);
00099     }
00100   else
00101     {
00102       for (i = 0; i < experiment->ninputs; ++i)
00103         g_free (experiment->template[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 }
```

5.3.2.3 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->template[i] = NULL;
00074 #if DEBUG_EXPERIMENT
00075   fprintf (stderr, "input_new: end\n");
00076 #endif
00077 }
```

5.3.2.4 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

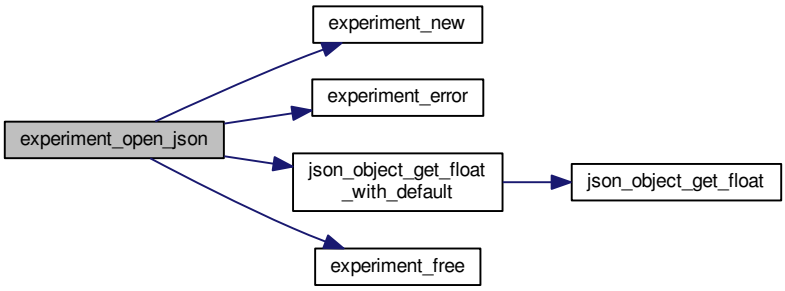
1 on success, 0 on error.

Definition at line 252 of file experiment.c.

```
00254 {
00255   char buffer[64];
00256   JsonObject *object;
00257   const char *name;
00258   int error_code;
00259   unsigned int i;
00260
00261 #if DEBUG_EXPERIMENT
00262   fprintf (stderr, "experiment_open_json: start\n");
00263 #endif
00264
00265   // Resetting experiment data
00266   experiment_new (experiment);
00267
00268   // Getting JSON object
00269   object = json_node_get_object (node);
00270
00271   // Reading the experimental data
00272   name = json_object_get_string_member (object, LABEL_NAME);
00273   if (!name)
00274     {
00275       experiment_error (experiment, gettext ("no data file name"));
00276       goto exit_on_error;
00277     }
00278   experiment->name = g_strdup (name);
00279 #if DEBUG_EXPERIMENT
00280   fprintf (stderr, "experiment_open_json: name=%s\n", experiment->name);
00281 #endif
```

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

Here is the call graph for this function:



5.3.2.5 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

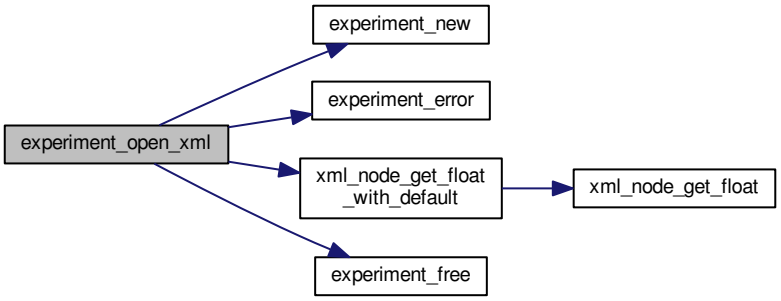
1 on success, 0 on error.

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, gettext ("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     = xml_node_get_float_with_default (node, (const xmlChar *)
      LABEL_WEIGHT, 1.,
00171                                        &error_code);
00172   if (error_code)
00173     {
00174       experiment_error (experiment, gettext ("bad weight"));
00175       goto exit_on_error;
00176     }
00177 #if DEBUG_EXPERIMENT
00178   fprintf (stderr, "experiment_open_xml: weight=%lg\n", experiment->weight);
00179 #endif
00180   experiment->template[0]
00181     = (char *) xmlGetProp (node, (const xmlChar *) template[0]);
00182   if (experiment->template[0])
00183     {
00184 #if DEBUG_EXPERIMENT
00185       fprintf (stderr, "experiment_open_xml: experiment=%s template1=%s\n",
00186                experiment->name, template[0]);
00187 #endif
00188       ++experiment->ninputs;
00189     }
00190   else
00191     {
00192       experiment_error (experiment, gettext ("no template"));
00193       goto exit_on_error;
00194     }
00195   for (i = 1; i < MAX_NINPUTS; ++i)
00196     {
00197 #if DEBUG_EXPERIMENT
00198       fprintf (stderr, "experiment_open_xml: template%u\n", i + 1);
00199 #endif
00200       if (xmlHasProp (node, (const xmlChar *) template[i]))
00201         {
00202           if (ninputs && ninputs <= i)
00203             {
00204               experiment_error (experiment, gettext ("bad templates number"));
00205               goto exit_on_error;
00206             }
00207           experiment->template[i]
00208             = (char *) xmlGetProp (node, (const xmlChar *) template[i]);
00209 #if DEBUG_EXPERIMENT
00210           fprintf (stderr, "experiment_open_xml: experiment=%s template%u=%s\n",
00211                    experiment->nexperiments, experiment->name,
00212                    experiment->template[i]);
00213 #endif
00214           ++experiment->ninputs;
00215         }
00216       else if (ninputs && ninputs > i)
00217         {
00218           snprintf (buffer, 64, "%s%u", gettext ("no template"), i + 1);
00219           experiment_error (experiment, buffer);
00220           goto exit_on_error;
00221         }
00222       else
00223         break;
00224     }
00225
00226 #if DEBUG_EXPERIMENT
00227   fprintf (stderr, "experiment_open_xml: end\n");
00228 #endif
00229   return 1;
00230
00231 exit_on_error:
00232   experiment_free (experiment, INPUT_TYPE_XML);
00233 #if DEBUG_EXPERIMENT
00234   fprintf (stderr, "experiment_open_xml: end\n");
00235 #endif
00236   return 0;
00237 }
```

Here is the call graph for this function:



5.3.3 Variable Documentation

5.3.3.1 template

```
const char* template[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 template labels.

Definition at line 50 of file experiment.c.

5.4 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
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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 <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 *template[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->template[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->template[i]);
00098       xmlFree (experiment->name);
00099     }
00100   else
00101     {
00102       for (i = 0; i < experiment->ninputs; ++i)
00103         g_free (experiment->template[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", gettext ("Experiment"), message);
00126   else
00127     snprintf (buffer, 64, "%s %s: %s", gettext ("Experiment"), experiment->name,
00128               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, gettext ("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     = xml_node_get_float_with_default (node, (const xmlChar *)
      LABEL_WEIGHT, 1.,
00171                                        &error_code);
00172   if (error_code)
00173     {
00174       experiment_error (experiment, gettext ("bad weight"));
00175       goto exit_on_error;
00176     }
00177 #if DEBUG_EXPERIMENT
00178   fprintf (stderr, "experiment_open_xml: weight=%lg\n", experiment->weight);
00179 #endif
00180   experiment->template[0]
00181     = (char *) xmlGetProp (node, (const xmlChar *) template[0]);
00182   if (experiment->template[0])
00183     {
00184 #if DEBUG_EXPERIMENT
00185       fprintf (stderr, "experiment_open_xml: experiment=%s template1=%s\n",
00186                experiment->name, template[0]);
00187 #endif
00188       ++experiment->ninputs;
00189     }
00190   else
00191     {
00192       experiment_error (experiment, gettext ("no template"));
00193       goto exit_on_error;
00194     }
00195   for (i = 1; i < MAX_NINPUTS; ++i)
00196     {
00197 #if DEBUG_EXPERIMENT
00198       fprintf (stderr, "experiment_open_xml: template%u\n", i + 1);
00199 #endif
00200       if (xmlHasProp (node, (const xmlChar *) template[i]))
00201         {
00202           if (ninputs && ninputs <= i)
00203             {
00204               experiment_error (experiment, gettext ("bad templates number"));
00205               goto exit_on_error;
00206             }
00207           experiment->template[i]
00208             = (char *) xmlGetProp (node, (const xmlChar *) template[i]);
00209 #if DEBUG_EXPERIMENT
00210           fprintf (stderr, "experiment_open_xml: experiment=%s template%u=%s\n",
00211                    experiment->nexperiments, experiment->name,
00212                    experiment->template[i]);
00213 #endif
00214           ++experiment->ninputs;
00215         }
00216       else if (ninputs && ninputs > i)
00217         {
00218           snprintf (buffer, 64, "%s%u", gettext ("no template"), i + 1);
00219           experiment_error (experiment, buffer);
00220           goto exit_on_error;
00221         }
00222       else
00223         break;
00224     }
00225
00226 #if DEBUG_EXPERIMENT
00227   fprintf (stderr, "experiment_open_xml: end\n");
00228 #endif
00229   return 1;
00230
00231 exit_on_error:
00232   experiment_free (experiment, INPUT_TYPE_XML);
00233 #if DEBUG_EXPERIMENT
00234   fprintf (stderr, "experiment_open_xml: end\n");
```

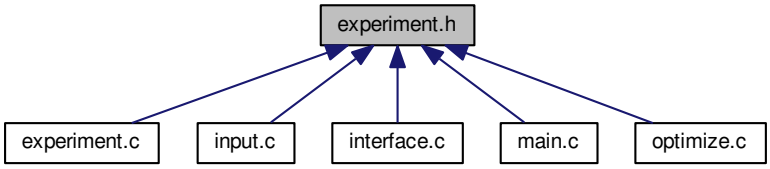
```
00235 #endif
00236   return 0;
00237 }
00238
00251 int
00252 experiment_open_json (Experiment * experiment, JsonNode * node,
00253                       unsigned int ninputs)
00254 {
00255   char buffer[64];
00256   JsonObject *object;
00257   const char *name;
00258   int error_code;
00259   unsigned int i;
00260
00261 #if DEBUG_EXPERIMENT
00262   fprintf (stderr, "experiment_open_json: start\n");
00263 #endif
00264
00265   // Resetting experiment data
00266   experiment_new (experiment);
00267
00268   // Getting JSON object
00269   object = json_node_get_object (node);
00270
00271   // Reading the experimental data
00272   name = json_object_get_string_member (object, LABEL_NAME);
00273   if (!name)
00274     {
00275       experiment_error (experiment, gettext ("no data file name"));
00276       goto exit_on_error;
00277     }
00278   experiment->name = g_strdup (name);
00279 #if DEBUG_EXPERIMENT
00280   fprintf (stderr, "experiment_open_json: name=%s\n", experiment->name);
00281 #endif
00282   experiment->weight
00283     = json_object_get_float_with_default (object,
    LABEL_WEIGHT, 1.,
00284                                           &error_code);
00285   if (error_code)
00286     {
00287       experiment_error (experiment, gettext ("bad weight"));
00288       goto exit_on_error;
00289     }
00290 #if DEBUG_EXPERIMENT
00291   fprintf (stderr, "experiment_open_json: weight=%lg\n", experiment->weight);
00292 #endif
00293   name = json_object_get_string_member (object, template[0]);
00294   if (name)
00295     {
00296 #if DEBUG_EXPERIMENT
00297       fprintf (stderr, "experiment_open_json: experiment=%s template1=%s\n",
00298                name, template[0]);
00299 #endif
00300       ++experiment->ninputs;
00301     }
00302   else
00303     {
00304       experiment_error (experiment, gettext ("no template"));
00305       goto exit_on_error;
00306     }
00307   experiment->template[0] = g_strdup (name);
00308   for (i = 1; i < MAX_NINPUTS; ++i)
00309     {
00310 #if DEBUG_EXPERIMENT
00311       fprintf (stderr, "experiment_open_json: template%u\n", i + 1);
00312 #endif
00313       if (json_object_get_member (object, template[i]))
00314         {
00315           if (ninputs && ninputs <= i)
00316             {
00317               experiment_error (experiment, gettext ("bad templates number"));
00318               goto exit_on_error;
00319             }
00320           name = json_object_get_string_member (object, template[i]);
00321 #if DEBUG_EXPERIMENT
00322           fprintf (stderr,
00323                    "experiment_open_json: experiment=%s template%u=%s\n",
00324                    experiment->nexperiments, name, template[i]);
00325 #endif
00326           experiment->template[i] = g_strdup (name);
00327           ++experiment->ninputs;
00328         }
00329       else if (ninputs && ninputs > i)
00330         {
00331           snprintf (buffer, 64, "%s%u", gettext ("no template"), i + 1);
00332           experiment_error (experiment, buffer);
```

```
00333           goto exit_on_error;
00334         }
00335       else
00336         break;
00337     }
00338
00339 #if DEBUG_EXPERIMENT
00340   fprintf (stderr, "experiment_open_json: end\n");
00341 #endif
00342   return 1;
00343
00344 exit_on_error:
00345   experiment_free (experiment, INPUT_TYPE_JSON);
00346 #if DEBUG_EXPERIMENT
00347   fprintf (stderr, "experiment_open_json: end\n");
00348 #endif
00349   return 0;
00350 }
```

5.5 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 * template [MAX_NINPUTS]

  Array of xmlChar strings with template labels.

5.5.1 Detailed Description

Header file to define the experiment data.

Authors

Javier Burguete.

Copyright

Copyright 2012-2016, all rights reserved.

Definition in file experiment.h.

5.5.2 Function Documentation

5.5.2.1 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", gettext ("Experiment"), message);
00126   else
00127     snprintf (buffer, 64, "%s %s: %s", gettext ("Experiment"), experiment->name,
00128               message);
00129   error_message = g_strdup (buffer);
00130 }
```

5.5.2.2 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->template[i]);
00098       xmlFree (experiment->name);
00099     }
00100   else
00101     {
00102       for (i = 0; i < experiment->ninputs; ++i)
00103         g_free (experiment->template[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 }
```

5.5.2.3 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->template[i] = NULL;
00074 #if DEBUG_EXPERIMENT
00075   fprintf (stderr, "input_new: end\n");
00076 #endif
00077 }
```

5.5.2.4 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

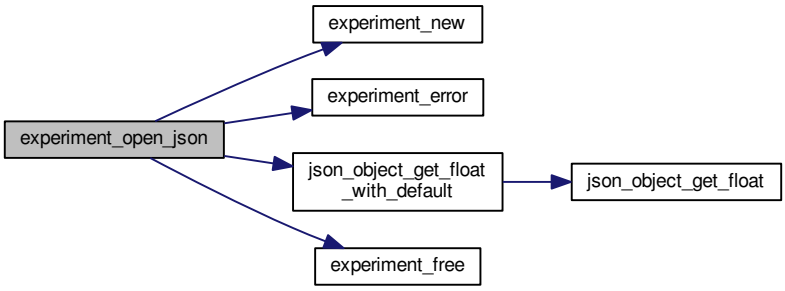
1 on success, 0 on error.

Definition at line 252 of file experiment.c.

```
00254 {
00255   char buffer[64];
00256   JsonObject *object;
00257   const char *name;
00258   int error_code;
00259   unsigned int i;
00260
00261 #if DEBUG_EXPERIMENT
00262   fprintf (stderr, "experiment_open_json: start\n");
00263 #endif
00264
00265   // Resetting experiment data
00266   experiment_new (experiment);
00267
00268   // Getting JSON object
00269   object = json_node_get_object (node);
00270
00271   // Reading the experimental data
00272   name = json_object_get_string_member (object, LABEL_NAME);
00273   if (!name)
00274     {
00275       experiment_error (experiment, gettext ("no data file name"));
00276       goto exit_on_error;
00277     }
00278   experiment->name = g_strdup (name);
00279 #if DEBUG_EXPERIMENT
00280   fprintf (stderr, "experiment_open_json: name=%s\n", experiment->name);
00281 #endif
00282   experiment->weight
00283     = json_object_get_float_with_default (object,
      LABEL_WEIGHT, 1.,
00284                                           &error_code);
00285   if (error_code)
00286     {
00287       experiment_error (experiment, gettext ("bad weight"));
00288       goto exit_on_error;
00289     }
00290 #if DEBUG_EXPERIMENT
00291   fprintf (stderr, "experiment_open_json: weight=%lg\n", experiment->weight);
00292 #endif
00293   name = json_object_get_string_member (object, template[0]);
00294   if (name)
00295     {
00296 #if DEBUG_EXPERIMENT
00297       fprintf (stderr, "experiment_open_json: experiment=%s template1=%s\n",
00298                name, template[0]);
00299 #endif
00300       ++experiment->ninputs;
00301     }
00302   else
00303     {
00304       experiment_error (experiment, gettext ("no template"));
00305       goto exit_on_error;
00306     }
00307   experiment->template[0] = g_strdup (name);
00308   for (i = 1; i < MAX_NINPUTS; ++i)
00309     {
00310 #if DEBUG_EXPERIMENT
```

```
00311       fprintf (stderr, "experiment_open_json: template%u\n", i + 1);
00312 #endif
00313       if (json_object_get_member (object, template[i]))
00314         {
00315           if (ninputs && ninputs <= i)
00316             {
00317               experiment_error (experiment, gettext ("bad templates number"));
00318               goto exit_on_error;
00319             }
00320           name = json_object_get_string_member (object, template[i]);
00321 #if DEBUG_EXPERIMENT
00322           fprintf (stderr,
00323                    "experiment_open_json: experiment=%s template%u=%s\n",
00324                    experiment->nexperiments, name, template[i]);
00325 #endif
00326           experiment->template[i] = g_strdup (name);
00327           ++experiment->ninputs;
00328         }
00329       else if (ninputs && ninputs > i)
00330         {
00331           snprintf (buffer, 64, "%s%u", gettext ("no template"), i + 1);
00332           experiment_error (experiment, buffer);
00333           goto exit_on_error;
00334         }
00335       else
00336         break;
00337     }
00338
00339 #if DEBUG_EXPERIMENT
00340   fprintf (stderr, "experiment_open_json: end\n");
00341 #endif
00342   return 1;
00343
00344 exit_on_error:
00345   experiment_free (experiment, INPUT_TYPE_JSON);
00346 #if DEBUG_EXPERIMENT
00347   fprintf (stderr, "experiment_open_json: end\n");
00348 #endif
00349   return 0;
00350 }
```

Here is the call graph for this function:



5.5.2.5 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

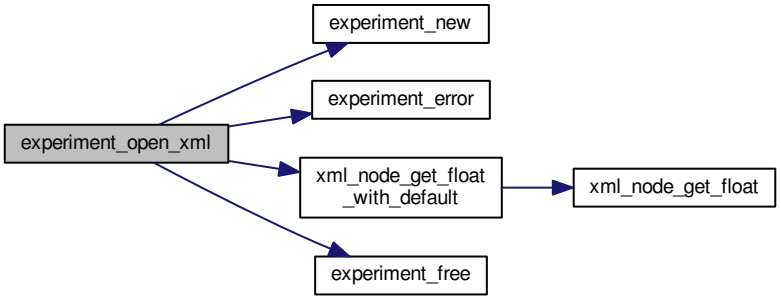
1 on success, 0 on error.

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, gettext ("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     = xml_node_get_float_with_default (node, (const xmlChar *)
      LABEL_WEIGHT, 1.,
00171                                        &error_code);
00172   if (error_code)
00173     {
00174       experiment_error (experiment, gettext ("bad weight"));
00175       goto exit_on_error;
00176     }
00177 #if DEBUG_EXPERIMENT
00178   fprintf (stderr, "experiment_open_xml: weight=%lg\n", experiment->weight);
00179 #endif
00180   experiment->template[0]
00181     = (char *) xmlGetProp (node, (const xmlChar *) template[0]);
00182   if (experiment->template[0])
00183     {
00184 #if DEBUG_EXPERIMENT
00185       fprintf (stderr, "experiment_open_xml: experiment=%s template1=%s\n",
00186                experiment->name, template[0]);
00187 #endif
00188       ++experiment->ninputs;
00189     }
00190   else
00191     {
00192       experiment_error (experiment, gettext ("no template"));
00193       goto exit_on_error;
00194     }
00195   for (i = 1; i < MAX_NINPUTS; ++i)
00196     {
00197 #if DEBUG_EXPERIMENT
00198       fprintf (stderr, "experiment_open_xml: template%u\n", i + 1);
00199 #endif
00200       if (xmlHasProp (node, (const xmlChar *) template[i]))
00201         {
00202           if (ninputs && ninputs <= i)
00203             {
00204               experiment_error (experiment, gettext ("bad templates number"));
00205               goto exit_on_error;
00206             }
00207           experiment->template[i]
00208             = (char *) xmlGetProp (node, (const xmlChar *) template[i]);
00209 #if DEBUG_EXPERIMENT
00210           fprintf (stderr, "experiment_open_xml: experiment=%s template%u=%s\n",
```

```
00211                   experiment->nexperiments, experiment->name,
00212                   experiment->template[i]);
00213 #endif
00214           ++experiment->ninputs;
00215         }
00216       else if (ninputs && ninputs > i)
00217         {
00218           snprintf (buffer, 64, "%s%u", gettext ("no template"), i + 1);
00219           experiment_error (experiment, buffer);
00220           goto exit_on_error;
00221         }
00222       else
00223         break;
00224     }
00225
00226 #if DEBUG_EXPERIMENT
00227   fprintf (stderr, "experiment_open_xml: end\n");
00228 #endif
00229   return 1;
00230
00231 exit_on_error:
00232   experiment_free (experiment, INPUT_TYPE_XML);
00233 #if DEBUG_EXPERIMENT
00234   fprintf (stderr, "experiment_open_xml: end\n");
00235 #endif
00236   return 0;
00237 }
```

Here is the call graph for this function:



5.6 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 2012-2016, 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,
```

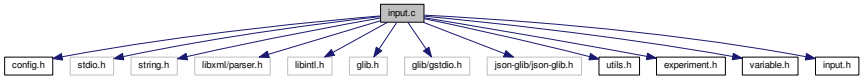
```
00024 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00025 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00026 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00027 CONTRACT, STRICT LIABILITY, OR TORT (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 *template[MAX_NINPUTS];
00049   double weight;
00050   unsigned int ninputs;
00051 } Experiment;
00052
00053 extern const char *template[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
```

5.7 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 **_GNU_SOURCE**
- #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.

5.7.1 Detailed Description

Source file to define the input functions.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file input.c.

5.7.2 Function Documentation

5.7.2.1 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", gettext ("Input"), message);
00128   error_message = g_strdup (buffer);
00129 }
```

5.7.2.2 input_open()

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

Function to open the input file.

Parameters

filename	Input data file name.

Returns

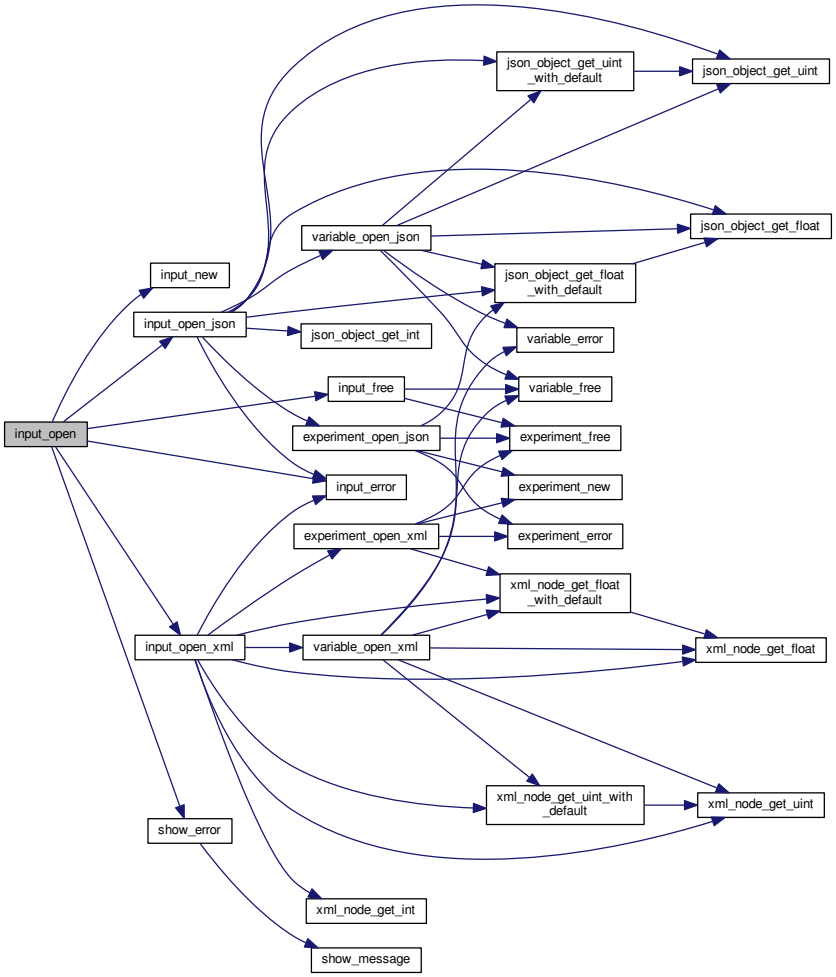
1_on_success, 0_on_error.

Definition at line 947 of file input.c.

```
00948 {
00949   xmlDoc *doc;
00950   JsonParser *parser;
00951
00952 #if DEBUG_INPUT
00953   fprintf (stderr, "input_open: start\n");
00954 #endif
00955
00956   // Resetting input data
00957   input_new ();
00958
00959   // Opening input file
00960 #if DEBUG_INPUT
00961   fprintf (stderr, "input_open: opening the input file %s\n", filename);
00962   fprintf (stderr, "input_open: trying XML format\n");
00963 #endif
00964   doc = xmlParseFile (filename);
00965   if (!doc)
00966     {
00967 #if DEBUG_INPUT
00968       fprintf (stderr, "input_open: trying JSON format\n");
00969 #endif
00970       parser = json_parser_new ();
00971       if (!json_parser_load_from_file (parser, filename, NULL))
00972         {
00973           input_error (gettext ("Unable to parse the input file"));
00974           goto exit_on_error;
00975         }
00976       if (!input_open_json (parser))
00977         goto exit_on_error;
00978     }
00979   else if (!input_open_xml (doc))
00980     goto exit_on_error;
00981
00982   // Getting the working directory
```

```
00983   input->directory = g_path_get_dirname (filename);
00984   input->name = g_path_get_basename (filename);
00985
00986 #if DEBUG_INPUT
00987   fprintf (stderr, "input_open: end\n");
00988 #endif
00989   return 1;
00990
00991 exit_on_error:
00992   show_error (error_message);
00993   g_free (error_message);
00994   input_free ();
00995 #if DEBUG_INPUT
00996   fprintf (stderr, "input_open: end\n");
00997 #endif
00998   return 0;
00999 }
```

Here is the call graph for this function:



5.7.2.3 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 557 of file input.c.

```
00558 {
00559   JsonNode *node, *child;
00560   JsonObject *object;
00561   JsonArray *array;
00562   const char *buffer;
00563   int error_code;
00564   unsigned int i, n;
00565
00566 #if DEBUG_INPUT
00567   fprintf (stderr, "input_open_json: start\n");
00568 #endif
00569
00570   // Resetting input data
00571   input->type = INPUT_TYPE_JSON;
00572
00573   // Getting the root node
00574 #if DEBUG_INPUT
00575   fprintf (stderr, "input_open_json: getting the root node\n");
00576 #endif
00577   node = json_parser_get_root (parser);
00578   object = json_node_get_object (node);
00579
00580   // Getting result and variables file names
00581   if (!input->result)
00582     {
00583       buffer = json_object_get_string_member (object, LABEL_RESULT_FILE);
00584       if (!buffer)
00585         buffer = result_name;
00586       input->result = g_strdup (buffer);
00587     }
00588   else
00589     input->result = g_strdup (result_name);
00590   if (!input->variables)
00591     {
00592       buffer = json_object_get_string_member (object, LABEL_VARIABLES_FILE);
00593       if (!buffer)
00594         buffer = variables_name;
00595       input->variables = g_strdup (buffer);
00596     }
00597   else
00598     input->variables = g_strdup (variables_name);
00599
00600   // Opening simulator program name
00601   buffer = json_object_get_string_member (object, LABEL_SIMULATOR);
00602   if (!buffer)
00603     {
00604       input_error (gettext ("Bad simulator program"));
00605       goto exit_on_error;
00606     }
00607   input->simulator = g_strdup (buffer);
00608
00609   // Opening evaluator program name
00610   buffer = json_object_get_string_member (object, LABEL_EVALUATOR);
00611   if (buffer)
00612     input->evaluator = g_strdup (buffer);
00613
00614   // Obtaining pseudo-random numbers generator seed
00615   input->seed
00616     = json_object_get_uint_with_default (object,
      LABEL_SEED,
00617                                          DEFAULT_RANDOM_SEED, &error_code);
00618   if (error_code)
00619     {
00620       input_error (gettext ("Bad pseudo-random numbers generator seed"));
00621       goto exit_on_error;
00622     }
00623
00624   // Opening algorithm
00625   buffer = json_object_get_string_member (object, LABEL_ALGORITHM);
```

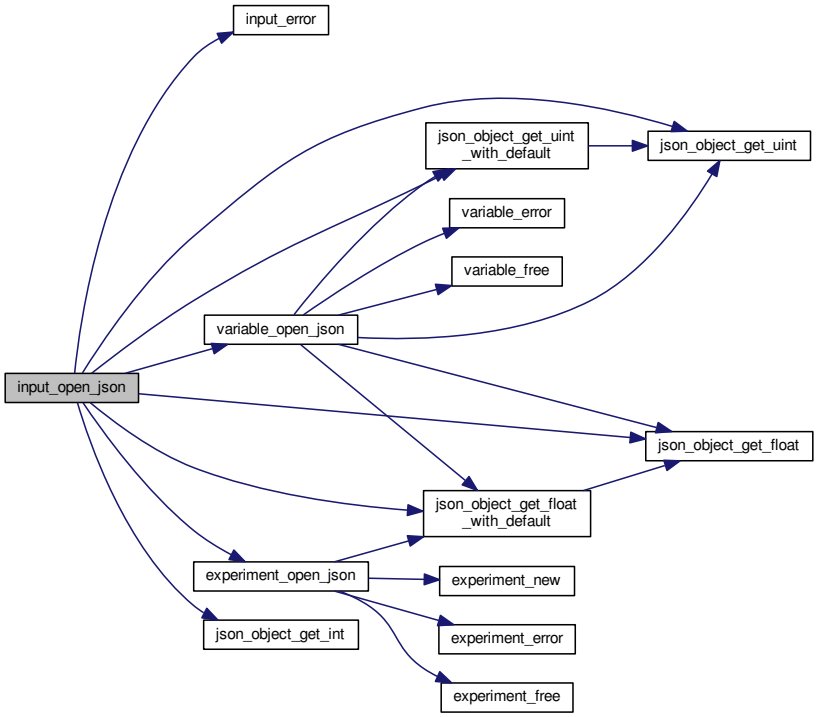
```
00626   if (!strcmp (buffer, LABEL_MONTE_CARLO))
00627     {
00628       input->algorithm = ALGORITHM_MONTE_CARLO;
00629 
00630       // Obtaining simulations number
00631       input->nsimulations
00632         = json_object_get_int (object, LABEL_NSIMULATIONS, &error_code
      );
00633       if (error_code)
00634         {
00635           input_error (gettext ("Bad simulations number"));
00636           goto exit_on_error;
00637         }
00638     }
00639   else if (!strcmp (buffer, LABEL_SWEEP))
00640     input->algorithm = ALGORITHM_SWEEP;
00641   else if (!strcmp (buffer, LABEL_GENETIC))
00642     {
00643       input->algorithm = ALGORITHM_GENETIC;
00644 
00645       // Obtaining population
00646       if (json_object_get_member (object, LABEL_NPOPULATION))
00647         {
00648           input->nsimulations
00649             = json_object_get_uint (object,
      LABEL_NPOPULATION, &error_code);
00650           if (error_code || input->nsimulations < 3)
00651             {
00652               input_error (gettext ("Invalid population number"));
00653               goto exit_on_error;
00654             }
00655         }
00656       else
00657         {
00658           input_error (gettext ("No population number"));
00659           goto exit_on_error;
00660         }
00661 
00662       // Obtaining generations
00663       if (json_object_get_member (object, LABEL_NGENERATIONS))
00664         {
00665           input->niterations
00666             = json_object_get_uint (object,
      LABEL_NGENERATIONS, &error_code);
00667           if (error_code || !input->niterations)
00668             {
00669               input_error (gettext ("Invalid generations number"));
00670               goto exit_on_error;
00671             }
00672         }
00673       else
00674         {
00675           input_error (gettext ("No generations number"));
00676           goto exit_on_error;
00677         }
00678 
00679       // Obtaining mutation probability
00680       if (json_object_get_member (object, LABEL_MUTATION))
00681         {
00682           input->mutation_ratio
00683             = json_object_get_float (object, LABEL_MUTATION, &error_code
      );
00684           if (error_code || input->mutation_ratio < 0.
00685               || input->mutation_ratio >= 1.)
00686             {
00687               input_error (gettext ("Invalid mutation probability"));
00688               goto exit_on_error;
00689             }
00690         }
00691       else
00692         {
00693           input_error (gettext ("No mutation probability"));
00694           goto exit_on_error;
00695         }
00696 
00697       // Obtaining reproduction probability
00698       if (json_object_get_member (object, LABEL_REPRODUCTION))
00699         {
00700           input->reproduction_ratio
00701             = json_object_get_float (object,
      LABEL_REPRODUCTION, &error_code);
00702           if (error_code || input->reproduction_ratio < 0.
00703               || input->reproduction_ratio >= 1.0)
00704             {
00705               input_error (gettext ("Invalid reproduction probability"));
00706               goto exit_on_error;
00707             }
```

```
00708         }
00709       else
00710         {
00711           input_error (gettext ("No reproduction probability"));
00712           goto exit_on_error;
00713         }
00714
00715       // Obtaining adaptation probability
00716       if (json_object_get_member (object, LABEL_ADAPTATION))
00717         {
00718           input->adaptation_ratio
00719             = json_object_get_float (object,
      LABEL_ADAPTATION, &error_code);
00720           if (error_code || input->adaptation_ratio < 0.
00721               || input->adaptation_ratio >= 1.)
00722             {
00723               input_error (gettext ("Invalid adaptation probability"));
00724               goto exit_on_error;
00725             }
00726         }
00727       else
00728         {
00729           input_error (gettext ("No adaptation probability"));
00730           goto exit_on_error;
00731         }
00732
00733       // Checking survivals
00734       i = input->mutation_ratio * input->nsimulations;
00735       i += input->reproduction_ratio * input->
      nsimulations;
00736       i += input->adaptation_ratio * input->
      nsimulations;
00737       if (i > input->nsimulations - 2)
00738         {
00739           input_error
00740             (gettext
00741              ("No enough survival entities to reproduce the population"));
00742           goto exit_on_error;
00743         }
00744     }
00745   else
00746     {
00747       input_error (gettext ("Unknown algorithm"));
00748       goto exit_on_error;
00749     }
00750
00751   if (input->algorithm == ALGORITHM_MONTE_CARLO
00752       || input->algorithm == ALGORITHM_SWEEP)
00753     {
00754
00755       // Obtaining iterations number
00756       input->niterations
00757         = json_object_get_uint (object, LABEL_NITERATIONS, &error_code
      );
00758       if (error_code == 1)
00759         input->niterations = 1;
00760       else if (error_code)
00761         {
00762           input_error (gettext ("Bad iterations number"));
00763           goto exit_on_error;
00764         }
00765
00766       // Obtaining best number
00767       input->nbest
00768         = json_object_get_uint_with_default (object,
      LABEL_NBEST, 1,
00769                                              &error_code);
00770       if (error_code || !input->nbest)
00771         {
00772           input_error (gettext ("Invalid best number"));
00773           goto exit_on_error;
00774         }
00775
00776       // Obtaining tolerance
00777       input->tolerance
00778         = json_object_get_float_with_default (object,
      LABEL_TOLERANCE, 0.,
00779                                             &error_code);
00780       if (error_code || input->tolerance < 0.)
00781         {
00782           input_error (gettext ("Invalid tolerance"));
00783           goto exit_on_error;
00784         }
00785
00786       // Getting direction search method parameters
00787       if (json_object_get_member (object, LABEL_NSTEPS))
00788         {
```

```
00789           input->nsteps
00790             = json_object_get_uint (object, LABEL_NSTEPS, &error_code);
00791           if (error_code || !input->nsteps)
00792             {
00793               input_error (gettext ("Invalid steps number"));
00794               goto exit_on_error;
00795             }
00796           buffer = json_object_get_string_member (object, LABEL_DIRECTION);
00797           if (!strcmp (buffer, LABEL_COORDINATES))
00798             input->direction = DIRECTION_METHOD_COORDINATES;
00799           else if (!strcmp (buffer, LABEL_RANDOM))
00800             {
00801               input->direction = DIRECTION_METHOD_RANDOM;
00802               input->nestimates
00803                 = json_object_get_uint (object,
      LABEL_NESTIMATES, &error_code);
00804               if (error_code || !input->nestimates)
00805                 {
00806                   input_error (gettext ("Invalid estimates number"));
00807                   goto exit_on_error;
00808                 }
00809             }
00810           else
00811             {
00812               input_error
00813                 (gettext ("Unknown method to estimate the direction search"));
00814               goto exit_on_error;
00815             }
00816           input->relaxation
00817             = json_object_get_float_with_default (object,
      LABEL_RELAXATION,
00818                                                   DEFAULT_RELAXATION,
00819                                                   &error_code);
00820           if (error_code || input->relaxation < 0. || input->
      relaxation > 2.)
00821             {
00822               input_error (gettext ("Invalid relaxation parameter"));
00823               goto exit_on_error;
00824             }
00825         }
00826       else
00827         input->nsteps = 0;
00828     }
00829   // Obtaining the threshold
00830   input->threshold
00831     = json_object_get_float_with_default (object,
      LABEL_THRESHOLD, 0.,
00832                                           &error_code);
00833   if (error_code)
00834     {
00835       input_error (gettext ("Invalid threshold"));
00836       goto exit_on_error;
00837     }
00838
00839   // Reading the experimental data
00840   array = json_object_get_array_member (object, LABEL_EXPERIMENTS);
00841   n = json_array_get_length (array);
00842   input->experiment = (Experiment *) g_malloc (n * sizeof (
      Experiment));
00843   for (i = 0; i < n; ++i)
00844     {
00845 #if DEBUG_INPUT
00846       fprintf (stderr, "input_open_json: nexperiments=%u\n",
00847                input->nexperiments);
00848 #endif
00849       child = json_array_get_element (array, i);
00850       if (!input->nexperiments)
00851         {
00852           if (!experiment_open_json (input->experiment, child, 0))
00853             goto exit_on_error;
00854         }
00855       else
00856         {
00857           if (!experiment_open_json (input->experiment +
      input->nexperiments,
00858                                      child, input->experiment->
      ninputs))
00859             goto exit_on_error;
00860         }
00861       ++input->nexperiments;
00862 #if DEBUG_INPUT
00863       fprintf (stderr, "input_open_json: nexperiments=%u\n",
00864                input->nexperiments);
00865 #endif
00866     }
00867   if (!input->nexperiments)
00868     {
```

```
00869       input_error (gettext ("No optimization experiments"));
00870       goto exit_on_error;
00871     }
00872
00873   // Reading the variables data
00874   array = json_object_get_array_member (object, LABEL_VARIABLES);
00875   n = json_array_get_length (array);
00876   input->variable = (Variable *) g_malloc (n * sizeof (
      Variable));
00877   for (i = 0; i < n; ++i)
00878     {
00879 #if DEBUG_INPUT
00880       fprintf (stderr, "input_open_json: nvariables=%u\n", input->
      nvariables);
00881 #endif
00882       child = json_array_get_element (array, i);
00883       if (!variable_open_json (input->variable +
      input->nvariables, child,
00884                                input->algorithm, input->
      nsteps))
00885         goto exit_on_error;
00886       ++input->nvariables;
00887     }
00888   if (!input->nvariables)
00889     {
00890       input_error (gettext ("No optimization variables"));
00891       goto exit_on_error;
00892     }
00893
00894   // Obtaining the error norm
00895   if (json_object_get_member (object, LABEL_NORM))
00896     {
00897       buffer = json_object_get_string_member (object, LABEL_NORM);
00898       if (!strcmp (buffer, LABEL_EUCLIDIAN))
00899         input->norm = ERROR_NORM_EUCLIDIAN;
00900       else if (!strcmp (buffer, LABEL_MAXIMUM))
00901         input->norm = ERROR_NORM_MAXIMUM;
00902       else if (!strcmp (buffer, LABEL_P))
00903         {
00904           input->norm = ERROR_NORM_P;
00905           input->p = json_object_get_float (object,
      LABEL_P, &error_code);
00906           if (!error_code)
00907             {
00908               input_error (gettext ("Bad P parameter"));
00909               goto exit_on_error;
00910             }
00911         }
00912       else if (!strcmp (buffer, LABEL_TAXICAB))
00913         input->norm = ERROR_NORM_TAXICAB;
00914       else
00915         {
00916           input_error (gettext ("Unknown error norm"));
00917           goto exit_on_error;
00918         }
00919     }
00920   else
00921     input->norm = ERROR_NORM_EUCLIDIAN;
00922
00923   // Closing the JSON document
00924   g_object_unref (parser);
00925
00926 #if DEBUG_INPUT
00927   fprintf (stderr, "input_open_json: end\n");
00928 #endif
00929   return 1;
00930
00931 exit_on_error:
00932   g_object_unref (parser);
00933 #if DEBUG_INPUT
00934   fprintf (stderr, "input_open_json: end\n");
00935 #endif
00936   return 0;
00937 }
```

Here is the call graph for this function:



5.7.2.4 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 (gettext ("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 (!input->variables)
00175     {
00176       input->variables =
00177         (char *) xmlGetProp (node, (const xmlChar *) LABEL_VARIABLES_FILE);
00178       if (!input->variables)
00179         input->variables =
00180           (char *) xmlStrdup ((const xmlChar *) variables_name);
00181     }
00182
00183   // Opening simulator program name
00184   input->simulator =
00185     (char *) xmlGetProp (node, (const xmlChar *) LABEL_SIMULATOR);
00186   if (!input->simulator)
00187     {
00188       input_error (gettext ("Bad simulator program"));
00189       goto exit_on_error;
00190     }
00191
00192   // Opening evaluator program name
00193   input->evaluator =
00194     (char *) xmlGetProp (node, (const xmlChar *) LABEL_EVALUATOR);
00195
00196   // Obtaining pseudo-random numbers generator seed
00197   input->seed
00198     = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_SEED,
00199                                       DEFAULT_RANDOM_SEED, &error_code);
00200   if (error_code)
00201     {
00202       input_error (gettext ("Bad pseudo-random numbers generator seed"));
00203       goto exit_on_error;
00204     }
00205
00206   // Opening algorithm
00207   buffer = xmlGetProp (node, (const xmlChar *) LABEL_ALGORITHM);
00208   if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MONTE_CARLO))
00209     {
00210       input->algorithm = ALGORITHM_MONTE_CARLO;
00211
00212       // Obtaining simulations number
00213       input->nsimulations
00214         = xml_node_get_int (node, (const xmlChar *)
      LABEL_NSIMULATIONS,
00215                             &error_code);
00216       if (error_code)
00217         {
00218           input_error (gettext ("Bad simulations number"));
00219           goto exit_on_error;
00220         }
00221     }
00222   else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_SWEEP))
00223     input->algorithm = ALGORITHM_SWEEP;
00224   else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_GENETIC))
00225     {
00226       input->algorithm = ALGORITHM_GENETIC;
00227
00228       // Obtaining population
00229       if (xmlHasProp (node, (const xmlChar *) LABEL_NPOPULATION))
00230         {
00231           input->nsimulations
00232             = xml_node_get_uint (node, (const xmlChar *)
```

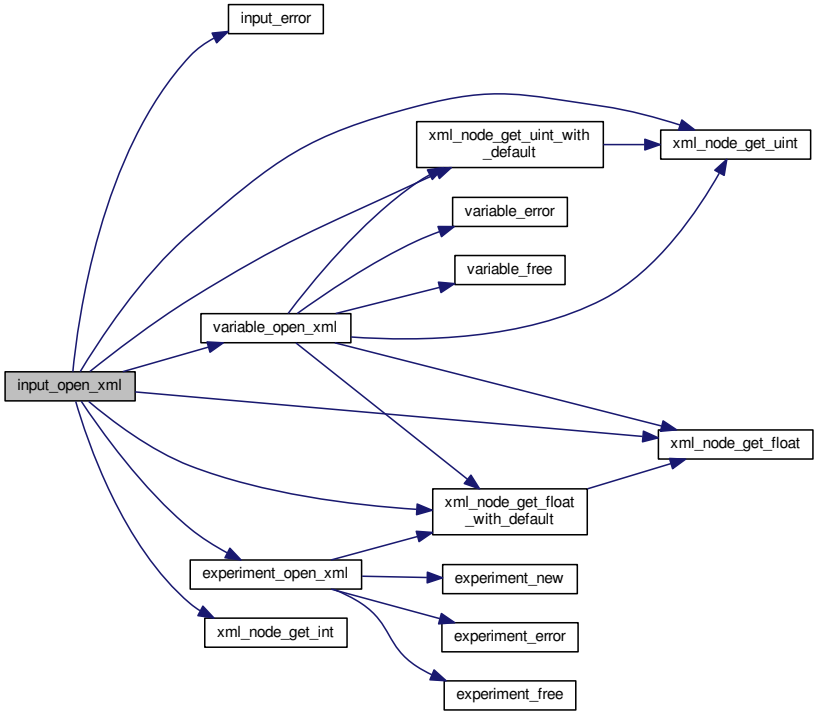
```
      LABEL_NPOPULATION,
00233                                 &error_code);
00234           if (error_code || input->nsimulations < 3)
00235             {
00236               input_error (gettext ("Invalid population number"));
00237               goto exit_on_error;
00238             }
00239         }
00240       else
00241         {
00242           input_error (gettext ("No population number"));
00243           goto exit_on_error;
00244         }
00245
00246       // Obtaining generations
00247       if (xmlHasProp (node, (const xmlChar *) LABEL_NGENERATIONS))
00248         {
00249           input->niterations
00250             = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NGENERATIONS,
00251                                 &error_code);
00252           if (error_code || !input->niterations)
00253             {
00254               input_error (gettext ("Invalid generations number"));
00255               goto exit_on_error;
00256             }
00257         }
00258       else
00259         {
00260           input_error (gettext ("No generations number"));
00261           goto exit_on_error;
00262         }
00263
00264       // Obtaining mutation probability
00265       if (xmlHasProp (node, (const xmlChar *) LABEL_MUTATION))
00266         {
00267           input->mutation_ratio
00268             = xml_node_get_float (node, (const xmlChar *)
      LABEL_MUTATION,
00269                                   &error_code);
00270           if (error_code || input->mutation_ratio < 0.
00271               || input->mutation_ratio >= 1.)
00272             {
00273               input_error (gettext ("Invalid mutation probability"));
00274               goto exit_on_error;
00275             }
00276         }
00277       else
00278         {
00279           input_error (gettext ("No mutation probability"));
00280           goto exit_on_error;
00281         }
00282
00283       // Obtaining reproduction probability
00284       if (xmlHasProp (node, (const xmlChar *) LABEL_REPRODUCTION))
00285         {
00286           input->reproduction_ratio
00287             = xml_node_get_float (node, (const xmlChar *)
      LABEL_REPRODUCTION,
00288                                   &error_code);
00289           if (error_code || input->reproduction_ratio < 0.
00290               || input->reproduction_ratio >= 1.0)
00291             {
00292               input_error (gettext ("Invalid reproduction probability"));
00293               goto exit_on_error;
00294             }
00295         }
00296       else
00297         {
00298           input_error (gettext ("No reproduction probability"));
00299           goto exit_on_error;
00300         }
00301
00302       // Obtaining adaptation probability
00303       if (xmlHasProp (node, (const xmlChar *) LABEL_ADAPTATION))
00304         {
00305           input->adaptation_ratio
00306             = xml_node_get_float (node, (const xmlChar *)
      LABEL_ADAPTATION,
00307                                   &error_code);
00308           if (error_code || input->adaptation_ratio < 0.
00309               || input->adaptation_ratio >= 1.)
00310             {
00311               input_error (gettext ("Invalid adaptation probability"));
00312               goto exit_on_error;
00313             }
00314         }
```

```
00315       else
00316         {
00317           input_error (gettext ("No adaptation probability"));
00318           goto exit_on_error;
00319         }
00320
00321       // Checking survivals
00322       i = input->mutation_ratio * input->nsimulations;
00323       i += input->reproduction_ratio * input->
      nsimulations;
00324       i += input->adaptation_ratio * input->
      nsimulations;
00325       if (i > input->nsimulations - 2)
00326         {
00327           input_error
00328             (gettext
00329              ("No enough survival entities to reproduce the population"));
00330           goto exit_on_error;
00331         }
00332     }
00333   else
00334     {
00335       input_error (gettext ("Unknown algorithm"));
00336       goto exit_on_error;
00337     }
00338   xmlFree (buffer);
00339   buffer = NULL;
00340
00341   if (input->algorithm == ALGORITHM_MONTE_CARLO
00342       || input->algorithm == ALGORITHM_SWEEP)
00343     {
00344
00345       // Obtaining iterations number
00346       input->niterations
00347         = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NITERATIONS,
00348                              &error_code);
00349       if (error_code == 1)
00350         input->niterations = 1;
00351       else if (error_code)
00352         {
00353           input_error (gettext ("Bad iterations number"));
00354           goto exit_on_error;
00355         }
00356
00357       // Obtaining best number
00358       input->nbest
00359         = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_NBEST,
00360                                           1, &error_code);
00361       if (error_code || !input->nbest)
00362         {
00363           input_error (gettext ("Invalid best number"));
00364           goto exit_on_error;
00365         }
00366
00367       // Obtaining tolerance
00368       input->tolerance
00369         = xml_node_get_float_with_default (node,
00370                                            (const xmlChar *) LABEL_TOLERANCE,
00371                                            0., &error_code);
00372       if (error_code || input->tolerance < 0.)
00373         {
00374           input_error (gettext ("Invalid tolerance"));
00375           goto exit_on_error;
00376         }
00377
00378       // Getting direction search method parameters
00379       if (xmlHasProp (node, (const xmlChar *) LABEL_NSTEPS))
00380         {
00381           input->nsteps =
00382             xml_node_get_uint (node, (const xmlChar *)
      LABEL_NSTEPS,
00383                                &error_code);
00384           if (error_code || !input->nsteps)
00385             {
00386               input_error (gettext ("Invalid steps number"));
00387               goto exit_on_error;
00388             }
00389           buffer = xmlGetProp (node, (const xmlChar *) LABEL_DIRECTION);
00390           if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_COORDINATES))
00391             input->direction = DIRECTION_METHOD_COORDINATES;
00392           else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_RANDOM))
00393             {
00394               input->direction = DIRECTION_METHOD_RANDOM;
00395               input->nestimates
00396                 = xml_node_get_uint (node, (const xmlChar *)
```

```
      LABEL_NESTIMATES,
00397                                     &error_code);
00398               if (error_code || !input->nestimates)
00399                 {
00400                   input_error (gettext ("Invalid estimates number"));
00401                   goto exit_on_error;
00402                 }
00403             }
00404           else
00405             {
00406               input_error
00407                 (gettext ("Unknown method to estimate the direction search"));
00408               goto exit_on_error;
00409             }
00410           xmlFree (buffer);
00411           buffer = NULL;
00412           input->relaxation
00413             = xml_node_get_float_with_default (node,
00414                                                (const xmlChar *)
00415                                                LABEL_RELAXATION,
00416                                                DEFAULT_RELAXATION, &error_code);
00417           if (error_code || input->relaxation < 0. || input->
      relaxation > 2.)
00418             {
00419               input_error (gettext ("Invalid relaxation parameter"));
00420               goto exit_on_error;
00421             }
00422         }
00423       else
00424         input->nsteps = 0;
00425     }
00426   // Obtaining the threshold
00427   input->threshold =
00428     xml_node_get_float_with_default (node, (const xmlChar *)
      LABEL_THRESHOLD,
00429                                      0., &error_code);
00430   if (error_code)
00431     {
00432       input_error (gettext ("Invalid threshold"));
00433       goto exit_on_error;
00434     }
00435
00436   // Reading the experimental data
00437   for (child = node->children; child; child = child->next)
00438     {
00439       if (xmlStrcmp (child->name, (const xmlChar *) LABEL_EXPERIMENT))
00440         break;
00441 #if DEBUG_INPUT
00442       fprintf (stderr, "input_open_xml: nexperiments=%u\n",
00443                input->nexperiments);
00444 #endif
00445       input->experiment = (Experiment *)
00446         g_realloc (input->experiment,
00447                    (1 + input->nexperiments) * sizeof (
      Experiment));
00448       if (!input->nexperiments)
00449         {
00450           if (!experiment_open_xml (input->experiment, child, 0))
00451             goto exit_on_error;
00452         }
00453       else
00454         {
00455           if (!experiment_open_xml (input->experiment +
      input->nexperiments,
00456                                     child, input->experiment->
      ninputs))
00457             goto exit_on_error;
00458         }
00459       ++input->nexperiments;
00460 #if DEBUG_INPUT
00461       fprintf (stderr, "input_open_xml: nexperiments=%u\n",
00462                input->nexperiments);
00463 #endif
00464     }
00465   if (!input->nexperiments)
00466     {
00467       input_error (gettext ("No optimization experiments"));
00468       goto exit_on_error;
00469     }
00470   buffer = NULL;
00471
00472   // Reading the variables data
00473   for (; child; child = child->next)
00474     {
00475 #if DEBUG_INPUT
00476       fprintf (stderr, "input_open_xml: nvariables=%u\n", input->nvariables);
00477 #endif
```

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

Here is the call graph for this function:



5.8 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 2012-2016, AUTHORS.
00009
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00013     1. Redistributions of source code must retain the above copyright notice,
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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 <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", gettext ("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 (gettext ("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 (!input->variables)
00175     {
00176       input->variables =
00177         (char *) xmlGetProp (node, (const xmlChar *) LABEL_VARIABLES_FILE);
00178       if (!input->variables)
00179         input->variables =
00180           (char *) xmlStrdup ((const xmlChar *) variables_name);
00181     }
00182
00183   // Opening simulator program name
00184   input->simulator =
00185     (char *) xmlGetProp (node, (const xmlChar *) LABEL_SIMULATOR);
00186   if (!input->simulator)
00187     {
00188       input_error (gettext ("Bad simulator program"));
00189       goto exit_on_error;
00190     }
00191
00192   // Opening evaluator program name
00193   input->evaluator =
00194     (char *) xmlGetProp (node, (const xmlChar *) LABEL_EVALUATOR);
00195
00196   // Obtaining pseudo-random numbers generator seed
00197   input->seed
00198     = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_SEED,
00199                                       DEFAULT_RANDOM_SEED, &error_code);
00200   if (error_code)
00201     {
00202       input_error (gettext ("Bad pseudo-random numbers generator seed"));
00203       goto exit_on_error;
00204     }
00205
00206   // Opening algorithm
00207   buffer = xmlGetProp (node, (const xmlChar *) LABEL_ALGORITHM);
00208   if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MONTE_CARLO))
00209     {
00210       input->algorithm = ALGORITHM_MONTE_CARLO;
00211
00212       // Obtaining simulations number
00213       input->nsimulations
00214         = xml_node_get_int (node, (const xmlChar *)
      LABEL_NSIMULATIONS,
00215                             &error_code);
00216       if (error_code)
00217         {
00218           input_error (gettext ("Bad simulations number"));
00219           goto exit_on_error;
00220         }
00221     }
00222   else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_SWEEP))
00223     input->algorithm = ALGORITHM_SWEEP;
00224   else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_GENETIC))
00225     {
00226       input->algorithm = ALGORITHM_GENETIC;
00227
00228       // Obtaining population
00229       if (xmlHasProp (node, (const xmlChar *) LABEL_NPOPULATION))
00230         {
00231           input->nsimulations
00232             = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NPOPULATION,
00233                                  &error_code);
```

```
00234           if (error_code || input->nsimulations < 3)
00235             {
00236               input_error (gettext ("Invalid population number"));
00237               goto exit_on_error;
00238             }
00239         }
00240       else
00241         {
00242           input_error (gettext ("No population number"));
00243           goto exit_on_error;
00244         }
00245
00246       // Obtaining generations
00247       if (xmlHasProp (node, (const xmlChar *) LABEL_NGENERATIONS))
00248         {
00249           input->niterations
00250             = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NGENERATIONS,
00251                                  &error_code);
00252           if (error_code || !input->niterations)
00253             {
00254               input_error (gettext ("Invalid generations number"));
00255               goto exit_on_error;
00256             }
00257         }
00258       else
00259         {
00260           input_error (gettext ("No generations number"));
00261           goto exit_on_error;
00262         }
00263
00264       // Obtaining mutation probability
00265       if (xmlHasProp (node, (const xmlChar *) LABEL_MUTATION))
00266         {
00267           input->mutation_ratio
00268             = xml_node_get_float (node, (const xmlChar *)
      LABEL_MUTATION,
00269                                   &error_code);
00270           if (error_code || input->mutation_ratio < 0.
00271               || input->mutation_ratio >= 1.)
00272             {
00273               input_error (gettext ("Invalid mutation probability"));
00274               goto exit_on_error;
00275             }
00276         }
00277       else
00278         {
00279           input_error (gettext ("No mutation probability"));
00280           goto exit_on_error;
00281         }
00282
00283       // Obtaining reproduction probability
00284       if (xmlHasProp (node, (const xmlChar *) LABEL_REPRODUCTION))
00285         {
00286           input->reproduction_ratio
00287             = xml_node_get_float (node, (const xmlChar *)
      LABEL_REPRODUCTION,
00288                                   &error_code);
00289           if (error_code || input->reproduction_ratio < 0.
00290               || input->reproduction_ratio >= 1.0)
00291             {
00292               input_error (gettext ("Invalid reproduction probability"));
00293               goto exit_on_error;
00294             }
00295         }
00296       else
00297         {
00298           input_error (gettext ("No reproduction probability"));
00299           goto exit_on_error;
00300         }
00301
00302       // Obtaining adaptation probability
00303       if (xmlHasProp (node, (const xmlChar *) LABEL_ADAPTATION))
00304         {
00305           input->adaptation_ratio
00306             = xml_node_get_float (node, (const xmlChar *)
      LABEL_ADAPTATION,
00307                                   &error_code);
00308           if (error_code || input->adaptation_ratio < 0.
00309               || input->adaptation_ratio >= 1.)
00310             {
00311               input_error (gettext ("Invalid adaptation probability"));
00312               goto exit_on_error;
00313             }
00314         }
00315       else
00316         {
```

```
00317           input_error (gettext ("No adaptation probability"));
00318           goto exit_on_error;
00319         }
00320
00321       // Checking survivals
00322       i = input->mutation_ratio * input->nsimulations;
00323       i += input->reproduction_ratio * input->nsimulations;
00324       i += input->adaptation_ratio * input->nsimulations;
00325       if (i > input->nsimulations - 2)
00326         {
00327           input_error
00328             (gettext
00329              ("No enough survival entities to reproduce the population"));
00330           goto exit_on_error;
00331         }
00332     }
00333   else
00334     {
00335       input_error (gettext ("Unknown algorithm"));
00336       goto exit_on_error;
00337     }
00338   xmlFree (buffer);
00339   buffer = NULL;
00340
00341   if (input->algorithm == ALGORITHM_MONTE_CARLO
00342       || input->algorithm == ALGORITHM_SWEEP)
00343     {
00344
00345       // Obtaining iterations number
00346       input->niterations
00347         = xml_node_get_uint (node, (const xmlChar *)
    LABEL_NITERATIONS,
00348                              &error_code);
00349       if (error_code == 1)
00350         input->niterations = 1;
00351       else if (error_code)
00352         {
00353           input_error (gettext ("Bad iterations number"));
00354           goto exit_on_error;
00355         }
00356
00357       // Obtaining best number
00358       input->nbest
00359         = xml_node_get_uint_with_default (node, (const xmlChar *)
    LABEL_NBEST,
00360                                           1, &error_code);
00361       if (error_code || !input->nbest)
00362         {
00363           input_error (gettext ("Invalid best number"));
00364           goto exit_on_error;
00365         }
00366
00367       // Obtaining tolerance
00368       input->tolerance
00369         = xml_node_get_float_with_default (node,
00370                                            (const xmlChar *) LABEL_TOLERANCE,
00371                                            0., &error_code);
00372       if (error_code || input->tolerance < 0.)
00373         {
00374           input_error (gettext ("Invalid tolerance"));
00375           goto exit_on_error;
00376         }
00377
00378       // Getting direction search method parameters
00379       if (xmlHasProp (node, (const xmlChar *) LABEL_NSTEPS))
00380         {
00381           input->nsteps =
00382             xml_node_get_uint (node, (const xmlChar *)
    LABEL_NSTEPS,
00383                                &error_code);
00384           if (error_code || !input->nsteps)
00385             {
00386               input_error (gettext ("Invalid steps number"));
00387               goto exit_on_error;
00388             }
00389           buffer = xmlGetProp (node, (const xmlChar *) LABEL_DIRECTION);
00390           if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_COORDINATES))
00391             input->direction = DIRECTION_METHOD_COORDINATES;
00392           else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_RANDOM))
00393             {
00394               input->direction = DIRECTION_METHOD_RANDOM;
00395               input->nestimates
00396                 = xml_node_get_uint (node, (const xmlChar *)
    LABEL_NESTIMATES,
00397                                      &error_code);
00398               if (error_code || !input->nestimates)
00399                 {
```

```
00400                   input_error (gettext ("Invalid estimates number"));
00401                   goto exit_on_error;
00402                 }
00403             }
00404           else
00405             {
00406               input_error
00407                 (gettext ("Unknown method to estimate the direction search"));
00408               goto exit_on_error;
00409             }
00410           xmlFree (buffer);
00411           buffer = NULL;
00412           input->relaxation
00413             = xml_node_get_float_with_default (node,
00414                                                (const xmlChar *)
00415                                                LABEL_RELAXATION,
00416                                                DEFAULT_RELAXATION, &error_code);
00417           if (error_code || input->relaxation < 0. || input->
      relaxation > 2.)
00418             {
00419               input_error (gettext ("Invalid relaxation parameter"));
00420               goto exit_on_error;
00421             }
00422         }
00423       else
00424         input->nsteps = 0;
00425     }
00426   // Obtaining the threshold
00427   input->threshold =
00428     xml_node_get_float_with_default (node, (const xmlChar *)
      LABEL_THRESHOLD,
00429                                      0., &error_code);
00430   if (error_code)
00431     {
00432       input_error (gettext ("Invalid threshold"));
00433       goto exit_on_error;
00434     }
00435
00436   // Reading the experimental data
00437   for (child = node->children; child; child = child->next)
00438     {
00439       if (xmlStrcmp (child->name, (const xmlChar *) LABEL_EXPERIMENT))
00440         break;
00441 #if DEBUG_INPUT
00442       fprintf (stderr, "input_open_xml: nexperiments=%u\n",
00443                input->nexperiments);
00444 #endif
00445       input->experiment = (Experiment *)
00446         g_realloc (input->experiment,
00447                    (1 + input->nexperiments) * sizeof (Experiment));
00448       if (!input->nexperiments)
00449         {
00450           if (!experiment_open_xml (input->experiment, child, 0))
00451             goto exit_on_error;
00452         }
00453       else
00454         {
00455           if (!experiment_open_xml (input->experiment + input->
      nexperiments,
00456                                     child, input->experiment->ninputs))
00457             goto exit_on_error;
00458         }
00459       ++input->nexperiments;
00460 #if DEBUG_INPUT
00461       fprintf (stderr, "input_open_xml: nexperiments=%u\n",
00462                input->nexperiments);
00463 #endif
00464     }
00465   if (!input->nexperiments)
00466     {
00467       input_error (gettext ("No optimization experiments"));
00468       goto exit_on_error;
00469     }
00470   buffer = NULL;
00471
00472   // Reading the variables data
00473   for (; child; child = child->next)
00474     {
00475 #if DEBUG_INPUT
00476       fprintf (stderr, "input_open_xml: nvariables=%u\n", input->nvariables);
00477 #endif
00478       if (xmlStrcmp (child->name, (const xmlChar *) LABEL_VARIABLE))
00479         {
00480           snprintf (buffer2, 64, "%s %u: %s",
00481                     gettext ("Variable"),
00482                     input->nvariables + 1, gettext ("bad XML node"));
00483           input_error (buffer2);
```

```
00484           goto exit_on_error;
00485         }
00486       input->variable = (Variable *)
00487         g_realloc (input->variable,
00488                    (1 + input->nvariables) * sizeof (Variable));
00489       if (!variable_open_xml (input->variable + input->
    nvariables, child,
00490                               input->algorithm, input->nsteps))
00491         goto exit_on_error;
00492       ++input->nvariables;
00493     }
00494   if (!input->nvariables)
00495     {
00496       input_error (gettext ("No optimization variables"));
00497       goto exit_on_error;
00498     }
00499   buffer = NULL;
00500
00501   // Obtaining the error norm
00502   if (xmlHasProp (node, (const xmlChar *) LABEL_NORM))
00503     {
00504       buffer = xmlGetProp (node, (const xmlChar *) LABEL_NORM);
00505       if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_EUCLIDIAN))
00506         input->norm = ERROR_NORM_EUCLIDIAN;
00507       else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MAXIMUM))
00508         input->norm = ERROR_NORM_MAXIMUM;
00509       else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_P))
00510         {
00511           input->norm = ERROR_NORM_P;
00512           input->p
00513             = xml_node_get_float (node, (const xmlChar *)
    LABEL_P, &error_code);
00514           if (!error_code)
00515             {
00516               input_error (gettext ("Bad P parameter"));
00517               goto exit_on_error;
00518             }
00519         }
00520       else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_TAXICAB))
00521         input->norm = ERROR_NORM_TAXICAB;
00522       else
00523         {
00524           input_error (gettext ("Unknown error norm"));
00525           goto exit_on_error;
00526         }
00527       xmlFree (buffer);
00528     }
00529   else
00530     input->norm = ERROR_NORM_EUCLIDIAN;
00531
00532   // Closing the XML document
00533   xmlFreeDoc (doc);
00534
00535 #if DEBUG_INPUT
00536   fprintf (stderr, "input_open_xml: end\n");
00537 #endif
00538   return 1;
00539
00540 exit_on_error:
00541   xmlFree (buffer);
00542   xmlFreeDoc (doc);
00543 #if DEBUG_INPUT
00544   fprintf (stderr, "input_open_xml: end\n");
00545 #endif
00546   return 0;
00547 }
00548
00556 int
00557 input_open_json (JsonParser * parser)
00558 {
00559   JsonNode *node, *child;
00560   JsonObject *object;
00561   JsonArray *array;
00562   const char *buffer;
00563   int error_code;
00564   unsigned int i, n;
00565
00566 #if DEBUG_INPUT
00567   fprintf (stderr, "input_open_json: start\n");
00568 #endif
00569
00570   // Resetting input data
00571   input->type = INPUT_TYPE_JSON;
00572
00573   // Getting the root node
00574 #if DEBUG_INPUT
00575   fprintf (stderr, "input_open_json: getting the root node\n");
```

```
00576 #endif
00577   node = json_parser_get_root (parser);
00578   object = json_node_get_object (node);
00579
00580   // Getting result and variables file names
00581   if (!input->result)
00582     {
00583       buffer = json_object_get_string_member (object, LABEL_RESULT_FILE);
00584       if (!buffer)
00585         buffer = result_name;
00586       input->result = g_strdup (buffer);
00587     }
00588   else
00589     input->result = g_strdup (result_name);
00590   if (!input->variables)
00591     {
00592       buffer = json_object_get_string_member (object, LABEL_VARIABLES_FILE);
00593       if (!buffer)
00594         buffer = variables_name;
00595       input->variables = g_strdup (buffer);
00596     }
00597   else
00598     input->variables = g_strdup (variables_name);
00599
00600   // Opening simulator program name
00601   buffer = json_object_get_string_member (object, LABEL_SIMULATOR);
00602   if (!buffer)
00603     {
00604       input_error (gettext ("Bad simulator program"));
00605       goto exit_on_error;
00606     }
00607   input->simulator = g_strdup (buffer);
00608
00609   // Opening evaluator program name
00610   buffer = json_object_get_string_member (object, LABEL_EVALUATOR);
00611   if (buffer)
00612     input->evaluator = g_strdup (buffer);
00613
00614   // Obtaining pseudo-random numbers generator seed
00615   input->seed
00616     = json_object_get_uint_with_default (object,
      LABEL_SEED,
00617                                          DEFAULT_RANDOM_SEED, &error_code);
00618   if (error_code)
00619     {
00620       input_error (gettext ("Bad pseudo-random numbers generator seed"));
00621       goto exit_on_error;
00622     }
00623
00624   // Opening algorithm
00625   buffer = json_object_get_string_member (object, LABEL_ALGORITHM);
00626   if (!strcmp (buffer, LABEL_MONTE_CARLO))
00627     {
00628       input->algorithm = ALGORITHM_MONTE_CARLO;
00629
00630       // Obtaining simulations number
00631       input->nsimulations
00632         = json_object_get_int (object, LABEL_NSIMULATIONS, &error_code
      );
00633       if (error_code)
00634         {
00635           input_error (gettext ("Bad simulations number"));
00636           goto exit_on_error;
00637         }
00638     }
00639   else if (!strcmp (buffer, LABEL_SWEEP))
00640     input->algorithm = ALGORITHM_SWEEP;
00641   else if (!strcmp (buffer, LABEL_GENETIC))
00642     {
00643       input->algorithm = ALGORITHM_GENETIC;
00644
00645       // Obtaining population
00646       if (json_object_get_member (object, LABEL_NPOPULATION))
00647         {
00648           input->nsimulations
00649             = json_object_get_uint (object,
      LABEL_NPOPULATION, &error_code);
00650           if (error_code || input->nsimulations < 3)
00651             {
00652               input_error (gettext ("Invalid population number"));
00653               goto exit_on_error;
00654             }
00655         }
00656       else
00657         {
00658           input_error (gettext ("No population number"));
00659           goto exit_on_error;
```

```
00660         }
00661
00662       // Obtaining generations
00663       if (json_object_get_member (object, LABEL_NGENERATIONS))
00664         {
00665           input->niterations
00666             = json_object_get_uint (object,
      LABEL_NGENERATIONS, &error_code);
00667           if (error_code || !input->niterations)
00668             {
00669               input_error (gettext ("Invalid generations number"));
00670               goto exit_on_error;
00671             }
00672         }
00673       else
00674         {
00675           input_error (gettext ("No generations number"));
00676           goto exit_on_error;
00677         }
00678
00679       // Obtaining mutation probability
00680       if (json_object_get_member (object, LABEL_MUTATION))
00681         {
00682           input->mutation_ratio
00683             = json_object_get_float (object, LABEL_MUTATION, &error_code
      );
00684           if (error_code || input->mutation_ratio < 0.
00685               || input->mutation_ratio >= 1.)
00686             {
00687               input_error (gettext ("Invalid mutation probability"));
00688               goto exit_on_error;
00689             }
00690         }
00691       else
00692         {
00693           input_error (gettext ("No mutation probability"));
00694           goto exit_on_error;
00695         }
00696
00697       // Obtaining reproduction probability
00698       if (json_object_get_member (object, LABEL_REPRODUCTION))
00699         {
00700           input->reproduction_ratio
00701             = json_object_get_float (object,
      LABEL_REPRODUCTION, &error_code);
00702           if (error_code || input->reproduction_ratio < 0.
00703               || input->reproduction_ratio >= 1.0)
00704             {
00705               input_error (gettext ("Invalid reproduction probability"));
00706               goto exit_on_error;
00707             }
00708         }
00709       else
00710         {
00711           input_error (gettext ("No reproduction probability"));
00712           goto exit_on_error;
00713         }
00714
00715       // Obtaining adaptation probability
00716       if (json_object_get_member (object, LABEL_ADAPTATION))
00717         {
00718           input->adaptation_ratio
00719             = json_object_get_float (object,
      LABEL_ADAPTATION, &error_code);
00720           if (error_code || input->adaptation_ratio < 0.
00721               || input->adaptation_ratio >= 1.)
00722             {
00723               input_error (gettext ("Invalid adaptation probability"));
00724               goto exit_on_error;
00725             }
00726         }
00727       else
00728         {
00729           input_error (gettext ("No adaptation probability"));
00730           goto exit_on_error;
00731         }
00732
00733       // Checking survivals
00734       i = input->mutation_ratio * input->nsimulations;
00735       i += input->reproduction_ratio * input->nsimulations;
00736       i += input->adaptation_ratio * input->nsimulations;
00737       if (i > input->nsimulations - 2)
00738         {
00739           input_error
00740             (gettext
00741              ("No enough survival entities to reproduce the population"));
00742           goto exit_on_error;
```

```
00743         }
00744     }
00745   else
00746     {
00747       input_error (gettext ("Unknown algorithm"));
00748       goto exit_on_error;
00749     }
00750
00751   if (input->algorithm == ALGORITHM_MONTE_CARLO
00752       || input->algorithm == ALGORITHM_SWEEP)
00753     {
00754
00755       // Obtaining iterations number
00756       input->niterations
00757         = json_object_get_uint (object, LABEL_NITERATIONS, &error_code
      );
00758       if (error_code == 1)
00759         input->niterations = 1;
00760       else if (error_code)
00761         {
00762           input_error (gettext ("Bad iterations number"));
00763           goto exit_on_error;
00764         }
00765
00766       // Obtaining best number
00767       input->nbest
00768         = json_object_get_uint_with_default (object,
      LABEL_NBEST, 1,
00769                                              &error_code);
00770       if (error_code || !input->nbest)
00771         {
00772           input_error (gettext ("Invalid best number"));
00773           goto exit_on_error;
00774         }
00775
00776       // Obtaining tolerance
00777       input->tolerance
00778         = json_object_get_float_with_default (object,
      LABEL_TOLERANCE, 0.,
00779                                             &error_code);
00780       if (error_code || input->tolerance < 0.)
00781         {
00782           input_error (gettext ("Invalid tolerance"));
00783           goto exit_on_error;
00784         }
00785
00786       // Getting direction search method parameters
00787       if (json_object_get_member (object, LABEL_NSTEPS))
00788         {
00789           input->nsteps
00790             = json_object_get_uint (object, LABEL_NSTEPS, &error_code);
00791           if (error_code || !input->nsteps)
00792             {
00793               input_error (gettext ("Invalid steps number"));
00794               goto exit_on_error;
00795             }
00796           buffer = json_object_get_string_member (object, LABEL_DIRECTION);
00797           if (!strcmp (buffer, LABEL_COORDINATES))
00798             input->direction = DIRECTION_METHOD_COORDINATES;
00799           else if (!strcmp (buffer, LABEL_RANDOM))
00800             {
00801               input->direction = DIRECTION_METHOD_RANDOM;
00802               input->nestimates
00803                 = json_object_get_uint (object,
      LABEL_NESTIMATES, &error_code);
00804               if (error_code || !input->nestimates)
00805                 {
00806                   input_error (gettext ("Invalid estimates number"));
00807                   goto exit_on_error;
00808                 }
00809             }
00810           else
00811             {
00812               input_error
00813                 (gettext ("Unknown method to estimate the direction search"));
00814               goto exit_on_error;
00815             }
00816           input->relaxation
00817             = json_object_get_float_with_default (object,
      LABEL_RELAXATION,
00818                                                   DEFAULT_RELAXATION,
00819                                                   &error_code);
00820           if (error_code || input->relaxation < 0. || input->
      relaxation > 2.)
00821             {
00822               input_error (gettext ("Invalid relaxation parameter"));
00823               goto exit_on_error;
```

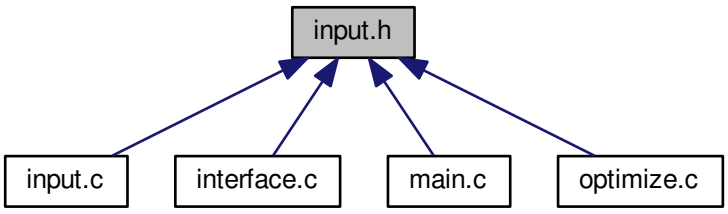
```
00824             }
00825         }
00826       else
00827         input->nsteps = 0;
00828     }
00829   // Obtaining the threshold
00830   input->threshold
00831     = json_object_get_float_with_default (object,
      LABEL_THRESHOLD, 0.,
00832                                           &error_code);
00833   if (error_code)
00834     {
00835       input_error (gettext ("Invalid threshold"));
00836       goto exit_on_error;
00837     }
00838
00839   // Reading the experimental data
00840   array = json_object_get_array_member (object, LABEL_EXPERIMENTS);
00841   n = json_array_get_length (array);
00842   input->experiment = (Experiment *) g_malloc (n * sizeof (
      Experiment));
00843   for (i = 0; i < n; ++i)
00844     {
00845 #if DEBUG_INPUT
00846       fprintf (stderr, "input_open_json: nexperiments=%u\n",
00847                input->nexperiments);
00848 #endif
00849       child = json_array_get_element (array, i);
00850       if (!input->nexperiments)
00851         {
00852           if (!experiment_open_json (input->experiment, child, 0))
00853             goto exit_on_error;
00854         }
00855       else
00856         {
00857           if (!experiment_open_json (input->experiment + input->
      nexperiments,
00858                                      child, input->experiment->ninputs))
00859             goto exit_on_error;
00860         }
00861       ++input->nexperiments;
00862 #if DEBUG_INPUT
00863       fprintf (stderr, "input_open_json: nexperiments=%u\n",
00864                input->nexperiments);
00865 #endif
00866     }
00867   if (!input->nexperiments)
00868     {
00869       input_error (gettext ("No optimization experiments"));
00870       goto exit_on_error;
00871     }
00872
00873   // Reading the variables data
00874   array = json_object_get_array_member (object, LABEL_VARIABLES);
00875   n = json_array_get_length (array);
00876   input->variable = (Variable *) g_malloc (n * sizeof (Variable));
00877   for (i = 0; i < n; ++i)
00878     {
00879 #if DEBUG_INPUT
00880       fprintf (stderr, "input_open_json: nvariables=%u\n", input->nvariables);
00881 #endif
00882       child = json_array_get_element (array, i);
00883       if (!variable_open_json (input->variable + input->
      nvariables, child,
00884                                input->algorithm, input->nsteps))
00885         goto exit_on_error;
00886       ++input->nvariables;
00887     }
00888   if (!input->nvariables)
00889     {
00890       input_error (gettext ("No optimization variables"));
00891       goto exit_on_error;
00892     }
00893
00894   // Obtaining the error norm
00895   if (json_object_get_member (object, LABEL_NORM))
00896     {
00897       buffer = json_object_get_string_member (object, LABEL_NORM);
00898       if (!strcmp (buffer, LABEL_EUCLIDIAN))
00899         input->norm = ERROR_NORM_EUCLIDIAN;
00900       else if (!strcmp (buffer, LABEL_MAXIMUM))
00901         input->norm = ERROR_NORM_MAXIMUM;
00902       else if (!strcmp (buffer, LABEL_P))
00903         {
00904           input->norm = ERROR_NORM_P;
00905           input->p = json_object_get_float (object,
      LABEL_P, &error_code);
```

```
00906           if (!error_code)
00907             {
00908               input_error (gettext ("Bad P parameter"));
00909               goto exit_on_error;
00910             }
00911         }
00912       else if (!strcmp (buffer, LABEL_TAXICAB))
00913         input->norm = ERROR_NORM_TAXICAB;
00914       else
00915         {
00916           input_error (gettext ("Unknown error norm"));
00917           goto exit_on_error;
00918         }
00919     }
00920   else
00921     input->norm = ERROR_NORM_EUCLIDIAN;
00922
00923   // Closing the JSON document
00924   g_object_unref (parser);
00925
00926 #if DEBUG_INPUT
00927   fprintf (stderr, "input_open_json: end\n");
00928 #endif
00929   return 1;
00930
00931 exit_on_error:
00932   g_object_unref (parser);
00933 #if DEBUG_INPUT
00934   fprintf (stderr, "input_open_json: end\n");
00935 #endif
00936   return 0;
00937 }
00938
00946 int
00947 input_open (char *filename)
00948 {
00949   xmlDoc *doc;
00950   JsonParser *parser;
00951
00952 #if DEBUG_INPUT
00953   fprintf (stderr, "input_open: start\n");
00954 #endif
00955
00956   // Resetting input data
00957   input_new ();
00958
00959   // Opening input file
00960 #if DEBUG_INPUT
00961   fprintf (stderr, "input_open: opening the input file %s\n", filename);
00962   fprintf (stderr, "input_open: trying XML format\n");
00963 #endif
00964   doc = xmlParseFile (filename);
00965   if (!doc)
00966     {
00967 #if DEBUG_INPUT
00968       fprintf (stderr, "input_open: trying JSON format\n");
00969 #endif
00970       parser = json_parser_new ();
00971       if (!json_parser_load_from_file (parser, filename, NULL))
00972         {
00973           input_error (gettext ("Unable to parse the input file"));
00974           goto exit_on_error;
00975         }
00976       if (!input_open_json (parser))
00977         goto exit_on_error;
00978     }
00979   else if (!input_open_xml (doc))
00980     goto exit_on_error;
00981
00982   // Getting the working directory
00983   input->directory = g_path_get_dirname (filename);
00984   input->name = g_path_get_basename (filename);
00985
00986 #if DEBUG_INPUT
00987   fprintf (stderr, "input_open: end\n");
00988 #endif
00989   return 1;
00990
00991 exit_on_error:
00992   show_error (error_message);
00993   g_free (error_message);
00994   input_free ();
00995 #if DEBUG_INPUT
00996   fprintf (stderr, "input_open: end\n");
00997 #endif
00998   return 0;
00999 }
```

5.9 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.

5.9.1 Detailed Description

Header file to define the input functions.

Authors

Javier Burguete.

Copyright

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Definition in file input.h.

5.9.2 Enumeration Type Documentation

5.9.2.1 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 };
```

5.9.2.2 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 };
```

5.9.3 Function Documentation

5.9.3.1 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", gettext ("Input"), message);
00128   error_message = g_strdup (buffer);
00129 }
```

5.9.3.2 input_open()

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

Function to open the input file.

Parameters

filename	Input data file name.

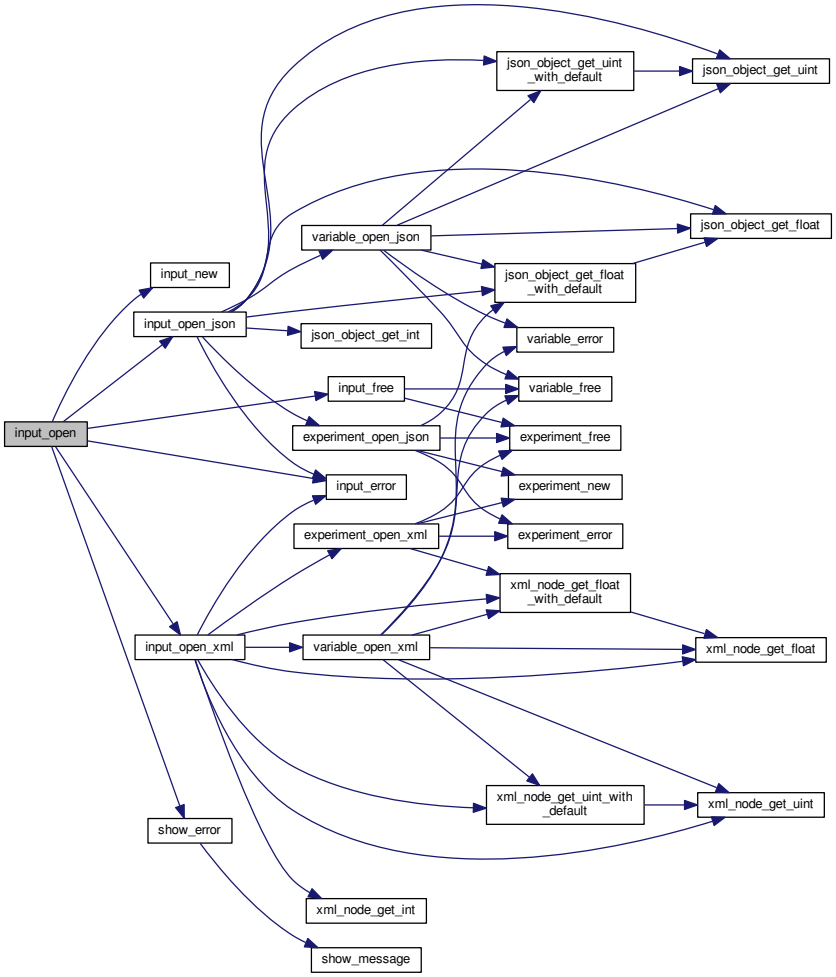
Returns

1_on_success, 0_on_error.

Definition at line 947 of file input.c.

```
00948 {
00949   xmlDoc *doc;
00950   JsonParser *parser;
00951
00952 #if DEBUG_INPUT
00953   fprintf (stderr, "input_open: start\n");
00954 #endif
00955
00956   // Resetting input data
00957   input_new ();
00958
00959   // Opening input file
00960 #if DEBUG_INPUT
00961   fprintf (stderr, "input_open: opening the input file %s\n", filename);
00962   fprintf (stderr, "input_open: trying XML format\n");
00963 #endif
00964   doc = xmlParseFile (filename);
00965   if (!doc)
00966     {
00967 #if DEBUG_INPUT
00968       fprintf (stderr, "input_open: trying JSON format\n");
00969 #endif
00970       parser = json_parser_new ();
00971       if (!json_parser_load_from_file (parser, filename, NULL))
00972         {
00973           input_error (gettext ("Unable to parse the input file"));
00974           goto exit_on_error;
00975         }
00976       if (!input_open_json (parser))
00977         goto exit_on_error;
00978     }
00979   else if (!input_open_xml (doc))
00980     goto exit_on_error;
00981
00982   // Getting the working directory
00983   input->directory = g_path_get_dirname (filename);
00984   input->name = g_path_get_basename (filename);
00985
00986 #if DEBUG_INPUT
00987   fprintf (stderr, "input_open: end\n");
00988 #endif
00989   return 1;
00990
00991 exit_on_error:
00992   show_error (error_message);
00993   g_free (error_message);
00994   input_free ();
00995 #if DEBUG_INPUT
00996   fprintf (stderr, "input_open: end\n");
00997 #endif
00998   return 0;
00999 }
```

Here is the call graph for this function:



5.9.3.3 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 557 of file input.c.

```
00558 {
00559   JsonNode *node, *child;
00560   JsonObject *object;
00561   JsonArray *array;
00562   const char *buffer;
00563   int error_code;
00564   unsigned int i, n;
00565 
00566 #if DEBUG_INPUT
00567   fprintf (stderr, "input_open_json: start\n");
00568 #endif
00569 
00570   // Resetting input data
00571   input->type = INPUT_TYPE_JSON;
00572 
00573   // Getting the root node
00574 #if DEBUG_INPUT
00575   fprintf (stderr, "input_open_json: getting the root node\n");
00576 #endif
00577   node = json_parser_get_root (parser);
00578   object = json_node_get_object (node);
00579 
00580   // Getting result and variables file names
00581   if (!input->result)
00582     {
00583       buffer = json_object_get_string_member (object, LABEL_RESULT_FILE);
00584       if (!buffer)
00585         buffer = result_name;
00586       input->result = g_strdup (buffer);
00587     }
00588   else
00589     input->result = g_strdup (result_name);
00590   if (!input->variables)
00591     {
00592       buffer = json_object_get_string_member (object, LABEL_VARIABLES_FILE);
00593       if (!buffer)
00594         buffer = variables_name;
00595       input->variables = g_strdup (buffer);
00596     }
00597   else
00598     input->variables = g_strdup (variables_name);
00599 
00600   // Opening simulator program name
00601   buffer = json_object_get_string_member (object, LABEL_SIMULATOR);
00602   if (!buffer)
00603     {
00604       input_error (gettext ("Bad simulator program"));
00605       goto exit_on_error;
00606     }
00607   input->simulator = g_strdup (buffer);
00608 
00609   // Opening evaluator program name
00610   buffer = json_object_get_string_member (object, LABEL_EVALUATOR);
00611   if (buffer)
00612     input->evaluator = g_strdup (buffer);
00613 
00614   // Obtaining pseudo-random numbers generator seed
00615   input->seed
00616     = json_object_get_uint_with_default (object,
     LABEL_SEED,
00617                                          DEFAULT_RANDOM_SEED, &error_code);
00618   if (error_code)
00619     {
00620       input_error (gettext ("Bad pseudo-random numbers generator seed"));
00621       goto exit_on_error;
00622     }
00623 
00624   // Opening algorithm
00625   buffer = json_object_get_string_member (object, LABEL_ALGORITHM);
00626   if (!strcmp (buffer, LABEL_MONTE_CARLO))
00627     {
00628       input->algorithm = ALGORITHM_MONTE_CARLO;
00629 
00630       // Obtaining simulations number
00631       input->nsimulations
00632         = json_object_get_int (object, LABEL_NSIMULATIONS, &error_code
     );
00633       if (error_code)
00634         {
00635           input_error (gettext ("Bad simulations number"));
00636           goto exit_on_error;
00637         }
00638     }
00639   else if (!strcmp (buffer, LABEL_SWEEP))
00640     input->algorithm = ALGORITHM_SWEEP;
00641   else if (!strcmp (buffer, LABEL_GENETIC))
00642     {
```

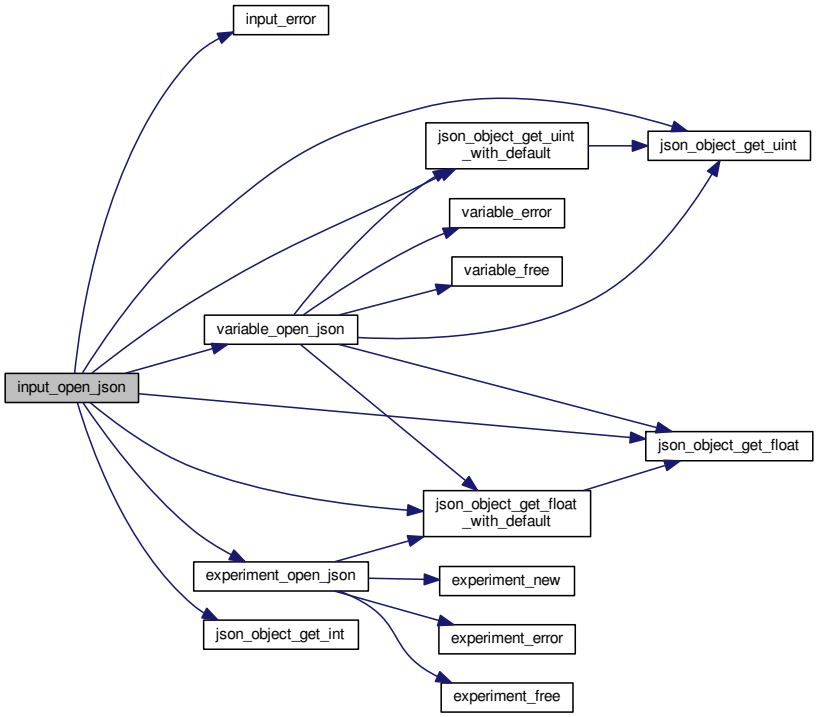
```
00643       input->algorithm = ALGORITHM_GENETIC;
00644
00645       // Obtaining population
00646       if (json_object_get_member (object, LABEL_NPOPULATION))
00647         {
00648           input->nsimulations
00649             = json_object_get_uint (object,
      LABEL_NPOPULATION, &error_code);
00650           if (error_code || input->nsimulations < 3)
00651             {
00652               input_error (gettext ("Invalid population number"));
00653               goto exit_on_error;
00654             }
00655         }
00656       else
00657         {
00658           input_error (gettext ("No population number"));
00659           goto exit_on_error;
00660         }
00661
00662       // Obtaining generations
00663       if (json_object_get_member (object, LABEL_NGENERATIONS))
00664         {
00665           input->niterations
00666             = json_object_get_uint (object,
      LABEL_NGENERATIONS, &error_code);
00667           if (error_code || !input->niterations)
00668             {
00669               input_error (gettext ("Invalid generations number"));
00670               goto exit_on_error;
00671             }
00672         }
00673       else
00674         {
00675           input_error (gettext ("No generations number"));
00676           goto exit_on_error;
00677         }
00678
00679       // Obtaining mutation probability
00680       if (json_object_get_member (object, LABEL_MUTATION))
00681         {
00682           input->mutation_ratio
00683             = json_object_get_float (object, LABEL_MUTATION, &error_code
      );
00684           if (error_code || input->mutation_ratio < 0.
00685               || input->mutation_ratio >= 1.)
00686             {
00687               input_error (gettext ("Invalid mutation probability"));
00688               goto exit_on_error;
00689             }
00690         }
00691       else
00692         {
00693           input_error (gettext ("No mutation probability"));
00694           goto exit_on_error;
00695         }
00696
00697       // Obtaining reproduction probability
00698       if (json_object_get_member (object, LABEL_REPRODUCTION))
00699         {
00700           input->reproduction_ratio
00701             = json_object_get_float (object,
      LABEL_REPRODUCTION, &error_code);
00702           if (error_code || input->reproduction_ratio < 0.
00703               || input->reproduction_ratio >= 1.0)
00704             {
00705               input_error (gettext ("Invalid reproduction probability"));
00706               goto exit_on_error;
00707             }
00708         }
00709       else
00710         {
00711           input_error (gettext ("No reproduction probability"));
00712           goto exit_on_error;
00713         }
00714
00715       // Obtaining adaptation probability
00716       if (json_object_get_member (object, LABEL_ADAPTATION))
00717         {
00718           input->adaptation_ratio
00719             = json_object_get_float (object,
      LABEL_ADAPTATION, &error_code);
00720           if (error_code || input->adaptation_ratio < 0.
00721               || input->adaptation_ratio >= 1.)
00722             {
00723               input_error (gettext ("Invalid adaptation probability"));
00724               goto exit_on_error;
```

```
00725             }
00726         }
00727       else
00728         {
00729           input_error (gettext ("No adaptation probability"));
00730           goto exit_on_error;
00731         }
00732
00733       // Checking survivals
00734       i = input->mutation_ratio * input->nsimulations;
00735       i += input->reproduction_ratio * input->
      nsimulations;
00736       i += input->adaptation_ratio * input->
      nsimulations;
00737       if (i > input->nsimulations - 2)
00738         {
00739           input_error
00740             (gettext
00741              ("No enough survival entities to reproduce the population"));
00742           goto exit_on_error;
00743         }
00744     }
00745   else
00746     {
00747       input_error (gettext ("Unknown algorithm"));
00748       goto exit_on_error;
00749     }
00750
00751   if (input->algorithm == ALGORITHM_MONTE_CARLO
00752       || input->algorithm == ALGORITHM_SWEEP)
00753     {
00754
00755       // Obtaining iterations number
00756       input->niterations
00757         = json_object_get_uint (object, LABEL_NITERATIONS, &error_code
      );
00758       if (error_code == 1)
00759         input->niterations = 1;
00760       else if (error_code)
00761         {
00762           input_error (gettext ("Bad iterations number"));
00763           goto exit_on_error;
00764         }
00765
00766       // Obtaining best number
00767       input->nbest
00768         = json_object_get_uint_with_default (object,
      LABEL_NBEST, 1,
00769                                              &error_code);
00770       if (error_code || !input->nbest)
00771         {
00772           input_error (gettext ("Invalid best number"));
00773           goto exit_on_error;
00774         }
00775
00776       // Obtaining tolerance
00777       input->tolerance
00778         = json_object_get_float_with_default (object,
      LABEL_TOLERANCE, 0.,
00779                                               &error_code);
00780       if (error_code || input->tolerance < 0.)
00781         {
00782           input_error (gettext ("Invalid tolerance"));
00783           goto exit_on_error;
00784         }
00785
00786       // Getting direction search method parameters
00787       if (json_object_get_member (object, LABEL_NSTEPS))
00788         {
00789           input->nsteps
00790             = json_object_get_uint (object, LABEL_NSTEPS, &error_code);
00791           if (error_code || !input->nsteps)
00792             {
00793               input_error (gettext ("Invalid steps number"));
00794               goto exit_on_error;
00795             }
00796           buffer = json_object_get_string_member (object, LABEL_DIRECTION);
00797           if (!strcmp (buffer, LABEL_COORDINATES))
00798             input->direction = DIRECTION_METHOD_COORDINATES;
00799           else if (!strcmp (buffer, LABEL_RANDOM))
00800             {
00801               input->direction = DIRECTION_METHOD_RANDOM;
00802               input->nestimates
00803                 = json_object_get_uint (object,
      LABEL_NESTIMATES, &error_code);
00804               if (error_code || !input->nestimates)
00805                 {
```

```
00806                   input_error (gettext ("Invalid estimates number"));
00807                   goto exit_on_error;
00808                 }
00809             }
00810           else
00811             {
00812               input_error
00813                 (gettext ("Unknown method to estimate the direction search"));
00814               goto exit_on_error;
00815             }
00816           input->relaxation
00817             = json_object_get_float_with_default (object,
      LABEL_RELAXATION,
00818                                                   DEFAULT_RELAXATION,
00819                                                   &error_code);
00820           if (error_code || input->relaxation < 0. || input->
      relaxation > 2.)
00821             {
00822               input_error (gettext ("Invalid relaxation parameter"));
00823               goto exit_on_error;
00824             }
00825         }
00826       else
00827         input->nsteps = 0;
00828     }
00829   // Obtaining the threshold
00830   input->threshold
00831     = json_object_get_float_with_default (object,
      LABEL_THRESHOLD, 0.,
00832                                           &error_code);
00833   if (error_code)
00834     {
00835       input_error (gettext ("Invalid threshold"));
00836       goto exit_on_error;
00837     }
00838
00839   // Reading the experimental data
00840   array = json_object_get_array_member (object, LABEL_EXPERIMENTS);
00841   n = json_array_get_length (array);
00842   input->experiment = (Experiment *) g_malloc (n * sizeof (
      Experiment));
00843   for (i = 0; i < n; ++i)
00844     {
00845 #if DEBUG_INPUT
00846       fprintf (stderr, "input_open_json: nexperiments=%u\n",
00847                input->nexperiments);
00848 #endif
00849       child = json_array_get_element (array, i);
00850       if (!input->nexperiments)
00851         {
00852           if (!experiment_open_json (input->experiment, child, 0))
00853             goto exit_on_error;
00854         }
00855       else
00856         {
00857           if (!experiment_open_json (input->experiment +
      input->nexperiments,
00858                                      child, input->experiment->
      ninputs))
00859             goto exit_on_error;
00860         }
00861       ++input->nexperiments;
00862 #if DEBUG_INPUT
00863       fprintf (stderr, "input_open_json: nexperiments=%u\n",
00864                input->nexperiments);
00865 #endif
00866     }
00867   if (!input->nexperiments)
00868     {
00869       input_error (gettext ("No optimization experiments"));
00870       goto exit_on_error;
00871     }
00872
00873   // Reading the variables data
00874   array = json_object_get_array_member (object, LABEL_VARIABLES);
00875   n = json_array_get_length (array);
00876   input->variable = (Variable *) g_malloc (n * sizeof (
      Variable));
00877   for (i = 0; i < n; ++i)
00878     {
00879 #if DEBUG_INPUT
00880       fprintf (stderr, "input_open_json: nvariables=%u\n", input->
      nvariables);
00881 #endif
00882       child = json_array_get_element (array, i);
00883       if (!variable_open_json (input->variable +
      input->nvariables, child,
```

```
00884                                 input->algorithm, input->
      nsteps))
00885         goto exit_on_error;
00886       ++input->nvariables;
00887     }
00888   if (!input->nvariables)
00889     {
00890       input_error (gettext ("No optimization variables"));
00891       goto exit_on_error;
00892     }
00893
00894   // Obtaining the error norm
00895   if (json_object_get_member (object, LABEL_NORM))
00896     {
00897       buffer = json_object_get_string_member (object, LABEL_NORM);
00898       if (!strcmp (buffer, LABEL_EUCLIDIAN))
00899         input->norm = ERROR_NORM_EUCLIDIAN;
00900       else if (!strcmp (buffer, LABEL_MAXIMUM))
00901         input->norm = ERROR_NORM_MAXIMUM;
00902       else if (!strcmp (buffer, LABEL_P))
00903         {
00904           input->norm = ERROR_NORM_P;
00905           input->p = json_object_get_float (object,
      LABEL_P, &error_code);
00906           if (!error_code)
00907             {
00908               input_error (gettext ("Bad P parameter"));
00909               goto exit_on_error;
00910             }
00911         }
00912       else if (!strcmp (buffer, LABEL_TAXICAB))
00913         input->norm = ERROR_NORM_TAXICAB;
00914       else
00915         {
00916           input_error (gettext ("Unknown error norm"));
00917           goto exit_on_error;
00918         }
00919     }
00920   else
00921     input->norm = ERROR_NORM_EUCLIDIAN;
00922
00923   // Closing the JSON document
00924   g_object_unref (parser);
00925
00926 #if DEBUG_INPUT
00927   fprintf (stderr, "input_open_json: end\n");
00928 #endif
00929   return 1;
00930
00931 exit_on_error:
00932   g_object_unref (parser);
00933 #if DEBUG_INPUT
00934   fprintf (stderr, "input_open_json: end\n");
00935 #endif
00936   return 0;
00937 }
```

Here is the call graph for this function:



5.9.3.4 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 (gettext ("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 (!input->variables)
00175     {
00176       input->variables =
00177         (char *) xmlGetProp (node, (const xmlChar *) LABEL_VARIABLES_FILE);
00178       if (!input->variables)
00179         input->variables =
00180           (char *) xmlStrdup ((const xmlChar *) variables_name);
00181     }
00182
00183   // Opening simulator program name
00184   input->simulator =
00185     (char *) xmlGetProp (node, (const xmlChar *) LABEL_SIMULATOR);
00186   if (!input->simulator)
00187     {
00188       input_error (gettext ("Bad simulator program"));
00189       goto exit_on_error;
00190     }
00191
00192   // Opening evaluator program name
00193   input->evaluator =
00194     (char *) xmlGetProp (node, (const xmlChar *) LABEL_EVALUATOR);
00195
00196   // Obtaining pseudo-random numbers generator seed
00197   input->seed
00198     = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_SEED,
00199                                       DEFAULT_RANDOM_SEED, &error_code);
00200   if (error_code)
00201     {
00202       input_error (gettext ("Bad pseudo-random numbers generator seed"));
00203       goto exit_on_error;
00204     }
00205
00206   // Opening algorithm
00207   buffer = xmlGetProp (node, (const xmlChar *) LABEL_ALGORITHM);
00208   if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MONTE_CARLO))
00209     {
00210       input->algorithm = ALGORITHM_MONTE_CARLO;
00211
00212       // Obtaining simulations number
00213       input->nsimulations
00214         = xml_node_get_int (node, (const xmlChar *)
      LABEL_NSIMULATIONS,
00215                             &error_code);
00216       if (error_code)
00217         {
00218           input_error (gettext ("Bad simulations number"));
00219           goto exit_on_error;
00220         }
00221     }
00222   else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_SWEEP))
00223     input->algorithm = ALGORITHM_SWEEP;
00224   else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_GENETIC))
00225     {
00226       input->algorithm = ALGORITHM_GENETIC;
00227
00228       // Obtaining population
00229       if (xmlHasProp (node, (const xmlChar *) LABEL_NPOPULATION))
00230         {
00231           input->nsimulations
00232             = xml_node_get_uint (node, (const xmlChar *)
```

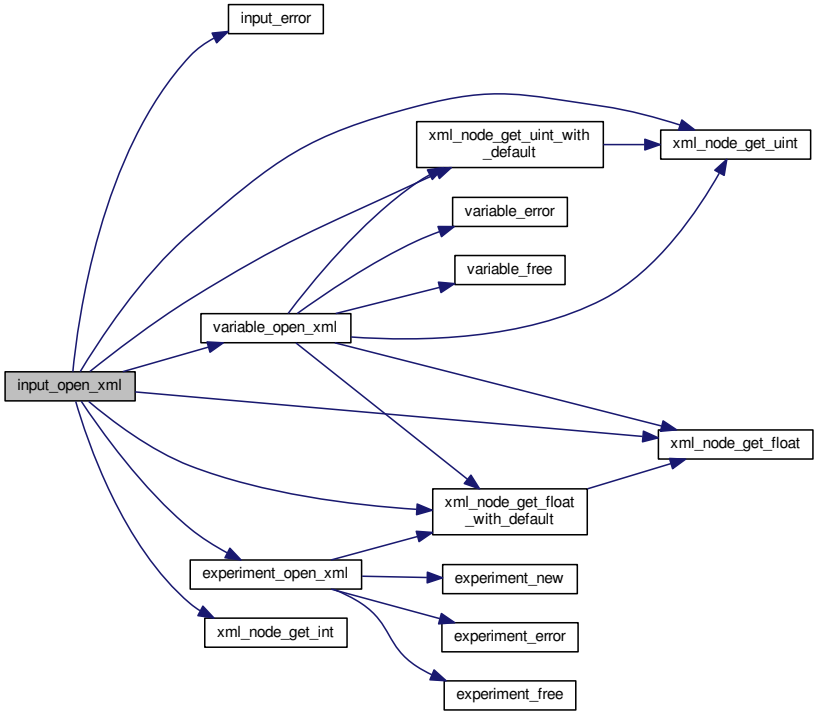
```
      LABEL_NPOPULATION,
00233                                 &error_code);
00234           if (error_code || input->nsimulations < 3)
00235             {
00236               input_error (gettext ("Invalid population number"));
00237               goto exit_on_error;
00238             }
00239         }
00240       else
00241         {
00242           input_error (gettext ("No population number"));
00243           goto exit_on_error;
00244         }
00245
00246       // Obtaining generations
00247       if (xmlHasProp (node, (const xmlChar *) LABEL_NGENERATIONS))
00248         {
00249           input->niterations
00250             = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NGENERATIONS,
00251                                 &error_code);
00252           if (error_code || !input->niterations)
00253             {
00254               input_error (gettext ("Invalid generations number"));
00255               goto exit_on_error;
00256             }
00257         }
00258       else
00259         {
00260           input_error (gettext ("No generations number"));
00261           goto exit_on_error;
00262         }
00263
00264       // Obtaining mutation probability
00265       if (xmlHasProp (node, (const xmlChar *) LABEL_MUTATION))
00266         {
00267           input->mutation_ratio
00268             = xml_node_get_float (node, (const xmlChar *)
      LABEL_MUTATION,
00269                                   &error_code);
00270           if (error_code || input->mutation_ratio < 0.
00271               || input->mutation_ratio >= 1.)
00272             {
00273               input_error (gettext ("Invalid mutation probability"));
00274               goto exit_on_error;
00275             }
00276         }
00277       else
00278         {
00279           input_error (gettext ("No mutation probability"));
00280           goto exit_on_error;
00281         }
00282
00283       // Obtaining reproduction probability
00284       if (xmlHasProp (node, (const xmlChar *) LABEL_REPRODUCTION))
00285         {
00286           input->reproduction_ratio
00287             = xml_node_get_float (node, (const xmlChar *)
      LABEL_REPRODUCTION,
00288                                   &error_code);
00289           if (error_code || input->reproduction_ratio < 0.
00290               || input->reproduction_ratio >= 1.0)
00291             {
00292               input_error (gettext ("Invalid reproduction probability"));
00293               goto exit_on_error;
00294             }
00295         }
00296       else
00297         {
00298           input_error (gettext ("No reproduction probability"));
00299           goto exit_on_error;
00300         }
00301
00302       // Obtaining adaptation probability
00303       if (xmlHasProp (node, (const xmlChar *) LABEL_ADAPTATION))
00304         {
00305           input->adaptation_ratio
00306             = xml_node_get_float (node, (const xmlChar *)
      LABEL_ADAPTATION,
00307                                   &error_code);
00308           if (error_code || input->adaptation_ratio < 0.
00309               || input->adaptation_ratio >= 1.)
00310             {
00311               input_error (gettext ("Invalid adaptation probability"));
00312               goto exit_on_error;
00313             }
00314         }
```

```
00315       else
00316         {
00317           input_error (gettext ("No adaptation probability"));
00318           goto exit_on_error;
00319         }
00320
00321       // Checking survivals
00322       i = input->mutation_ratio * input->nsimulations;
00323       i += input->reproduction_ratio * input->
      nsimulations;
00324       i += input->adaptation_ratio * input->
      nsimulations;
00325       if (i > input->nsimulations - 2)
00326         {
00327           input_error
00328             (gettext
00329              ("No enough survival entities to reproduce the population"));
00330           goto exit_on_error;
00331         }
00332     }
00333   else
00334     {
00335       input_error (gettext ("Unknown algorithm"));
00336       goto exit_on_error;
00337     }
00338   xmlFree (buffer);
00339   buffer = NULL;
00340
00341   if (input->algorithm == ALGORITHM_MONTE_CARLO
00342       || input->algorithm == ALGORITHM_SWEEP)
00343     {
00344
00345       // Obtaining iterations number
00346       input->niterations
00347         = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NITERATIONS,
00348                              &error_code);
00349       if (error_code == 1)
00350         input->niterations = 1;
00351       else if (error_code)
00352         {
00353           input_error (gettext ("Bad iterations number"));
00354           goto exit_on_error;
00355         }
00356
00357       // Obtaining best number
00358       input->nbest
00359         = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_NBEST,
00360                                           1, &error_code);
00361       if (error_code || !input->nbest)
00362         {
00363           input_error (gettext ("Invalid best number"));
00364           goto exit_on_error;
00365         }
00366
00367       // Obtaining tolerance
00368       input->tolerance
00369         = xml_node_get_float_with_default (node,
00370                                            (const xmlChar *) LABEL_TOLERANCE,
00371                                            0., &error_code);
00372       if (error_code || input->tolerance < 0.)
00373         {
00374           input_error (gettext ("Invalid tolerance"));
00375           goto exit_on_error;
00376         }
00377
00378       // Getting direction search method parameters
00379       if (xmlHasProp (node, (const xmlChar *) LABEL_NSTEPS))
00380         {
00381           input->nsteps =
00382             xml_node_get_uint (node, (const xmlChar *)
      LABEL_NSTEPS,
00383                                &error_code);
00384           if (error_code || !input->nsteps)
00385             {
00386               input_error (gettext ("Invalid steps number"));
00387               goto exit_on_error;
00388             }
00389           buffer = xmlGetProp (node, (const xmlChar *) LABEL_DIRECTION);
00390           if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_COORDINATES))
00391             input->direction = DIRECTION_METHOD_COORDINATES;
00392           else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_RANDOM))
00393             {
00394               input->direction = DIRECTION_METHOD_RANDOM;
00395               input->nestimates
00396                 = xml_node_get_uint (node, (const xmlChar *)
```

```
      LABEL_NESTIMATES,
00397                                     &error_code);
00398               if (error_code || !input->nestimates)
00399                 {
00400                   input_error (gettext ("Invalid estimates number"));
00401                   goto exit_on_error;
00402                 }
00403             }
00404           else
00405             {
00406               input_error
00407                 (gettext ("Unknown method to estimate the direction search"));
00408               goto exit_on_error;
00409             }
00410           xmlFree (buffer);
00411           buffer = NULL;
00412           input->relaxation
00413             = xml_node_get_float_with_default (node,
00414                                                (const xmlChar *)
00415                                                LABEL_RELAXATION,
00416                                                DEFAULT_RELAXATION, &error_code);
00417           if (error_code || input->relaxation < 0. || input->
      relaxation > 2.)
00418             {
00419               input_error (gettext ("Invalid relaxation parameter"));
00420               goto exit_on_error;
00421             }
00422         }
00423       else
00424         input->nsteps = 0;
00425     }
00426   // Obtaining the threshold
00427   input->threshold =
00428     xml_node_get_float_with_default (node, (const xmlChar *)
      LABEL_THRESHOLD,
00429                                      0., &error_code);
00430   if (error_code)
00431     {
00432       input_error (gettext ("Invalid threshold"));
00433       goto exit_on_error;
00434     }
00435
00436   // Reading the experimental data
00437   for (child = node->children; child; child = child->next)
00438     {
00439       if (xmlStrcmp (child->name, (const xmlChar *) LABEL_EXPERIMENT))
00440         break;
00441 #if DEBUG_INPUT
00442       fprintf (stderr, "input_open_xml: nexperiments=%u\n",
00443                input->nexperiments);
00444 #endif
00445       input->experiment = (Experiment *)
00446         g_realloc (input->experiment,
00447                    (1 + input->nexperiments) * sizeof (
      Experiment));
00448       if (!input->nexperiments)
00449         {
00450           if (!experiment_open_xml (input->experiment, child, 0))
00451             goto exit_on_error;
00452         }
00453       else
00454         {
00455           if (!experiment_open_xml (input->experiment +
      input->nexperiments,
00456                                     child, input->experiment->
      ninputs))
00457             goto exit_on_error;
00458         }
00459       ++input->nexperiments;
00460 #if DEBUG_INPUT
00461       fprintf (stderr, "input_open_xml: nexperiments=%u\n",
00462                input->nexperiments);
00463 #endif
00464     }
00465   if (!input->nexperiments)
00466     {
00467       input_error (gettext ("No optimization experiments"));
00468       goto exit_on_error;
00469     }
00470   buffer = NULL;
00471
00472   // Reading the variables data
00473   for (; child; child = child->next)
00474     {
00475 #if DEBUG_INPUT
00476       fprintf (stderr, "input_open_xml: nvariables=%u\n", input->nvariables);
00477 #endif
```

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

Here is the call graph for this function:



5.10 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 2012-2016, AUTHORS.
00009
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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
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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
```

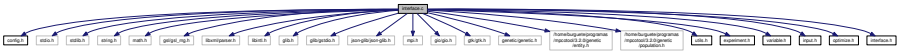
5.11 interface.c File Reference

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 **_GNU_SOURCE**
- #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 ()

  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.

5.11.1 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.

5.11.2 Function Documentation

5.11.2.1 input_save()

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

Function to save the input file.

Parameters

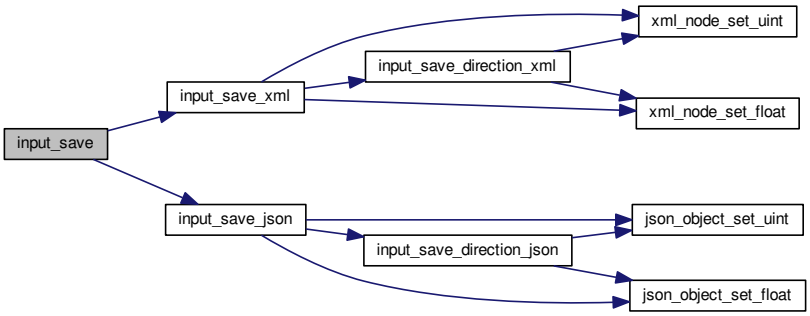
filename	Input file name.

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:



5.11.2.2 input_save_direction_json()

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

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

Parameters

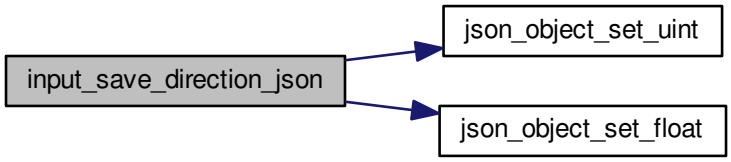
node	JSON node.

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:



5.11.2.3 input_save_direction_xml()

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

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

Parameters

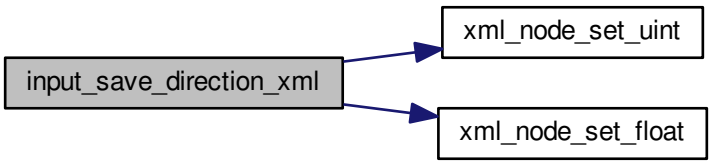
node	XML node.

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:



5.11.2.4 input_save_json()

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

Function to save the input file in JSON format.

Parameters

generator	JsonGenerator struct.

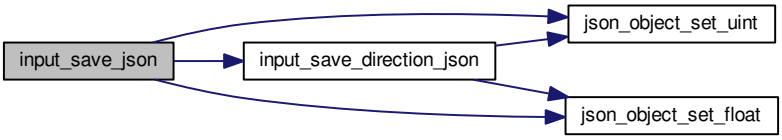
Definition at line 412 of file interface.c.

```
00413 {
00414   unsigned int i, j;
00415   char *buffer;
00416   JsonNode *node, *child;
00417   JsonObject *object, *object2;
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 (object2, LABEL_NAME,
00506                                      input->experiment[i].name);
00507       if (input->experiment[i].weight != 1.)
00508         json_object_set_float (object2, LABEL_WEIGHT,
00509                                input->experiment[i].weight);
00510       for (j = 0; j < input->experiment->ninputs; ++j)
00511         json_object_set_string_member (object2, template[j],
00512                                        input->experiment[i].
      template[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 (object2, LABEL_NAME,
00524                                      input->variable[i].name);
00525       json_object_set_float (object2, LABEL_MINIMUM,
00526                              input->variable[i].rangemin);
00527       if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
00528         json_object_set_float (object2,
      LABEL_ABSOLUTE_MINIMUM,
00529                                input->variable[i].rangeminabs);
00530       json_object_set_float (object2, LABEL_MAXIMUM,
00531                              input->variable[i].rangemax);
00532       if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
00533         json_object_set_float (object2,
      LABEL_ABSOLUTE_MAXIMUM,
00534                                input->variable[i].rangemaxabs);
00535       if (input->variable[i].precision !=
      DEFAULT_PRECISION)
00536         json_object_set_uint (object2, LABEL_PRECISION,
00537                               input->variable[i].precision);
00538       if (input->algorithm == ALGORITHM_SWEEP)
00539         json_object_set_uint (object2, LABEL_NSWEEPS,
00540                               input->variable[i].nsweeps);
00541       else if (input->algorithm == ALGORITHM_GENETIC)
00542         json_object_set_uint (object2, 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:



5.11.2.5 input_save_xml()

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

Function to save the input file in XML format.

Parameters

doc	xmlDoc struct.

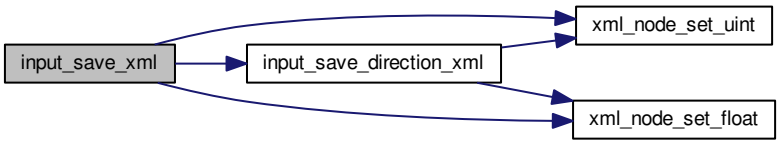
Definition at line 242 of file interface.c.

```
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, "%.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 *) template[j],
00350                     (xmlChar *) input->experiment[i].template[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:



5.11.2.6 window_get_algorithm()

```
unsigned int window_get_algorithm ( )
```

Function to get the stochastic algorithm number.

Returns

Stochastic algorithm number.

Definition at line 726 of file interface.c.

```
00727 {
00728   unsigned int i;
00729 #if DEBUG_INTERFACE
00730   fprintf (stderr, "window_get_algorithm: start\n");
00731 #endif
00732   i = gtk_array_get_active (window->button_algorithm,
      NALGORITHMS);
00733 #if DEBUG_INTERFACE
00734   fprintf (stderr, "window_get_algorithm: %u\n", i);
00735   fprintf (stderr, "window_get_algorithm: end\n");
00736 #endif
00737   return i;
00738 }
```

Here is the call graph for this function:

5.11.2.7 window_get_direction()

```
unsigned int window_get_direction ( )
```

Function to get the direction search method number.

Returns

Direction search method number.

Definition at line 746 of file interface.c.

```
00747 {
00748   unsigned int i;
00749 #if DEBUG_INTERFACE
00750   fprintf (stderr, "window_get_direction: start\n");
00751 #endif
00752   i = gtk_array_get_active (window->button_direction,
      NDIRECTIONS);
00753 #if DEBUG_INTERFACE
00754   fprintf (stderr, "window_get_direction: %u\n", i);
00755   fprintf (stderr, "window_get_direction: end\n");
00756 #endif
00757   return i;
00758 }
```

Here is the call graph for this function:

5.11.2.8 window_get_norm()

```
unsigned int window_get_norm ( )
```

Function to get the norm method number.

Returns

Norm method number.

Definition at line 766 of file interface.c.

```
00767 {
00768   unsigned int i;
00769 #if DEBUG_INTERFACE
00770   fprintf (stderr, "window_get_norm: start\n");
00771 #endif
00772   i = gtk_array_get_active (window->button_norm,
      NNORMS);
00773 #if DEBUG_INTERFACE
00774   fprintf (stderr, "window_get_norm: %u\n", i);
00775   fprintf (stderr, "window_get_norm: end\n");
00776 #endif
00777   return i;
00778 }
```

Here is the call graph for this function:

5.11.2.9 window_read()

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

Function to read the input data of a file.

Parameters

filename	File name.

Returns

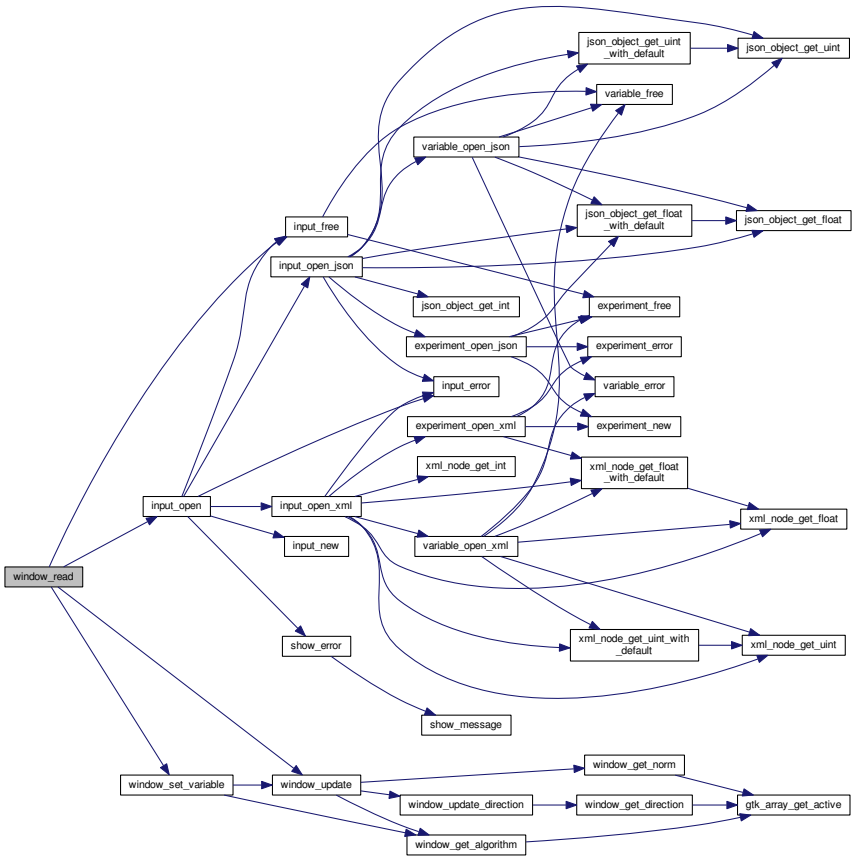
1 on succes, 0 on error.

Definition at line 1874 of file interface.c.

```
01875 {
01876   unsigned int i;
01877   char *buffer;
01878 #if DEBUG_INTERFACE
01879   fprintf (stderr, "window_read: start\n");
01880 #endif
01881
01882   // Reading new input file
01883   input_free ();
01884   if (!input_open (filename))
01885     {
01886 #if DEBUG_INTERFACE
01887       fprintf (stderr, "window_read: end\n");
01888 #endif
01889       return 0;
01890     }
01891
01892   // Setting GTK+ widgets data
01893   gtk_entry_set_text (window->entry_result, input->result);
01894   gtk_entry_set_text (window->entry_variables, input->
      variables);
01895   buffer = g_build_filename (input->directory, input->
      simulator, NULL);
01896   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01897                                  (window->button_simulator), buffer);
01898   g_free (buffer);
01899   gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
01900                                 (size_t) input->evaluator);
01901   if (input->evaluator)
01902     {
01903       buffer = g_build_filename (input->directory, input->
      evaluator, NULL);
01904       gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01905                                      (window->button_evaluator), buffer);
01906       g_free (buffer);
01907     }
01908   gtk_toggle_button_set_active
01909     (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
      algorithm]), TRUE);
01910   switch (input->algorithm)
01911     {
01912     case ALGORITHM_MONTE_CARLO:
01913       gtk_spin_button_set_value (window->spin_simulations,
01914                                  (gdouble) input->nsimulations);
01915     case ALGORITHM_SWEEP:
01916       gtk_spin_button_set_value (window->spin_iterations,
01917                                  (gdouble) input->niterations);
01918       gtk_spin_button_set_value (window->spin_bests, (gdouble)
      input->nbest);
01919       gtk_spin_button_set_value (window->spin_tolerance,
      input->tolerance);
01920       gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->
      check_direction),
01921                                     input->nsteps);
01922       if (input->nsteps)
01923         {
01924           gtk_toggle_button_set_active
01925             (GTK_TOGGLE_BUTTON (window->button_direction
01926                                 [input->direction]), TRUE);
01927           gtk_spin_button_set_value (window->spin_steps,
01928                                      (gdouble) input->nsteps);
01929           gtk_spin_button_set_value (window->spin_relaxation,
01930                                      (gdouble) input->relaxation);
01931           switch (input->direction)
01932             {
01933             case DIRECTION_METHOD_RANDOM:
01934               gtk_spin_button_set_value (window->spin_estimates,
01935                                          (gdouble) input->nestimates);
01936             }
```

```
01937         }
01938       break;
01939     default:
01940       gtk_spin_button_set_value (window->spin_population,
01941                                  (gdouble) input->nsimulations);
01942       gtk_spin_button_set_value (window->spin_generations,
01943                                  (gdouble) input->niterations);
01944       gtk_spin_button_set_value (window->spin_mutation, input->
      mutation_ratio);
01945       gtk_spin_button_set_value (window->spin_reproduction,
01946                                  input->reproduction_ratio);
01947       gtk_spin_button_set_value (window->spin_adaptation,
01948                                  input->adaptation_ratio);
01949     }
01950   gtk_toggle_button_set_active
01951     (GTK_TOGGLE_BUTTON (window->button_norm[input->norm]), TRUE);
01952   gtk_spin_button_set_value (window->spin_p, input->p);
01953   gtk_spin_button_set_value (window->spin_threshold, input->
      threshold);
01954   g_signal_handler_block (window->combo_experiment, window->
      id_experiment);
01955   g_signal_handler_block (window->button_experiment,
01956                           window->id_experiment_name);
01957   gtk_combo_box_text_remove_all (window->combo_experiment);
01958   for (i = 0; i < input->nexperiments; ++i)
01959     gtk_combo_box_text_append_text (window->combo_experiment,
01960                                     input->experiment[i].name);
01961   g_signal_handler_unblock
01962     (window->button_experiment, window->
      id_experiment_name);
01963   g_signal_handler_unblock (window->combo_experiment,
      window->id_experiment);
01964   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
01965   g_signal_handler_block (window->combo_variable, window->
      id_variable);
01966   g_signal_handler_block (window->entry_variable, window->
      id_variable_label);
01967   gtk_combo_box_text_remove_all (window->combo_variable);
01968   for (i = 0; i < input->nvariables; ++i)
01969     gtk_combo_box_text_append_text (window->combo_variable,
01970                                     input->variable[i].name);
01971   g_signal_handler_unblock (window->entry_variable, window->
      id_variable_label);
01972   g_signal_handler_unblock (window->combo_variable, window->
      id_variable);
01973   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
01974   window_set_variable ();
01975   window_update ();
01976
01977 #if DEBUG_INTERFACE
01978   fprintf (stderr, "window_read: end\n");
01979 #endif
01980   return 1;
01981 }
```

Here is the call graph for this function:



5.11.2.10 window_save()

```
int window_save ( )
```

Function to save the input file.

Returns

1 on OK, 0 on Cancel.

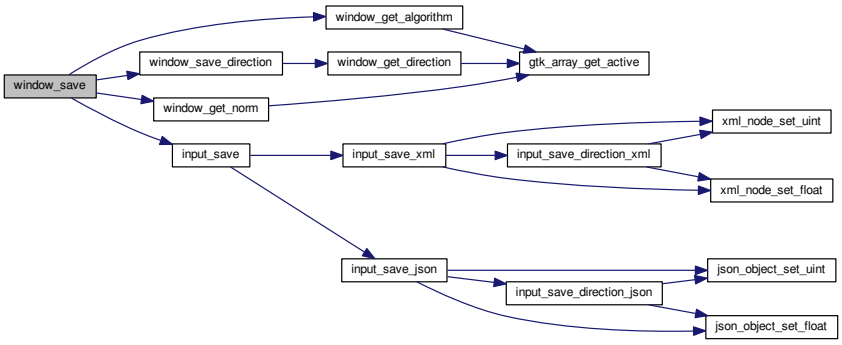
Definition at line 819 of file interface.c.

```
00820 {
00821   GtkFileChooserDialog *dlg;
00822   GtkFileFilter *filter1, *filter2;
00823   char *buffer;
00824
00825 #if DEBUG_INTERFACE
00826   fprintf (stderr, "window_save: start\n");
00827 #endif
00828
00829   // Opening the saving dialog
00830   dlg = (GtkFileChooserDialog *)
00831     gtk_file_chooser_dialog_new (gettext ("Save file"),
00832                                  window->window,
```

```
00833                                 GTK_FILE_CHOOSER_ACTION_SAVE,
00834                                 gettext ("_Cancel"),
00835                                 GTK_RESPONSE_CANCEL,
00836                                 gettext ("_OK"), GTK_RESPONSE_OK, NULL);
00837   gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
00838   buffer = g_build_filename (input->directory, input->name, NULL);
00839   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER (dlg), buffer);
00840   g_free (buffer);
00841
00842   // Adding XML filter
00843   filter1 = (GtkFileFilter *) gtk_file_filter_new ();
00844   gtk_file_filter_set_name (filter1, "XML");
00845   gtk_file_filter_add_pattern (filter1, "*.xml");
00846   gtk_file_filter_add_pattern (filter1, "*.XML");
00847   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter1);
00848
00849   // Adding JSON filter
00850   filter2 = (GtkFileFilter *) gtk_file_filter_new ();
00851   gtk_file_filter_set_name (filter2, "JSON");
00852   gtk_file_filter_add_pattern (filter2, "*.json");
00853   gtk_file_filter_add_pattern (filter2, "*.JSON");
00854   gtk_file_filter_add_pattern (filter2, "*.js");
00855   gtk_file_filter_add_pattern (filter2, "*.JS");
00856   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter2);
00857
00858   if (input->type == INPUT_TYPE_XML)
00859     gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter1);
00860   else
00861     gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter2);
00862
00863   // If OK response then saving
00864   if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
00865     {
00866       // Setting input file type
00867       filter1 = gtk_file_chooser_get_filter (GTK_FILE_CHOOSER (dlg));
00868       buffer = (char *) gtk_file_filter_get_name (filter1);
00869       if (!strcmp (buffer, "XML"))
00870         input->type = INPUT_TYPE_XML;
00871       else
00872         input->type = INPUT_TYPE_JSON;
00873
00874       // Adding properties to the root XML node
00875       input->simulator = gtk_file_chooser_get_filename
00876         (GTK_FILE_CHOOSER (window->button_simulator));
00877       if (gtk_toggle_button_get_active
00878           (GTK_TOGGLE_BUTTON (window->check_evaluator)))
00879         input->evaluator = gtk_file_chooser_get_filename
00880           (GTK_FILE_CHOOSER (window->button_evaluator));
00881       else
00882         input->evaluator = NULL;
00883       if (input->type == INPUT_TYPE_XML)
00884         {
00885           input->result
00886             = (char *) xmlStrdup ((const xmlChar *)
00887                                   gtk_entry_get_text (window->entry_result));
00888           input->variables
00889             = (char *) xmlStrdup ((const xmlChar *)
00890                                   gtk_entry_get_text (window->
      entry_variables));
00891         }
00892       else
00893         {
00894           input->result = g_strdup (gtk_entry_get_text (window->
      entry_result));
00895           input->variables
00896             = g_strdup (gtk_entry_get_text (window->entry_variables));
00897         }
00898
00899       // Setting the algorithm
00900       switch (window_get_algorithm ())
00901         {
00902         case ALGORITHM_MONTE_CARLO:
00903           input->algorithm = ALGORITHM_MONTE_CARLO;
00904           input->nsimulations
00905             = gtk_spin_button_get_value_as_int (window->spin_simulations);
00906           input->niterations
00907             = gtk_spin_button_get_value_as_int (window->spin_iterations);
00908           input->tolerance = gtk_spin_button_get_value (window->
      spin_tolerance);
00909           input->nbest = gtk_spin_button_get_value_as_int (window->
      spin_bests);
00910           window_save_direction ();
00911           break;
00912         case ALGORITHM_SWEEP:
00913           input->algorithm = ALGORITHM_SWEEP;
00914           input->niterations
00915             = gtk_spin_button_get_value_as_int (window->spin_iterations);
```

```
00916           input->tolerance = gtk_spin_button_get_value (window->
      spin_tolerance);
00917           input->nbest = gtk_spin_button_get_value_as_int (window->
      spin_bests);
00918           window_save_direction ();
00919           break;
00920         default:
00921           input->algorithm = ALGORITHM_GENETIC;
00922           input->nsimulations
00923             = gtk_spin_button_get_value_as_int (window->spin_population);
00924           input->niterations
00925             = gtk_spin_button_get_value_as_int (window->spin_generations);
00926           input->mutation_ratio
00927             = gtk_spin_button_get_value (window->spin_mutation);
00928           input->reproduction_ratio
00929             = gtk_spin_button_get_value (window->spin_reproduction);
00930           input->adaptation_ratio
00931             = gtk_spin_button_get_value (window->spin_adaptation);
00932           break;
00933         }
00934       input->norm = window_get_norm ();
00935       input->p = gtk_spin_button_get_value (window->spin_p);
00936       input->threshold = gtk_spin_button_get_value (window->
      spin_threshold);
00937
00938       // Saving the XML file
00939       buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
00940       input_save (buffer);
00941
00942       // Closing and freeing memory
00943       g_free (buffer);
00944       gtk_widget_destroy (GTK_WIDGET (dlg));
00945 #if DEBUG_INTERFACE
00946       fprintf (stderr, "window_save: end\n");
00947 #endif
00948       return 1;
00949     }
00950
00951   // Closing and freeing memory
00952   gtk_widget_destroy (GTK_WIDGET (dlg));
00953 #if DEBUG_INTERFACE
00954   fprintf (stderr, "window_save: end\n");
00955 #endif
00956   return 0;
00957 }
```

Here is the call graph for this function:



5.11.2.11 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 1518 of file interface.c.

```
01519 {
01520   unsigned int i, j;
01521   char *buffer;
01522   GFile *file1, *file2;
01523 #if DEBUG_INTERFACE
01524   fprintf (stderr, "window_template_experiment: start\n");
01525 #endif
01526   i = (size_t) data;
01527   j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01528   file1
01529     = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
01530   file2 = g_file_new_for_path (input->directory);
01531   buffer = g_file_get_relative_path (file2, file1);
01532   if (input->type == INPUT_TYPE_XML)
01533     input->experiment[j].template[i] = (char *) xmlStrdup ((xmlChar *) buffer);
01534   else
01535     input->experiment[j].template[i] = g_strdup (buffer);
01536   g_free (buffer);
01537   g_object_unref (file2);
01538   g_object_unref (file1);
01539 #if DEBUG_INTERFACE
01540   fprintf (stderr, "window_template_experiment: end\n");
01541 #endif
01542 }
```

5.12 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 2012-2016, 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 *) template[j],
00350                     (xmlChar *) input->experiment[i].template[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, *object2;
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 (object2, LABEL_NAME,
00506                                      input->experiment[i].name);
00507       if (input->experiment[i].weight != 1.)
00508         json_object_set_float (object2, LABEL_WEIGHT,
00509                                input->experiment[i].weight);
00510       for (j = 0; j < input->experiment->ninputs; ++j)
00511         json_object_set_string_member (object2, template[j],
00512                                        input->experiment[i].
      template[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 (object2, LABEL_NAME,
00524                                      input->variable[i].name);
00525       json_object_set_float (object2, LABEL_MINIMUM,
00526                              input->variable[i].rangemin);
00527       if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
00528         json_object_set_float (object2,
      LABEL_ABSOLUTE_MINIMUM,
00529                                input->variable[i].rangeminabs);
00530       json_object_set_float (object2, LABEL_MAXIMUM,
00531                              input->variable[i].rangemax);
00532       if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
00533         json_object_set_float (object2,
      LABEL_ABSOLUTE_MAXIMUM,
00534                                input->variable[i].rangemaxabs);
00535       if (input->variable[i].precision !=
      DEFAULT_PRECISION)
00536         json_object_set_uint (object2, LABEL_PRECISION,
00537                               input->variable[i].precision);
00538       if (input->algorithm == ALGORITHM_SWEEP)
00539         json_object_set_uint (object2, LABEL_NSWEEPS,
00540                               input->variable[i].nsweeps);
00541       else if (input->algorithm == ALGORITHM_GENETIC)
00542         json_object_set_uint (object2, 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 (gettext ("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      gettext ("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 (gettext ("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      gettext ("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 (gettext ("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
00651     (GTK_WIDGET (options->spin_direction),
00652      gettext ("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),
00660                    0, 1, 1, 1);
00661   gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_threads),
00662                    1, 1, 1, 1);
00663   gtk_grid_attach (options->grid, GTK_WIDGET (options->label_direction),
00664                    0, 2, 1, 1);
```

```
00665   gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_direction),
00666                    1, 2, 1, 1);
00667   gtk_widget_show_all (GTK_WIDGET (options->grid));
00668   options->dialog = (GtkDialog *)
00669     gtk_dialog_new_with_buttons (gettext ("Options"),
00670                                  window->window,
00671                                  GTK_DIALOG_MODAL,
00672                                  gettext ("_OK"), GTK_RESPONSE_OK,
00673                                  gettext ("_Cancel"), GTK_RESPONSE_CANCEL,
00674                                  NULL);
00675   gtk_container_add
00676     (GTK_CONTAINER (gtk_dialog_get_content_area (options->dialog)),
00677      GTK_WIDGET (options->grid));
00678   if (gtk_dialog_run (options->dialog) == GTK_RESPONSE_OK)
00679     {
00680       input->seed
00681         = (unsigned long int) gtk_spin_button_get_value (options->spin_seed);
00682       nthreads = gtk_spin_button_get_value_as_int (options->spin_threads);
00683       nthreads_direction
00684         = gtk_spin_button_get_value_as_int (options->spin_direction);
00685     }
00686   gtk_widget_destroy (GTK_WIDGET (options->dialog));
00687 #if DEBUG_INTERFACE
00688   fprintf (stderr, "options_new: end\n");
00689 #endif
00690 }
00691
00696 void
00697 running_new ()
00698 {
00699 #if DEBUG_INTERFACE
00700   fprintf (stderr, "running_new: start\n");
00701 #endif
00702   running->label = (GtkLabel *) gtk_label_new (gettext ("Calculating ..."));
00703   running->spinner = (GtkSpinner *) gtk_spinner_new ();
00704   running->grid = (GtkGrid *) gtk_grid_new ();
00705   gtk_grid_attach (running->grid, GTK_WIDGET (running->label), 0, 0, 1, 1);
00706   gtk_grid_attach (running->grid, GTK_WIDGET (running->spinner), 0, 1, 1, 1);
00707   running->dialog = (GtkDialog *)
00708     gtk_dialog_new_with_buttons (gettext ("Calculating"),
00709                                  window->window, GTK_DIALOG_MODAL, NULL, NULL);
00710   gtk_container_add
00711     (GTK_CONTAINER (gtk_dialog_get_content_area (running->dialog)),
00712      GTK_WIDGET (running->grid));
00713   gtk_spinner_start (running->spinner);
00714   gtk_widget_show_all (GTK_WIDGET (running->dialog));
00715 #if DEBUG_INTERFACE
00716   fprintf (stderr, "running_new: end\n");
00717 #endif
00718 }
00719
00725 unsigned int
00726 window_get_algorithm ()
00727 {
00728   unsigned int i;
00729 #if DEBUG_INTERFACE
00730   fprintf (stderr, "window_get_algorithm: start\n");
00731 #endif
00732   i = gtk_array_get_active (window->button_algorithm,
      NALGORITHMS);
00733 #if DEBUG_INTERFACE
00734   fprintf (stderr, "window_get_algorithm: %u\n", i);
00735   fprintf (stderr, "window_get_algorithm: end\n");
00736 #endif
00737   return i;
00738 }
00739
00745 unsigned int
00746 window_get_direction ()
00747 {
00748   unsigned int i;
00749 #if DEBUG_INTERFACE
00750   fprintf (stderr, "window_get_direction: start\n");
00751 #endif
00752   i = gtk_array_get_active (window->button_direction,
      NDIRECTIONS);
00753 #if DEBUG_INTERFACE
00754   fprintf (stderr, "window_get_direction: %u\n", i);
00755   fprintf (stderr, "window_get_direction: end\n");
00756 #endif
00757   return i;
00758 }
00759
00765 unsigned int
00766 window_get_norm ()
00767 {
00768   unsigned int i;
```

```
00769 #if DEBUG_INTERFACE
00770   fprintf (stderr, "window_get_norm: start\n");
00771 #endif
00772   i = gtk_array_get_active (window->button_norm,
      NNORMS);
00773 #if DEBUG_INTERFACE
00774   fprintf (stderr, "window_get_norm: %u\n", i);
00775   fprintf (stderr, "window_get_norm: end\n");
00776 #endif
00777   return i;
00778 }
00779
00784 void
00785 window_save_direction ()
00786 {
00787 #if DEBUG_INTERFACE
00788   fprintf (stderr, "window_save_direction: start\n");
00789 #endif
00790   if (gtk_toggle_button_get_active
00791       (GTK_TOGGLE_BUTTON (window->check_direction)))
00792     {
00793       input->nsteps = gtk_spin_button_get_value_as_int (window->
      spin_steps);
00794       input->relaxation = gtk_spin_button_get_value (window->
      spin_relaxation);
00795       switch (window_get_direction ())
00796         {
00797         case DIRECTION_METHOD_COORDINATES:
00798           input->direction = DIRECTION_METHOD_COORDINATES;
00799           break;
00800         default:
00801           input->direction = DIRECTION_METHOD_RANDOM;
00802           input->nestimates
00803             = gtk_spin_button_get_value_as_int (window->spin_estimates);
00804         }
00805     }
00806   else
00807     input->nsteps = 0;
00808 #if DEBUG_INTERFACE
00809   fprintf (stderr, "window_save_direction: end\n");
00810 #endif
00811 }
00812
00818 int
00819 window_save ()
00820 {
00821   GtkFileChooserDialog *dlg;
00822   GtkFileFilter *filter1, *filter2;
00823   char *buffer;
00824
00825 #if DEBUG_INTERFACE
00826   fprintf (stderr, "window_save: start\n");
00827 #endif
00828
00829   // Opening the saving dialog
00830   dlg = (GtkFileChooserDialog *)
00831     gtk_file_chooser_dialog_new (gettext ("Save file"),
00832                                  window->window,
00833                                  GTK_FILE_CHOOSER_ACTION_SAVE,
00834                                  gettext ("_Cancel"),
00835                                  GTK_RESPONSE_CANCEL,
00836                                  gettext ("_OK"), GTK_RESPONSE_OK, NULL);
00837   gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
00838   buffer = g_build_filename (input->directory, input->name, NULL);
00839   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER (dlg), buffer);
00840   g_free (buffer);
00841
00842   // Adding XML filter
00843   filter1 = (GtkFileFilter *) gtk_file_filter_new ();
00844   gtk_file_filter_set_name (filter1, "XML");
00845   gtk_file_filter_add_pattern (filter1, "*.xml");
00846   gtk_file_filter_add_pattern (filter1, "*.XML");
00847   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter1);
00848
00849   // Adding JSON filter
00850   filter2 = (GtkFileFilter *) gtk_file_filter_new ();
00851   gtk_file_filter_set_name (filter2, "JSON");
00852   gtk_file_filter_add_pattern (filter2, "*.json");
00853   gtk_file_filter_add_pattern (filter2, "*.JSON");
00854   gtk_file_filter_add_pattern (filter2, "*.js");
00855   gtk_file_filter_add_pattern (filter2, "*.JS");
00856   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter2);
00857
00858   if (input->type == INPUT_TYPE_XML)
00859     gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter1);
00860   else
00861     gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter2);
```

```
00862
00863   // If OK response then saving
00864   if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
00865     {
00866       // Setting input file type
00867       filter1 = gtk_file_chooser_get_filter (GTK_FILE_CHOOSER (dlg));
00868       buffer = (char *) gtk_file_filter_get_name (filter1);
00869       if (!strcmp (buffer, "XML"))
00870         input->type = INPUT_TYPE_XML;
00871       else
00872         input->type = INPUT_TYPE_JSON;
00873
00874       // Adding properties to the root XML node
00875       input->simulator = gtk_file_chooser_get_filename
00876         (GTK_FILE_CHOOSER (window->button_simulator));
00877       if (gtk_toggle_button_get_active
00878           (GTK_TOGGLE_BUTTON (window->check_evaluator)))
00879         input->evaluator = gtk_file_chooser_get_filename
00880           (GTK_FILE_CHOOSER (window->button_evaluator));
00881       else
00882         input->evaluator = NULL;
00883       if (input->type == INPUT_TYPE_XML)
00884         {
00885           input->result
00886             = (char *) xmlStrdup ((const xmlChar *)
00887                                   gtk_entry_get_text (window->entry_result));
00888           input->variables
00889             = (char *) xmlStrdup ((const xmlChar *)
00890                                   gtk_entry_get_text (window->entry_variables));
00891         }
00892       else
00893         {
00894           input->result = g_strdup (gtk_entry_get_text (window->
      entry_result));
00895           input->variables
00896             = g_strdup (gtk_entry_get_text (window->entry_variables));
00897         }
00898
00899       // Setting the algorithm
00900       switch (window_get_algorithm ())
00901         {
00902         case ALGORITHM_MONTE_CARLO:
00903           input->algorithm = ALGORITHM_MONTE_CARLO;
00904           input->nsimulations
00905             = gtk_spin_button_get_value_as_int (window->spin_simulations);
00906           input->niterations
00907             = gtk_spin_button_get_value_as_int (window->spin_iterations);
00908           input->tolerance = gtk_spin_button_get_value (window->
      spin_tolerance);
00909           input->nbest = gtk_spin_button_get_value_as_int (window->
      spin_bests);
00910           window_save_direction ();
00911           break;
00912         case ALGORITHM_SWEEP:
00913           input->algorithm = ALGORITHM_SWEEP;
00914           input->niterations
00915             = gtk_spin_button_get_value_as_int (window->spin_iterations);
00916           input->tolerance = gtk_spin_button_get_value (window->
      spin_tolerance);
00917           input->nbest = gtk_spin_button_get_value_as_int (window->
      spin_bests);
00918           window_save_direction ();
00919           break;
00920         default:
00921           input->algorithm = ALGORITHM_GENETIC;
00922           input->nsimulations
00923             = gtk_spin_button_get_value_as_int (window->spin_population);
00924           input->niterations
00925             = gtk_spin_button_get_value_as_int (window->spin_generations);
00926           input->mutation_ratio
00927             = gtk_spin_button_get_value (window->spin_mutation);
00928           input->reproduction_ratio
00929             = gtk_spin_button_get_value (window->spin_reproduction);
00930           input->adaptation_ratio
00931             = gtk_spin_button_get_value (window->spin_adaptation);
00932           break;
00933         }
00934       input->norm = window_get_norm ();
00935       input->p = gtk_spin_button_get_value (window->spin_p);
00936       input->threshold = gtk_spin_button_get_value (window->
      spin_threshold);
00937
00938       // Saving the XML file
00939       buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
00940       input_save (buffer);
00941
00942       // Closing and freeing memory
```

```
00943       g_free (buffer);
00944       gtk_widget_destroy (GTK_WIDGET (dlg));
00945 #if DEBUG_INTERFACE
00946       fprintf (stderr, "window_save: end\n");
00947 #endif
00948       return 1;
00949     }
00950
00951   // Closing and freeing memory
00952   gtk_widget_destroy (GTK_WIDGET (dlg));
00953 #if DEBUG_INTERFACE
00954   fprintf (stderr, "window_save: end\n");
00955 #endif
00956   return 0;
00957 }
00958
00963 void
00964 window_run ()
00965 {
00966   unsigned int i;
00967   char *msg, *msg2, buffer[64], buffer2[64];
00968 #if DEBUG_INTERFACE
00969   fprintf (stderr, "window_run: start\n");
00970 #endif
00971   if (!window_save ())
00972     {
00973 #if DEBUG_INTERFACE
00974       fprintf (stderr, "window_run: end\n");
00975 #endif
00976       return;
00977     }
00978   running_new ();
00979   while (gtk_events_pending ())
00980     gtk_main_iteration ();
00981   optimize_open ();
00982 #if DEBUG_INTERFACE
00983   fprintf (stderr, "window_run: closing running dialog\n");
00984 #endif
00985   gtk_spinner_stop (running->spinner);
00986   gtk_widget_destroy (GTK_WIDGET (running->dialog));
00987 #if DEBUG_INTERFACE
00988   fprintf (stderr, "window_run: displaying results\n");
00989 #endif
00990   snprintf (buffer, 64, "error = %.15le\n", optimize->error_old[0]);
00991   msg2 = g_strdup (buffer);
00992   for (i = 0; i < optimize->nvariables; ++i, msg2 = msg)
00993     {
00994       snprintf (buffer, 64, "%s = %s\n",
00995                 input->variable[i].name, format[input->
      variable[i].precision]);
00996       snprintf (buffer2, 64, buffer, optimize->value_old[i]);
00997       msg = g_strconcat (msg2, buffer2, NULL);
00998       g_free (msg2);
00999     }
01000   snprintf (buffer, 64, "%s = %.6lg s", gettext ("Calculation time"),
01001             optimize->calculation_time);
01002   msg = g_strconcat (msg2, buffer, NULL);
01003   g_free (msg2);
01004   show_message (gettext ("Best result"), msg, INFO_TYPE);
01005   g_free (msg);
01006 #if DEBUG_INTERFACE
01007   fprintf (stderr, "window_run: freeing memory\n");
01008 #endif
01009   optimize_free ();
01010 #if DEBUG_INTERFACE
01011   fprintf (stderr, "window_run: end\n");
01012 #endif
01013 }
01014
01019 void
01020 window_help ()
01021 {
01022   char *buffer, *buffer2;
01023 #if DEBUG_INTERFACE
01024   fprintf (stderr, "window_help: start\n");
01025 #endif
01026   buffer2 = g_build_filename (window->application_directory, "..", "manuals",
01027                               gettext ("user-manual.pdf"), NULL);
01028   buffer = g_filename_to_uri (buffer2, NULL, NULL);
01029   g_free (buffer2);
01030   gtk_show_uri (NULL, buffer, GDK_CURRENT_TIME, NULL);
01031 #if DEBUG_INTERFACE
01032   fprintf (stderr, "window_help: uri=%s\n", buffer);
01033 #endif
01034   g_free (buffer);
01035 #if DEBUG_INTERFACE
01036   fprintf (stderr, "window_help: end\n");
```

```
01037 #endif
01038 }
01039
01044 void
01045 window_about ()
01046 {
01047   static const gchar *authors[] = {
01048     "Javier Burguete Tolosa <jburguete@eead.csic.es>",
01049     "Borja Latorre Garcés <borja.latorre@csic.es>",
01050     NULL
01051   };
01052 #if DEBUG_INTERFACE
01053   fprintf (stderr, "window_about: start\n");
01054 #endif
01055   gtk_show_about_dialog
01056     (window->window,
01057      "program_name", "MPCOTool",
01058      "comments",
01059      gettext ("The Multi-Purposes Calibration and Optimization Tool.\n"
01060               "A software to perform calibrations or optimizations of "
01061               "empirical parameters"),
01062      "authors", authors,
01063      "translator-credits",
01064      "Javier Burguete Tolosa <jburguete@eead.csic.es> "
01065      "(english, french and spanish)\n"
01066      "Uğur Çayoğlu (german)",
01067      "version", "3.2.0",
01068      "copyright", "Copyright 2012-2016 Javier Burguete Tolosa",
01069      "logo", window->logo,
01070      "website", "https://github.com/jburguete/mpcotool",
01071      "license-type", GTK_LICENSE_BSD, NULL);
01072 #if DEBUG_INTERFACE
01073   fprintf (stderr, "window_about: end\n");
01074 #endif
01075 }
01076
01082 void
01083 window_update_direction ()
01084 {
01085 #if DEBUG_INTERFACE
01086   fprintf (stderr, "window_update_direction: start\n");
01087 #endif
01088   gtk_widget_show (GTK_WIDGET (window->check_direction));
01089   if (gtk_toggle_button_get_active
01090       (GTK_TOGGLE_BUTTON (window->check_direction)))
01091     {
01092       gtk_widget_show (GTK_WIDGET (window->grid_direction));
01093       gtk_widget_show (GTK_WIDGET (window->label_step));
01094       gtk_widget_show (GTK_WIDGET (window->spin_step));
01095     }
01096   switch (window_get_direction ())
01097     {
01098     case DIRECTION_METHOD_COORDINATES:
01099       gtk_widget_hide (GTK_WIDGET (window->label_estimates));
01100       gtk_widget_hide (GTK_WIDGET (window->spin_estimates));
01101       break;
01102     default:
01103       gtk_widget_show (GTK_WIDGET (window->label_estimates));
01104       gtk_widget_show (GTK_WIDGET (window->spin_estimates));
01105     }
01106 #if DEBUG_INTERFACE
01107   fprintf (stderr, "window_update_direction: end\n");
01108 #endif
01109 }
01110
01115 void
01116 window_update ()
01117 {
01118   unsigned int i;
01119 #if DEBUG_INTERFACE
01120   fprintf (stderr, "window_update: start\n");
01121 #endif
01122   gtk_widget_set_sensitive
01123     (GTK_WIDGET (window->button_evaluator),
01124      gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
01125                                    (window->check_evaluator)));
01126   gtk_widget_hide (GTK_WIDGET (window->label_simulations));
01127   gtk_widget_hide (GTK_WIDGET (window->spin_simulations));
01128   gtk_widget_hide (GTK_WIDGET (window->label_iterations));
01129   gtk_widget_hide (GTK_WIDGET (window->spin_iterations));
01130   gtk_widget_hide (GTK_WIDGET (window->label_tolerance));
01131   gtk_widget_hide (GTK_WIDGET (window->spin_tolerance));
01132   gtk_widget_hide (GTK_WIDGET (window->label_bests));
01133   gtk_widget_hide (GTK_WIDGET (window->spin_bests));
01134   gtk_widget_hide (GTK_WIDGET (window->label_population));
01135   gtk_widget_hide (GTK_WIDGET (window->spin_population));
01136   gtk_widget_hide (GTK_WIDGET (window->label_generations));
```

```
01137   gtk_widget_hide (GTK_WIDGET (window->spin_generations));
01138   gtk_widget_hide (GTK_WIDGET (window->label_mutation));
01139   gtk_widget_hide (GTK_WIDGET (window->spin_mutation));
01140   gtk_widget_hide (GTK_WIDGET (window->label_reproduction));
01141   gtk_widget_hide (GTK_WIDGET (window->spin_reproduction));
01142   gtk_widget_hide (GTK_WIDGET (window->label_adaptation));
01143   gtk_widget_hide (GTK_WIDGET (window->spin_adaptation));
01144   gtk_widget_hide (GTK_WIDGET (window->label_sweeps));
01145   gtk_widget_hide (GTK_WIDGET (window->spin_sweeps));
01146   gtk_widget_hide (GTK_WIDGET (window->label_bits));
01147   gtk_widget_hide (GTK_WIDGET (window->spin_bits));
01148   gtk_widget_hide (GTK_WIDGET (window->check_direction));
01149   gtk_widget_hide (GTK_WIDGET (window->grid_direction));
01150   gtk_widget_hide (GTK_WIDGET (window->label_step));
01151   gtk_widget_hide (GTK_WIDGET (window->spin_step));
01152   gtk_widget_hide (GTK_WIDGET (window->label_p));
01153   gtk_widget_hide (GTK_WIDGET (window->spin_p));
01154   i = gtk_spin_button_get_value_as_int (window->spin_iterations);
01155   switch (window_get_algorithm ())
01156     {
01157     case ALGORITHM_MONTE_CARLO:
01158       gtk_widget_show (GTK_WIDGET (window->label_simulations));
01159       gtk_widget_show (GTK_WIDGET (window->spin_simulations));
01160       gtk_widget_show (GTK_WIDGET (window->label_iterations));
01161       gtk_widget_show (GTK_WIDGET (window->spin_iterations));
01162       if (i > 1)
01163         {
01164           gtk_widget_show (GTK_WIDGET (window->label_tolerance));
01165           gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
01166           gtk_widget_show (GTK_WIDGET (window->label_bests));
01167           gtk_widget_show (GTK_WIDGET (window->spin_bests));
01168         }
01169       window_update_direction ();
01170       break;
01171     case ALGORITHM_SWEEP:
01172       gtk_widget_show (GTK_WIDGET (window->label_iterations));
01173       gtk_widget_show (GTK_WIDGET (window->spin_iterations));
01174       if (i > 1)
01175         {
01176           gtk_widget_show (GTK_WIDGET (window->label_tolerance));
01177           gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
01178           gtk_widget_show (GTK_WIDGET (window->label_bests));
01179           gtk_widget_show (GTK_WIDGET (window->spin_bests));
01180         }
01181       gtk_widget_show (GTK_WIDGET (window->label_sweeps));
01182       gtk_widget_show (GTK_WIDGET (window->spin_sweeps));
01183       gtk_widget_show (GTK_WIDGET (window->check_direction));
01184       window_update_direction ();
01185       break;
01186     default:
01187       gtk_widget_show (GTK_WIDGET (window->label_population));
01188       gtk_widget_show (GTK_WIDGET (window->spin_population));
01189       gtk_widget_show (GTK_WIDGET (window->label_generations));
01190       gtk_widget_show (GTK_WIDGET (window->spin_generations));
01191       gtk_widget_show (GTK_WIDGET (window->label_mutation));
01192       gtk_widget_show (GTK_WIDGET (window->spin_mutation));
01193       gtk_widget_show (GTK_WIDGET (window->label_reproduction));
01194       gtk_widget_show (GTK_WIDGET (window->spin_reproduction));
01195       gtk_widget_show (GTK_WIDGET (window->label_adaptation));
01196       gtk_widget_show (GTK_WIDGET (window->spin_adaptation));
01197       gtk_widget_show (GTK_WIDGET (window->label_bits));
01198       gtk_widget_show (GTK_WIDGET (window->spin_bits));
01199     }
01200   gtk_widget_set_sensitive
01201     (GTK_WIDGET (window->button_remove_experiment),
      input->nexperiments > 1);
01202   gtk_widget_set_sensitive
01203     (GTK_WIDGET (window->button_remove_variable), input->
      nvariables > 1);
01204   for (i = 0; i < input->experiment->ninputs; ++i)
01205     {
01206       gtk_widget_show (GTK_WIDGET (window->check_template[i]));
01207       gtk_widget_show (GTK_WIDGET (window->button_template[i]));
01208       gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 0);
01209       gtk_widget_set_sensitive (GTK_WIDGET (window->button_template[i]), 1);
01210       g_signal_handler_block
01211         (window->check_template[i], window->id_template[i]);
01212       g_signal_handler_block (window->button_template[i], window->
      id_input[i]);
01213       gtk_toggle_button_set_active
01214         (GTK_TOGGLE_BUTTON (window->check_template[i]), 1);
01215       g_signal_handler_unblock
01216         (window->button_template[i], window->id_input[i]);
01217       g_signal_handler_unblock
01218         (window->check_template[i], window->id_template[i]);
01219     }
01220   if (i > 0)
```

```
01221     {
01222       gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i - 1]), 1);
01223       gtk_widget_set_sensitive
01224         (GTK_WIDGET (window->button_template[i - 1]),
01225          gtk_toggle_button_get_active
01226          GTK_TOGGLE_BUTTON (window->check_template[i - 1]));
01227     }
01228   if (i < MAX_NINPUTS)
01229     {
01230       gtk_widget_show (GTK_WIDGET (window->check_template[i]));
01231       gtk_widget_show (GTK_WIDGET (window->button_template[i]));
01232       gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 1);
01233       gtk_widget_set_sensitive
01234         (GTK_WIDGET (window->button_template[i]),
01235          gtk_toggle_button_get_active
01236          GTK_TOGGLE_BUTTON (window->check_template[i]));
01237       g_signal_handler_block
01238         (window->check_template[i], window->id_template[i]);
01239       g_signal_handler_block (window->button_template[i], window->
      id_input[i]);
01240       gtk_toggle_button_set_active
01241         (GTK_TOGGLE_BUTTON (window->check_template[i]), 0);
01242       g_signal_handler_unblock
01243         (window->button_template[i], window->id_input[i]);
01244       g_signal_handler_unblock
01245         (window->check_template[i], window->id_template[i]);
01246     }
01247   while (++i < MAX_NINPUTS)
01248     {
01249       gtk_widget_hide (GTK_WIDGET (window->check_template[i]));
01250       gtk_widget_hide (GTK_WIDGET (window->button_template[i]));
01251     }
01252   gtk_widget_set_sensitive
01253     (GTK_WIDGET (window->spin_minabs),
01254      gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (window->check_minabs)));
01255   gtk_widget_set_sensitive
01256     (GTK_WIDGET (window->spin_maxabs),
01257      gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (window->check_maxabs)));
01258   if (window_get_norm () == ERROR_NORM_P)
01259     {
01260       gtk_widget_show (GTK_WIDGET (window->label_p));
01261       gtk_widget_show (GTK_WIDGET (window->spin_p));
01262     }
01263 #if DEBUG_INTERFACE
01264   fprintf (stderr, "window_update: end\n");
01265 #endif
01266 }
01267
01272 void
01273 window_set_algorithm ()
01274 {
01275   int i;
01276 #if DEBUG_INTERFACE
01277   fprintf (stderr, "window_set_algorithm: start\n");
01278 #endif
01279   i = window_get_algorithm ();
01280   switch (i)
01281     {
01282     case ALGORITHM_SWEEP:
01283       i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01284       if (i < 0)
01285         i = 0;
01286       gtk_spin_button_set_value (window->spin_sweeps,
01287                                  (gdouble) input->variable[i].
      nsweeps);
01288       break;
01289     case ALGORITHM_GENETIC:
01290       i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01291       if (i < 0)
01292         i = 0;
01293       gtk_spin_button_set_value (window->spin_bits,
01294                                  (gdouble) input->variable[i].nbits);
01295     }
01296   window_update ();
01297 #if DEBUG_INTERFACE
01298   fprintf (stderr, "window_set_algorithm: end\n");
01299 #endif
01300 }
01301
01306 void
01307 window_set_experiment ()
01308 {
01309   unsigned int i, j;
01310   char *buffer1, *buffer2;
01311 #if DEBUG_INTERFACE
01312   fprintf (stderr, "window_set_experiment: start\n");
01313 #endif
```

```
01314   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01315   gtk_spin_button_set_value (window->spin_weight, input->
      experiment[i].weight);
01316   buffer1 = gtk_combo_box_text_get_active_text (window->combo_experiment);
01317   buffer2 = g_build_filename (input->directory, buffer1, NULL);
01318   g_free (buffer1);
01319   g_signal_handler_block
01320     (window->button_experiment, window->id_experiment_name);
01321   gtk_file_chooser_set_filename
01322     (GTK_FILE_CHOOSER (window->button_experiment), buffer2);
01323   g_signal_handler_unblock
01324     (window->button_experiment, window->id_experiment_name);
01325   g_free (buffer2);
01326   for (j = 0; j < input->experiment->ninputs; ++j)
01327     {
01328       g_signal_handler_block (window->button_template[j], window->
      id_input[j]);
01329       buffer2 = g_build_filename (input->directory,
01330                                   input->experiment[i].template[j], NULL);
01331       gtk_file_chooser_set_filename
01332         (GTK_FILE_CHOOSER (window->button_template[j]), buffer2);
01333       g_free (buffer2);
01334       g_signal_handler_unblock
01335         (window->button_template[j], window->id_input[j]);
01336     }
01337 #if DEBUG_INTERFACE
01338   fprintf (stderr, "window_set_experiment: end\n");
01339 #endif
01340 }
01341
01346 void
01347 window_remove_experiment ()
01348 {
01349   unsigned int i, j;
01350 #if DEBUG_INTERFACE
01351   fprintf (stderr, "window_remove_experiment: start\n");
01352 #endif
01353   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01354   g_signal_handler_block (window->combo_experiment, window->
      id_experiment);
01355   gtk_combo_box_text_remove (window->combo_experiment, i);
01356   g_signal_handler_unblock (window->combo_experiment, window->
      id_experiment);
01357   experiment_free (input->experiment + i, input->
      type);
01358   --input->nexperiments;
01359   for (j = i; j < input->nexperiments; ++j)
01360     memcpy (input->experiment + j, input->experiment + j + 1,
01361             sizeof (Experiment));
01362   j = input->nexperiments - 1;
01363   if (i > j)
01364     i = j;
01365   for (j = 0; j < input->experiment->ninputs; ++j)
01366     g_signal_handler_block (window->button_template[j], window->
      id_input[j]);
01367   g_signal_handler_block
01368     (window->button_experiment, window->id_experiment_name);
01369   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
01370   g_signal_handler_unblock
01371     (window->button_experiment, window->id_experiment_name);
01372   for (j = 0; j < input->experiment->ninputs; ++j)
01373     g_signal_handler_unblock (window->button_template[j], window->
      id_input[j]);
01374   window_update ();
01375 #if DEBUG_INTERFACE
01376   fprintf (stderr, "window_remove_experiment: end\n");
01377 #endif
01378 }
01379
01384 void
01385 window_add_experiment ()
01386 {
01387   unsigned int i, j;
01388 #if DEBUG_INTERFACE
01389   fprintf (stderr, "window_add_experiment: start\n");
01390 #endif
01391   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01392   g_signal_handler_block (window->combo_experiment, window->
      id_experiment);
01393   gtk_combo_box_text_insert_text
01394     (window->combo_experiment, i, input->experiment[i].
      name);
01395   g_signal_handler_unblock (window->combo_experiment, window->
      id_experiment);
01396   input->experiment = (Experiment *) g_realloc
01397     (input->experiment, (input->nexperiments + 1) * sizeof (
      Experiment));
```

```
01398   for (j = input->nexperiments - 1; j > i; --j)
01399     memcpy (input->experiment + j + 1, input->experiment + j,
01400             sizeof (Experiment));
01401   input->experiment[j + 1].weight = input->experiment[j].
      weight;
01402   input->experiment[j + 1].ninputs = input->
      experiment[j].ninputs;
01403   if (input->type == INPUT_TYPE_XML)
01404     {
01405       input->experiment[j + 1].name
01406         = (char *) xmlStrdup ((xmlChar *) input->experiment[j].
      name);
01407       for (j = 0; j < input->experiment->ninputs; ++j)
01408         input->experiment[i + 1].template[j]
01409           = (char *) xmlStrdup ((xmlChar *) input->experiment[i].
      template[j]);
01410     }
01411   else
01412     {
01413       input->experiment[j + 1].name = g_strdup (input->
      experiment[j].name);
01414       for (j = 0; j < input->experiment->ninputs; ++j)
01415         input->experiment[i + 1].template[j]
01416           = g_strdup (input->experiment[i].template[j]);
01417     }
01418   ++input->nexperiments;
01419   for (j = 0; j < input->experiment->ninputs; ++j)
01420     g_signal_handler_block (window->button_template[j], window->
      id_input[j]);
01421   g_signal_handler_block
01422     (window->button_experiment, window->id_experiment_name);
01423   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i + 1);
01424   g_signal_handler_unblock
01425     (window->button_experiment, window->id_experiment_name);
01426   for (j = 0; j < input->experiment->ninputs; ++j)
01427     g_signal_handler_unblock (window->button_template[j], window->
      id_input[j]);
01428   window_update ();
01429 #if DEBUG_INTERFACE
01430   fprintf (stderr, "window_add_experiment: end\n");
01431 #endif
01432 }
01433
01438 void
01439 window_name_experiment ()
01440 {
01441   unsigned int i;
01442   char *buffer;
01443   GFile *file1, *file2;
01444 #if DEBUG_INTERFACE
01445   fprintf (stderr, "window_name_experiment: start\n");
01446 #endif
01447   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01448   file1
01449     = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_experiment));
01450   file2 = g_file_new_for_path (input->directory);
01451   buffer = g_file_get_relative_path (file2, file1);
01452   g_signal_handler_block (window->combo_experiment, window->
      id_experiment);
01453   gtk_combo_box_text_remove (window->combo_experiment, i);
01454   gtk_combo_box_text_insert_text (window->combo_experiment, i, buffer);
01455   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
01456   g_signal_handler_unblock (window->combo_experiment, window->
      id_experiment);
01457   g_free (buffer);
01458   g_object_unref (file2);
01459   g_object_unref (file1);
01460 #if DEBUG_INTERFACE
01461   fprintf (stderr, "window_name_experiment: end\n");
01462 #endif
01463 }
01464
01469 void
01470 window_weight_experiment ()
01471 {
01472   unsigned int i;
01473 #if DEBUG_INTERFACE
01474   fprintf (stderr, "window_weight_experiment: start\n");
01475 #endif
01476   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01477   input->experiment[i].weight = gtk_spin_button_get_value (window->
      spin_weight);
01478 #if DEBUG_INTERFACE
01479   fprintf (stderr, "window_weight_experiment: end\n");
01480 #endif
01481 }
01482
```

```
01488 void
01489 window_inputs_experiment ()
01490 {
01491   unsigned int j;
01492 #if DEBUG_INTERFACE
01493   fprintf (stderr, "window_inputs_experiment: start\n");
01494 #endif
01495   j = input->experiment->ninputs - 1;
01496   if (j
01497       && !gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
01498                                         (window->check_template[j])))
01499     --input->experiment->ninputs;
01500   if (input->experiment->ninputs < MAX_NINPUTS
01501       && gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
01502                                        (window->check_template[j])))
01503     ++input->experiment->ninputs;
01504   window_update ();
01505 #if DEBUG_INTERFACE
01506   fprintf (stderr, "window_inputs_experiment: end\n");
01507 #endif
01508 }
01509
01517 void
01518 window_template_experiment (void *data)
01519 {
01520   unsigned int i, j;
01521   char *buffer;
01522   GFile *file1, *file2;
01523 #if DEBUG_INTERFACE
01524   fprintf (stderr, "window_template_experiment: start\n");
01525 #endif
01526   i = (size_t) data;
01527   j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01528   file1
01529     = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
01530   file2 = g_file_new_for_path (input->directory);
01531   buffer = g_file_get_relative_path (file2, file1);
01532   if (input->type == INPUT_TYPE_XML)
01533     input->experiment[j].template[i] = (char *) xmlStrdup ((xmlChar *) buffer);
01534   else
01535     input->experiment[j].template[i] = g_strdup (buffer);
01536   g_free (buffer);
01537   g_object_unref (file2);
01538   g_object_unref (file1);
01539 #if DEBUG_INTERFACE
01540   fprintf (stderr, "window_template_experiment: end\n");
01541 #endif
01542 }
01543
01548 void
01549 window_set_variable ()
01550 {
01551   unsigned int i;
01552 #if DEBUG_INTERFACE
01553   fprintf (stderr, "window_set_variable: start\n");
01554 #endif
01555   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01556   g_signal_handler_block (window->entry_variable, window->
      id_variable_label);
01557   gtk_entry_set_text (window->entry_variable, input->variable[i].
      name);
01558   g_signal_handler_unblock (window->entry_variable, window->
      id_variable_label);
01559   gtk_spin_button_set_value (window->spin_min, input->variable[i].
      rangemin);
01560   gtk_spin_button_set_value (window->spin_max, input->variable[i].
      rangemax);
01561   if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
01562     {
01563       gtk_spin_button_set_value (window->spin_minabs,
01564                                  input->variable[i].rangeminabs);
01565       gtk_toggle_button_set_active
01566         (GTK_TOGGLE_BUTTON (window->check_minabs), 1);
01567     }
01568   else
01569     {
01570       gtk_spin_button_set_value (window->spin_minabs, -G_MAXDOUBLE);
01571       gtk_toggle_button_set_active
01572         (GTK_TOGGLE_BUTTON (window->check_minabs), 0);
01573     }
01574   if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
01575     {
01576       gtk_spin_button_set_value (window->spin_maxabs,
01577                                  input->variable[i].rangemaxabs);
01578       gtk_toggle_button_set_active
01579         (GTK_TOGGLE_BUTTON (window->check_maxabs), 1);
01580     }
```

```
01581   else
01582     {
01583       gtk_spin_button_set_value (window->spin_maxabs, G_MAXDOUBLE);
01584       gtk_toggle_button_set_active
01585         (GTK_TOGGLE_BUTTON (window->check_maxabs), 0);
01586     }
01587   gtk_spin_button_set_value (window->spin_precision,
01588                              input->variable[i].precision);
01589   gtk_spin_button_set_value (window->spin_steps, (gdouble) input->
      nsteps);
01590   if (input->nsteps)
01591     gtk_spin_button_set_value (window->spin_step, input->variable[i].
      step);
01592 #if DEBUG_INTERFACE
01593   fprintf (stderr, "window_set_variable: precision[%u]=%u\n", i,
01594            input->variable[i].precision);
01595 #endif
01596   switch (window_get_algorithm ())
01597     {
01598     case ALGORITHM_SWEEP:
01599       gtk_spin_button_set_value (window->spin_sweeps,
01600                                  (gdouble) input->variable[i].
      nsweeps);
01601 #if DEBUG_INTERFACE
01602       fprintf (stderr, "window_set_variable: nsweeps[%u]=%u\n", i,
01603                input->variable[i].nsweeps);
01604 #endif
01605       break;
01606     case ALGORITHM_GENETIC:
01607       gtk_spin_button_set_value (window->spin_bits,
01608                                  (gdouble) input->variable[i].nbits);
01609 #if DEBUG_INTERFACE
01610       fprintf (stderr, "window_set_variable: nbits[%u]=%u\n", i,
01611                input->variable[i].nbits);
01612 #endif
01613       break;
01614     }
01615   window_update ();
01616 #if DEBUG_INTERFACE
01617   fprintf (stderr, "window_set_variable: end\n");
01618 #endif
01619 }
01620
01625 void
01626 window_remove_variable ()
01627 {
01628   unsigned int i, j;
01629 #if DEBUG_INTERFACE
01630   fprintf (stderr, "window_remove_variable: start\n");
01631 #endif
01632   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01633   g_signal_handler_block (window->combo_variable, window->
      id_variable);
01634   gtk_combo_box_text_remove (window->combo_variable, i);
01635   g_signal_handler_unblock (window->combo_variable, window->
      id_variable);
01636   xmlFree (input->variable[i].name);
01637   --input->nvariables;
01638   for (j = i; j < input->nvariables; ++j)
01639     memcpy (input->variable + j, input->variable + j + 1, sizeof (
      Variable));
01640   j = input->nvariables - 1;
01641   if (i > j)
01642     i = j;
01643   g_signal_handler_block (window->entry_variable, window->
      id_variable_label);
01644   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
01645   g_signal_handler_unblock (window->entry_variable, window->
      id_variable_label);
01646   window_update ();
01647 #if DEBUG_INTERFACE
01648   fprintf (stderr, "window_remove_variable: end\n");
01649 #endif
01650 }
01651
01656 void
01657 window_add_variable ()
01658 {
01659   unsigned int i, j;
01660 #if DEBUG_INTERFACE
01661   fprintf (stderr, "window_add_variable: start\n");
01662 #endif
01663   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01664   g_signal_handler_block (window->combo_variable, window->
      id_variable);
01665   gtk_combo_box_text_insert_text (window->combo_variable, i,
01666                                   input->variable[i].name);
```

```
01667   g_signal_handler_unblock (window->combo_variable, window->
      id_variable);
01668   input->variable = (Variable *) g_realloc
01669     (input->variable, (input->nvariables + 1) * sizeof (
      Variable));
01670   for (j = input->nvariables - 1; j > i; --j)
01671     memcpy (input->variable + j + 1, input->variable + j, sizeof (
      Variable));
01672   memcpy (input->variable + j + 1, input->variable + j, sizeof (
      Variable));
01673   if (input->type == INPUT_TYPE_XML)
01674     input->variable[j + 1].name
01675       = (char *) xmlStrdup ((xmlChar *) input->variable[j].name);
01676   else
01677     input->variable[j + 1].name = g_strdup (input->
      variable[j].name);
01678   ++input->nvariables;
01679   g_signal_handler_block (window->entry_variable, window->
      id_variable_label);
01680   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i + 1);
01681   g_signal_handler_unblock (window->entry_variable, window->
      id_variable_label);
01682   window_update ();
01683 #if DEBUG_INTERFACE
01684   fprintf (stderr, "window_add_variable: end\n");
01685 #endif
01686 }
01687
01692 void
01693 window_label_variable ()
01694 {
01695   unsigned int i;
01696   const char *buffer;
01697 #if DEBUG_INTERFACE
01698   fprintf (stderr, "window_label_variable: start\n");
01699 #endif
01700   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01701   buffer = gtk_entry_get_text (window->entry_variable);
01702   g_signal_handler_block (window->combo_variable, window->
      id_variable);
01703   gtk_combo_box_text_remove (window->combo_variable, i);
01704   gtk_combo_box_text_insert_text (window->combo_variable, i, buffer);
01705   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
01706   g_signal_handler_unblock (window->combo_variable, window->
      id_variable);
01707 #if DEBUG_INTERFACE
01708   fprintf (stderr, "window_label_variable: end\n");
01709 #endif
01710 }
01711
01716 void
01717 window_precision_variable ()
01718 {
01719   unsigned int i;
01720 #if DEBUG_INTERFACE
01721   fprintf (stderr, "window_precision_variable: start\n");
01722 #endif
01723   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01724   input->variable[i].precision
01725     = (unsigned int) gtk_spin_button_get_value_as_int (window->spin_precision);
01726   gtk_spin_button_set_digits (window->spin_min, input->variable[i].
      precision);
01727   gtk_spin_button_set_digits (window->spin_max, input->variable[i].
      precision);
01728   gtk_spin_button_set_digits (window->spin_minabs,
01729                               input->variable[i].precision);
01730   gtk_spin_button_set_digits (window->spin_maxabs,
01731                               input->variable[i].precision);
01732 #if DEBUG_INTERFACE
01733   fprintf (stderr, "window_precision_variable: end\n");
01734 #endif
01735 }
01736
01741 void
01742 window_rangemin_variable ()
01743 {
01744   unsigned int i;
01745 #if DEBUG_INTERFACE
01746   fprintf (stderr, "window_rangemin_variable: start\n");
01747 #endif
01748   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01749   input->variable[i].rangemin = gtk_spin_button_get_value (window->
      spin_min);
01750 #if DEBUG_INTERFACE
01751   fprintf (stderr, "window_rangemin_variable: end\n");
01752 #endif
01753 }
```

```
01754
01759 void
01760 window_rangemax_variable ()
01761 {
01762   unsigned int i;
01763 #if DEBUG_INTERFACE
01764   fprintf (stderr, "window_rangemax_variable: start\n");
01765 #endif
01766   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01767   input->variable[i].rangemax = gtk_spin_button_get_value (window->
      spin_max);
01768 #if DEBUG_INTERFACE
01769   fprintf (stderr, "window_rangemax_variable: end\n");
01770 #endif
01771 }
01772
01777 void
01778 window_rangeminabs_variable ()
01779 {
01780   unsigned int i;
01781 #if DEBUG_INTERFACE
01782   fprintf (stderr, "window_rangeminabs_variable: start\n");
01783 #endif
01784   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01785   input->variable[i].rangeminabs
01786     = gtk_spin_button_get_value (window->spin_minabs);
01787 #if DEBUG_INTERFACE
01788   fprintf (stderr, "window_rangeminabs_variable: end\n");
01789 #endif
01790 }
01791
01796 void
01797 window_rangemaxabs_variable ()
01798 {
01799   unsigned int i;
01800 #if DEBUG_INTERFACE
01801   fprintf (stderr, "window_rangemaxabs_variable: start\n");
01802 #endif
01803   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01804   input->variable[i].rangemaxabs
01805     = gtk_spin_button_get_value (window->spin_maxabs);
01806 #if DEBUG_INTERFACE
01807   fprintf (stderr, "window_rangemaxabs_variable: end\n");
01808 #endif
01809 }
01810
01815 void
01816 window_step_variable ()
01817 {
01818   unsigned int i;
01819 #if DEBUG_INTERFACE
01820   fprintf (stderr, "window_step_variable: start\n");
01821 #endif
01822   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01823   input->variable[i].step = gtk_spin_button_get_value (window->
      spin_step);
01824 #if DEBUG_INTERFACE
01825   fprintf (stderr, "window_step_variable: end\n");
01826 #endif
01827 }
01828
01833 void
01834 window_update_variable ()
01835 {
01836   int i;
01837 #if DEBUG_INTERFACE
01838   fprintf (stderr, "window_update_variable: start\n");
01839 #endif
01840   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
01841   if (i < 0)
01842     i = 0;
01843   switch (window_get_algorithm ())
01844     {
01845     case ALGORITHM_SWEEP:
01846       input->variable[i].nsweeps
01847         = gtk_spin_button_get_value_as_int (window->spin_sweeps);
01848 #if DEBUG_INTERFACE
01849       fprintf (stderr, "window_update_variable: nsweeps[%d]=%u\n", i,
01850                input->variable[i].nsweeps);
01851 #endif
01852       break;
01853     case ALGORITHM_GENETIC:
01854       input->variable[i].nbits
01855         = gtk_spin_button_get_value_as_int (window->spin_bits);
01856 #if DEBUG_INTERFACE
01857       fprintf (stderr, "window_update_variable: nbits[%d]=%u\n", i,
01858                input->variable[i].nbits);
```

```
01859 #endif
01860     }
01861 #if DEBUG_INTERFACE
01862   fprintf (stderr, "window_update_variable: end\n");
01863 #endif
01864 }
01865
01873 int
01874 window_read (char *filename)
01875 {
01876   unsigned int i;
01877   char *buffer;
01878 #if DEBUG_INTERFACE
01879   fprintf (stderr, "window_read: start\n");
01880 #endif
01881
01882   // Reading new input file
01883   input_free ();
01884   if (!input_open (filename))
01885     {
01886 #if DEBUG_INTERFACE
01887       fprintf (stderr, "window_read: end\n");
01888 #endif
01889       return 0;
01890     }
01891
01892   // Setting GTK+ widgets data
01893   gtk_entry_set_text (window->entry_result, input->result);
01894   gtk_entry_set_text (window->entry_variables, input->
      variables);
01895   buffer = g_build_filename (input->directory, input->
      simulator, NULL);
01896   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01897                                  (window->button_simulator), buffer);
01898   g_free (buffer);
01899   gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
01900                                 (size_t) input->evaluator);
01901   if (input->evaluator)
01902     {
01903       buffer = g_build_filename (input->directory, input->
      evaluator, NULL);
01904       gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01905                                      (window->button_evaluator), buffer);
01906       g_free (buffer);
01907     }
01908   gtk_toggle_button_set_active
01909     (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
      algorithm]), TRUE);
01910   switch (input->algorithm)
01911     {
01912     case ALGORITHM_MONTE_CARLO:
01913       gtk_spin_button_set_value (window->spin_simulations,
01914                                  (gdouble) input->nsimulations);
01915     case ALGORITHM_SWEEP:
01916       gtk_spin_button_set_value (window->spin_iterations,
01917                                  (gdouble) input->niterations);
01918       gtk_spin_button_set_value (window->spin_bests, (gdouble) input->
      nbest);
01919       gtk_spin_button_set_value (window->spin_tolerance, input->
      tolerance);
01920       gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_direction),
01921                                     input->nsteps);
01922       if (input->nsteps)
01923         {
01924           gtk_toggle_button_set_active
01925             (GTK_TOGGLE_BUTTON (window->button_direction
01926                                 [input->direction]), TRUE);
01927           gtk_spin_button_set_value (window->spin_steps,
01928                                      (gdouble) input->nsteps);
01929           gtk_spin_button_set_value (window->spin_relaxation,
01930                                      (gdouble) input->relaxation);
01931           switch (input->direction)
01932             {
01933             case DIRECTION_METHOD_RANDOM:
01934               gtk_spin_button_set_value (window->spin_estimates,
01935                                          (gdouble) input->nestimates);
01936             }
01937         }
01938       break;
01939     default:
01940       gtk_spin_button_set_value (window->spin_population,
01941                                  (gdouble) input->nsimulations);
01942       gtk_spin_button_set_value (window->spin_generations,
01943                                  (gdouble) input->niterations);
01944       gtk_spin_button_set_value (window->spin_mutation, input->
      mutation_ratio);
01945       gtk_spin_button_set_value (window->spin_reproduction,
```

```
01946                                 input->reproduction_ratio);
01947       gtk_spin_button_set_value (window->spin_adaptation,
01948                                  input->adaptation_ratio);
01949     }
01950   gtk_toggle_button_set_active
01951     (GTK_TOGGLE_BUTTON (window->button_norm[input->norm]), TRUE);
01952   gtk_spin_button_set_value (window->spin_p, input->p);
01953   gtk_spin_button_set_value (window->spin_threshold, input->
      threshold);
01954   g_signal_handler_block (window->combo_experiment, window->
      id_experiment);
01955   g_signal_handler_block (window->button_experiment,
01956                           window->id_experiment_name);
01957   gtk_combo_box_text_remove_all (window->combo_experiment);
01958   for (i = 0; i < input->nexperiments; ++i)
01959     gtk_combo_box_text_append_text (window->combo_experiment,
01960                                     input->experiment[i].name);
01961   g_signal_handler_unblock
01962     (window->button_experiment, window->id_experiment_name);
01963   g_signal_handler_unblock (window->combo_experiment, window->
      id_experiment);
01964   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
01965   g_signal_handler_block (window->combo_variable, window->
      id_variable);
01966   g_signal_handler_block (window->entry_variable, window->
      id_variable_label);
01967   gtk_combo_box_text_remove_all (window->combo_variable);
01968   for (i = 0; i < input->nvariables; ++i)
01969     gtk_combo_box_text_append_text (window->combo_variable,
01970                                     input->variable[i].name);
01971   g_signal_handler_unblock (window->entry_variable, window->
      id_variable_label);
01972   g_signal_handler_unblock (window->combo_variable, window->
      id_variable);
01973   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
01974   window_set_variable ();
01975   window_update ();
01976
01977 #if DEBUG_INTERFACE
01978   fprintf (stderr, "window_read: end\n");
01979 #endif
01980   return 1;
01981 }
01982
01987 void
01988 window_open ()
01989 {
01990   GtkFileChooserDialog *dlg;
01991   GtkFileFilter *filter;
01992   char *buffer, *directory, *name;
01993
01994 #if DEBUG_INTERFACE
01995   fprintf (stderr, "window_open: start\n");
01996 #endif
01997
01998   // Saving a backup of the current input file
01999   directory = g_strdup (input->directory);
02000   name = g_strdup (input->name);
02001
02002   // Opening dialog
02003   dlg = (GtkFileChooserDialog *)
02004     gtk_file_chooser_dialog_new (gettext ("Open input file"),
02005                                  window->window,
02006                                  GTK_FILE_CHOOSER_ACTION_OPEN,
02007                                  gettext ("_Cancel"), GTK_RESPONSE_CANCEL,
02008                                  gettext ("_OK"), GTK_RESPONSE_OK, NULL);
02009
02010   // Adding XML filter
02011   filter = (GtkFileFilter *) gtk_file_filter_new ();
02012   gtk_file_filter_set_name (filter, "XML");
02013   gtk_file_filter_add_pattern (filter, "*.xml");
02014   gtk_file_filter_add_pattern (filter, "*.XML");
02015   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter);
02016
02017   // Adding JSON filter
02018   filter = (GtkFileFilter *) gtk_file_filter_new ();
02019   gtk_file_filter_set_name (filter, "JSON");
02020   gtk_file_filter_add_pattern (filter, "*.json");
02021   gtk_file_filter_add_pattern (filter, "*.JSON");
02022   gtk_file_filter_add_pattern (filter, "*.js");
02023   gtk_file_filter_add_pattern (filter, "*.JS");
02024   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter);
02025
02026   // If OK saving
02027   while (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
02028     {
02029
```

```
02030       // Traying to open the input file
02031       buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
02032       if (!window_read (buffer))
02033         {
02034 #if DEBUG_INTERFACE
02035           fprintf (stderr, "window_open: error reading input file\n");
02036 #endif
02037           g_free (buffer);
02038
02039           // Reading backup file on error
02040           buffer = g_build_filename (directory, name, NULL);
02041           if (!input_open (buffer))
02042             {
02043
02044               // Closing on backup file reading error
02045 #if DEBUG_INTERFACE
02046               fprintf (stderr, "window_read: error reading backup file\n");
02047 #endif
02048               g_free (buffer);
02049               break;
02050             }
02051           g_free (buffer);
02052         }
02053       else
02054         {
02055           g_free (buffer);
02056           break;
02057         }
02058     }
02059
02060   // Freeing and closing
02061   g_free (name);
02062   g_free (directory);
02063   gtk_widget_destroy (GTK_WIDGET (dlg));
02064 #if DEBUG_INTERFACE
02065   fprintf (stderr, "window_open: end\n");
02066 #endif
02067 }
02068
02073 void
02074 window_new ()
02075 {
02076   unsigned int i;
02077   char *buffer, *buffer2, buffer3[64];
02078   char *label_algorithm[NALGORITHMS] = {
02079     "_Monte-Carlo", gettext ("_Sweep"), gettext ("_Genetic")
02080   };
02081   char *tip_algorithm[NALGORITHMS] = {
02082     gettext ("Monte-Carlo brute force algorithm"),
02083     gettext ("Sweep brute force algorithm"),
02084     gettext ("Genetic algorithm")
02085   };
02086   char *label_direction[NDIRECTIONS] = {
02087     gettext ("_Coordinates descent"), gettext ("_Random")
02088   };
02089   char *tip_direction[NDIRECTIONS] = {
02090     gettext ("Coordinates direction estimate method"),
02091     gettext ("Random direction estimate method")
02092   };
02093   char *label_norm[NNORMS] = { "L2", "L", "Lp", "L1" };
02094   char *tip_norm[NNORMS] = {
02095     gettext ("Euclidean error norm (L2)"),
02096     gettext ("Maximum error norm (L)"),
02097     gettext ("P error norm (Lp)"),
02098     gettext ("Taxicab error norm (L1)")
02099   };
02100
02101 #if DEBUG_INTERFACE
02102   fprintf (stderr, "window_new: start\n");
02103 #endif
02104
02105   // Creating the window
02106   window->window = main_window
02107     = (GtkWindow *) gtk_window_new (GTK_WINDOW_TOPLEVEL);
02108
02109   // Finish when closing the window
02110   g_signal_connect (window->window, "delete-event", gtk_main_quit, NULL);
02111
02112   // Setting the window title
02113   gtk_window_set_title (window->window, "MPCOTool");
02114
02115   // Creating the open button
02116   window->button_open = (GtkToolButton *) gtk_tool_button_new
02117     (gtk_image_new_from_icon_name ("document-open",
02118                                    GTK_ICON_SIZE_LARGE_TOOLBAR),
02119      gettext ("Open"));
02120   g_signal_connect (window->button_open, "clicked", window_open, NULL);
```

```
02121
02122   // Creating the save button
02123   window->button_save = (GtkToolButton *) gtk_tool_button_new
02124     (gtk_image_new_from_icon_name ("document-save",
02125                                    GTK_ICON_SIZE_LARGE_TOOLBAR),
02126      gettext ("Save"));
02127   g_signal_connect (window->button_save, "clicked", (void (*))
      window_save,
02128                     NULL);
02129
02130   // Creating the run button
02131   window->button_run = (GtkToolButton *) gtk_tool_button_new
02132     (gtk_image_new_from_icon_name ("system-run",
02133                                    GTK_ICON_SIZE_LARGE_TOOLBAR),
02134      gettext ("Run"));
02135   g_signal_connect (window->button_run, "clicked", window_run, NULL);
02136
02137   // Creating the options button
02138   window->button_options = (GtkToolButton *) gtk_tool_button_new
02139     (gtk_image_new_from_icon_name ("preferences-system",
02140                                    GTK_ICON_SIZE_LARGE_TOOLBAR),
02141      gettext ("Options"));
02142   g_signal_connect (window->button_options, "clicked", options_new, NULL);
02143
02144   // Creating the help button
02145   window->button_help = (GtkToolButton *) gtk_tool_button_new
02146     (gtk_image_new_from_icon_name ("help-browser",
02147                                    GTK_ICON_SIZE_LARGE_TOOLBAR),
02148      gettext ("Help"));
02149   g_signal_connect (window->button_help, "clicked", window_help, NULL);
02150
02151   // Creating the about button
02152   window->button_about = (GtkToolButton *) gtk_tool_button_new
02153     (gtk_image_new_from_icon_name ("help-about",
02154                                    GTK_ICON_SIZE_LARGE_TOOLBAR),
02155      gettext ("About"));
02156   g_signal_connect (window->button_about, "clicked", window_about, NULL);
02157
02158   // Creating the exit button
02159   window->button_exit = (GtkToolButton *) gtk_tool_button_new
02160     (gtk_image_new_from_icon_name ("application-exit",
02161                                    GTK_ICON_SIZE_LARGE_TOOLBAR),
02162      gettext ("Exit"));
02163   g_signal_connect (window->button_exit, "clicked", gtk_main_quit, NULL);
02164
02165   // Creating the buttons bar
02166   window->bar_buttons = (GtkToolbar *) gtk_toolbar_new ();
02167   gtk_toolbar_insert
02168     (window->bar_buttons, GTK_TOOL_ITEM (window->button_open), 0);
02169   gtk_toolbar_insert
02170     (window->bar_buttons, GTK_TOOL_ITEM (window->button_save), 1);
02171   gtk_toolbar_insert
02172     (window->bar_buttons, GTK_TOOL_ITEM (window->button_run), 2);
02173   gtk_toolbar_insert
02174     (window->bar_buttons, GTK_TOOL_ITEM (window->button_options), 3);
02175   gtk_toolbar_insert
02176     (window->bar_buttons, GTK_TOOL_ITEM (window->button_help), 4);
02177   gtk_toolbar_insert
02178     (window->bar_buttons, GTK_TOOL_ITEM (window->button_about), 5);
02179   gtk_toolbar_insert
02180     (window->bar_buttons, GTK_TOOL_ITEM (window->button_exit), 6);
02181   gtk_toolbar_set_style (window->bar_buttons, GTK_TOOLBAR_BOTH);
02182
02183   // Creating the simulator program label and entry
02184   window->label_simulator
02185     = (GtkLabel *) gtk_label_new (gettext ("Simulator program"));
02186   window->button_simulator = (GtkFileChooserButton *)
02187     gtk_file_chooser_button_new (gettext ("Simulator program"),
02188                                  GTK_FILE_CHOOSER_ACTION_OPEN);
02189   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_simulator),
02190                                gettext ("Simulator program executable file"));
02191   gtk_widget_set_hexpand (GTK_WIDGET (window->button_simulator), TRUE);
02192
02193   // Creating the evaluator program label and entry
02194   window->check_evaluator = (GtkCheckButton *)
02195     gtk_check_button_new_with_mnemonic (gettext ("_Evaluator program"));
02196   g_signal_connect (window->check_evaluator, "toggled",
      window_update, NULL);
02197   window->button_evaluator = (GtkFileChooserButton *)
02198     gtk_file_chooser_button_new (gettext ("Evaluator program"),
02199                                  GTK_FILE_CHOOSER_ACTION_OPEN);
02200   gtk_widget_set_tooltip_text
02201     (GTK_WIDGET (window->button_evaluator),
02202      gettext ("Optional evaluator program executable file"));
02203
02204   // Creating the results files labels and entries
02205   window->label_result = (GtkLabel *) gtk_label_new (gettext ("Result file"));
```

```
02206   window->entry_result = (GtkEntry *) gtk_entry_new ();
02207   gtk_widget_set_tooltip_text
02208     (GTK_WIDGET (window->entry_result), gettext ("Best results file"));
02209   window->label_variables
02210     = (GtkLabel *) gtk_label_new (gettext ("Variables file"));
02211   window->entry_variables = (GtkEntry *) gtk_entry_new ();
02212   gtk_widget_set_tooltip_text
02213     (GTK_WIDGET (window->entry_variables),
02214      gettext ("All simulated results file"));
02215
02216   // Creating the files grid and attaching widgets
02217   window->grid_files = (GtkGrid *) gtk_grid_new ();
02218   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      label_simulator),
02219                    0, 0, 1, 1);
02220   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      button_simulator),
02221                    1, 0, 1, 1);
02222   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      check_evaluator),
02223                    0, 1, 1, 1);
02224   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      button_evaluator),
02225                    1, 1, 1, 1);
02226   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      label_result),
02227                    0, 2, 1, 1);
02228   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      entry_result),
02229                    1, 2, 1, 1);
02230   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      label_variables),
02231                    0, 3, 1, 1);
02232   gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
      entry_variables),
02233                    1, 3, 1, 1);
02234
02235   // Creating the algorithm properties
02236   window->label_simulations = (GtkLabel *) gtk_label_new
02237     (gettext ("Simulations number"));
02238   window->spin_simulations
02239     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
02240   gtk_widget_set_tooltip_text
02241     (GTK_WIDGET (window->spin_simulations),
02242      gettext ("Number of simulations to perform for each iteration"));
02243   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_simulations), TRUE);
02244   window->label_iterations = (GtkLabel *)
02245     gtk_label_new (gettext ("Iterations number"));
02246   window->spin_iterations
02247     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
02248   gtk_widget_set_tooltip_text
02249     (GTK_WIDGET (window->spin_iterations), gettext ("Number of iterations"));
02250   g_signal_connect
02251     (window->spin_iterations, "value-changed", window_update, NULL);
02252   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_iterations), TRUE);
02253   window->label_tolerance = (GtkLabel *) gtk_label_new (gettext ("Tolerance"));
02254   window->spin_tolerance
02255     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02256   gtk_widget_set_tooltip_text
02257     (GTK_WIDGET (window->spin_tolerance),
02258      gettext ("Tolerance to set the variable interval on the next iteration"));
02259   window->label_bests = (GtkLabel *) gtk_label_new (gettext ("Bests number"));
02260   window->spin_bests
02261     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
02262   gtk_widget_set_tooltip_text
02263     (GTK_WIDGET (window->spin_bests),
02264      gettext ("Number of best simulations used to set the variable interval "
02265               "on the next iteration"));
02266   window->label_population
02267     = (GtkLabel *) gtk_label_new (gettext ("Population number"));
02268   window->spin_population
02269     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
02270   gtk_widget_set_tooltip_text
02271     (GTK_WIDGET (window->spin_population),
02272      gettext ("Number of population for the genetic algorithm"));
02273   gtk_widget_set_hexpand (GTK_WIDGET (window->spin_population), TRUE);
02274   window->label_generations
02275     = (GtkLabel *) gtk_label_new (gettext ("Generations number"));
02276   window->spin_generations
02277     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
02278   gtk_widget_set_tooltip_text
02279     (GTK_WIDGET (window->spin_generations),
02280      gettext ("Number of generations for the genetic algorithm"));
02281   window->label_mutation
02282     = (GtkLabel *) gtk_label_new (gettext ("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      gettext ("Ratio of mutation for the genetic algorithm"));
02288   window->label_reproduction
02289     = (GtkLabel *) gtk_label_new (gettext ("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      gettext ("Ratio of reproduction for the genetic algorithm"));
02295   window->label_adaptation
02296     = (GtkLabel *) gtk_label_new (gettext ("Adaptation ratio"));
02297   window->spin_adaptation
02298     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02299   gtk_widget_set_tooltip_text
02300     (GTK_WIDGET (window->spin_adaptation),
02301      gettext ("Ratio of adaptation for the genetic algorithm"));
02302   window->label_threshold = (GtkLabel *) gtk_label_new (gettext ("Threshold"));
02303   window->spin_threshold = (GtkSpinButton *) gtk_spin_button_new_with_range
02304     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02305   gtk_widget_set_tooltip_text
02306     (GTK_WIDGET (window->spin_threshold),
02307      gettext ("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 (gettext ("_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 (gettext ("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 (gettext ("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 (gettext ("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, GTK_WIDGET (window->
    label_estimates),
02357                    0, NDIRECTIONS + 1, 1, 1);
02358   gtk_grid_attach (window->grid_direction, GTK_WIDGET (window->
    spin_estimates),
02359                    1, NDIRECTIONS + 1, 1, 1);
02360   gtk_grid_attach (window->grid_direction,
02361                    GTK_WIDGET (window->label_relaxation), 0, NDIRECTIONS + 2, 1,
02362                    1);
02363   gtk_grid_attach (window->grid_direction, GTK_WIDGET (window->
    spin_relaxation),
02364                    1, NDIRECTIONS + 2, 1, 1);
```

```
02365
02366   // Creating the array of algorithms
02367   window->grid_algorithm = (GtkGrid *) gtk_grid_new ();
02368   window->button_algorithm[0] = (GtkRadioButton *)
02369     gtk_radio_button_new_with_mnemonic (NULL, label_algorithm[0]);
02370   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[0]),
02371                                tip_algorithm[0]);
02372   gtk_grid_attach (window->grid_algorithm,
02373                    GTK_WIDGET (window->button_algorithm[0]), 0, 0, 1, 1);
02374   g_signal_connect (window->button_algorithm[0], "clicked",
02375                     window_set_algorithm, NULL);
02376   for (i = 0; ++i < NALGORITHMS;)
02377     {
02378       window->button_algorithm[i] = (GtkRadioButton *)
02379         gtk_radio_button_new_with_mnemonic
02380         (gtk_radio_button_get_group (window->button_algorithm[0]),
02381          label_algorithm[i]);
02382       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[i]),
02383                                    tip_algorithm[i]);
02384       gtk_grid_attach (window->grid_algorithm,
02385                        GTK_WIDGET (window->button_algorithm[i]), 0, i, 1, 1);
02386       g_signal_connect (window->button_algorithm[i], "clicked",
02387                         window_set_algorithm, NULL);
02388     }
02389   gtk_grid_attach (window->grid_algorithm,
02390                    GTK_WIDGET (window->label_simulations), 0,
02391                    NALGORITHMS, 1, 1);
02392   gtk_grid_attach (window->grid_algorithm,
02393                    GTK_WIDGET (window->spin_simulations), 1, NALGORITHMS, 1, 1);
02394   gtk_grid_attach (window->grid_algorithm,
02395                    GTK_WIDGET (window->label_iterations), 0,
02396                    NALGORITHMS + 1, 1, 1);
02397   gtk_grid_attach (window->grid_algorithm,
02398                    GTK_WIDGET (window->spin_iterations), 1,
02399                    NALGORITHMS + 1, 1, 1);
02400   gtk_grid_attach (window->grid_algorithm,
02401                    GTK_WIDGET (window->label_tolerance), 0,
02402                    NALGORITHMS + 2, 1, 1);
02403   gtk_grid_attach (window->grid_algorithm,
02404                    GTK_WIDGET (window->spin_tolerance), 1,
02405                    NALGORITHMS + 2, 1, 1);
02406   gtk_grid_attach (window->grid_algorithm,
02407                    GTK_WIDGET (window->label_bests), 0, NALGORITHMS + 3, 1, 1);
02408   gtk_grid_attach (window->grid_algorithm,
02409                    GTK_WIDGET (window->spin_bests), 1, NALGORITHMS + 3, 1, 1);
02410   gtk_grid_attach (window->grid_algorithm,
02411                    GTK_WIDGET (window->label_population), 0,
02412                    NALGORITHMS + 4, 1, 1);
02413   gtk_grid_attach (window->grid_algorithm,
02414                    GTK_WIDGET (window->spin_population), 1,
02415                    NALGORITHMS + 4, 1, 1);
02416   gtk_grid_attach (window->grid_algorithm,
02417                    GTK_WIDGET (window->label_generations), 0,
02418                    NALGORITHMS + 5, 1, 1);
02419   gtk_grid_attach (window->grid_algorithm,
02420                    GTK_WIDGET (window->spin_generations), 1,
02421                    NALGORITHMS + 5, 1, 1);
02422   gtk_grid_attach (window->grid_algorithm,
02423                    GTK_WIDGET (window->label_mutation), 0,
02424                    NALGORITHMS + 6, 1, 1);
02425   gtk_grid_attach (window->grid_algorithm,
02426                    GTK_WIDGET (window->spin_mutation), 1,
02427                    NALGORITHMS + 6, 1, 1);
02428   gtk_grid_attach (window->grid_algorithm,
02429                    GTK_WIDGET (window->label_reproduction), 0,
02430                    NALGORITHMS + 7, 1, 1);
02431   gtk_grid_attach (window->grid_algorithm,
02432                    GTK_WIDGET (window->spin_reproduction), 1,
02433                    NALGORITHMS + 7, 1, 1);
02434   gtk_grid_attach (window->grid_algorithm,
02435                    GTK_WIDGET (window->label_adaptation), 0,
02436                    NALGORITHMS + 8, 1, 1);
02437   gtk_grid_attach (window->grid_algorithm,
02438                    GTK_WIDGET (window->spin_adaptation), 1,
02439                    NALGORITHMS + 8, 1, 1);
02440   gtk_grid_attach (window->grid_algorithm,
02441                    GTK_WIDGET (window->check_direction), 0,
02442                    NALGORITHMS + 9, 2, 1);
02443   gtk_grid_attach (window->grid_algorithm,
02444                    GTK_WIDGET (window->grid_direction), 0,
02445                    NALGORITHMS + 10, 2, 1);
02446   gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->
      label_threshold),
02447                    0, NALGORITHMS + 11, 1, 1);
02448   gtk_grid_attach (window->grid_algorithm,
02449                    GTK_WIDGET (window->scrolled_threshold), 1,
02450                    NALGORITHMS + 11, 1, 1);
```

```
02451   window->frame_algorithm = (GtkFrame *) gtk_frame_new (gettext ("Algorithm"));
02452   gtk_container_add (GTK_CONTAINER (window->frame_algorithm),
02453                      GTK_WIDGET (window->grid_algorithm));
02454
02455   // Creating the variable widgets
02456   window->combo_variable = (GtkComboBoxText *) gtk_combo_box_text_new ();
02457   gtk_widget_set_tooltip_text
02458     (GTK_WIDGET (window->combo_variable), gettext ("Variables selector"));
02459   window->id_variable = g_signal_connect
02460     (window->combo_variable, "changed", window_set_variable, NULL);
02461   window->button_add_variable
02462     = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
02463                                                    GTK_ICON_SIZE_BUTTON);
02464   g_signal_connect
02465     (window->button_add_variable, "clicked",
      window_add_variable, NULL);
02466   gtk_widget_set_tooltip_text
02467     (GTK_WIDGET (window->button_add_variable), gettext ("Add variable"));
02468   window->button_remove_variable
02469     = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
02470                                                    GTK_ICON_SIZE_BUTTON);
02471   g_signal_connect
02472     (window->button_remove_variable, "clicked",
      window_remove_variable, NULL);
02473   gtk_widget_set_tooltip_text
02474     (GTK_WIDGET (window->button_remove_variable), gettext ("Remove variable"));
02475   window->label_variable = (GtkLabel *) gtk_label_new (gettext ("Name"));
02476   window->entry_variable = (GtkEntry *) gtk_entry_new ();
02477   gtk_widget_set_tooltip_text
02478     (GTK_WIDGET (window->entry_variable), gettext ("Variable name"));
02479   gtk_widget_set_hexpand (GTK_WIDGET (window->entry_variable), TRUE);
02480   window->id_variable_label = g_signal_connect
02481     (window->entry_variable, "changed", window_label_variable, NULL);
02482   window->label_min = (GtkLabel *) gtk_label_new (gettext ("Minimum"));
02483   window->spin_min = (GtkSpinButton *) gtk_spin_button_new_with_range
02484     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02485   gtk_widget_set_tooltip_text
02486     (GTK_WIDGET (window->spin_min),
02487      gettext ("Minimum initial value of the variable"));
02488   window->scrolled_min
02489     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02490   gtk_container_add (GTK_CONTAINER (window->scrolled_min),
02491                      GTK_WIDGET (window->spin_min));
02492   g_signal_connect (window->spin_min, "value-changed",
02493                     window_rangemin_variable, NULL);
02494   window->label_max = (GtkLabel *) gtk_label_new (gettext ("Maximum"));
02495   window->spin_max = (GtkSpinButton *) gtk_spin_button_new_with_range
02496     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02497   gtk_widget_set_tooltip_text
02498     (GTK_WIDGET (window->spin_max),
02499      gettext ("Maximum initial value of the variable"));
02500   window->scrolled_max
02501     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02502   gtk_container_add (GTK_CONTAINER (window->scrolled_max),
02503                      GTK_WIDGET (window->spin_max));
02504   g_signal_connect (window->spin_max, "value-changed",
02505                     window_rangemax_variable, NULL);
02506   window->check_minabs = (GtkCheckButton *)
02507     gtk_check_button_new_with_mnemonic (gettext ("_Absolute minimum"));
02508   g_signal_connect (window->check_minabs, "toggled", window_update, NULL);
02509   window->spin_minabs = (GtkSpinButton *) gtk_spin_button_new_with_range
02510     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02511   gtk_widget_set_tooltip_text
02512     (GTK_WIDGET (window->spin_minabs),
02513      gettext ("Minimum allowed value of the variable"));
02514   window->scrolled_minabs
02515     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02516   gtk_container_add (GTK_CONTAINER (window->scrolled_minabs),
02517                      GTK_WIDGET (window->spin_minabs));
02518   g_signal_connect (window->spin_minabs, "value-changed",
02519                     window_rangeminabs_variable, NULL);
02520   window->check_maxabs = (GtkCheckButton *)
02521     gtk_check_button_new_with_mnemonic (gettext ("_Absolute maximum"));
02522   g_signal_connect (window->check_maxabs, "toggled", window_update, NULL);
02523   window->spin_maxabs = (GtkSpinButton *) gtk_spin_button_new_with_range
02524     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02525   gtk_widget_set_tooltip_text
02526     (GTK_WIDGET (window->spin_maxabs),
02527      gettext ("Maximum allowed value of the variable"));
02528   window->scrolled_maxabs
02529     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02530   gtk_container_add (GTK_CONTAINER (window->scrolled_maxabs),
02531                      GTK_WIDGET (window->spin_maxabs));
02532   g_signal_connect (window->spin_maxabs, "value-changed",
02533                     window_rangemaxabs_variable, NULL);
02534   window->label_precision
02535     = (GtkLabel *) gtk_label_new (gettext ("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      gettext ("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 (gettext ("Sweeps number"));
02545   window->spin_sweeps
02546     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
02547   gtk_widget_set_tooltip_text
02548     (GTK_WIDGET (window->spin_sweeps),
02549      gettext ("Number of steps sweeping the variable"));
02550   g_signal_connect
02551     (window->spin_sweeps, "value-changed", window_update_variable, NULL);
02552   window->label_bits = (GtkLabel *) gtk_label_new (gettext ("Bits number"));
02553   window->spin_bits
02554     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
02555   gtk_widget_set_tooltip_text
02556     (GTK_WIDGET (window->spin_bits),
02557      gettext ("Number of bits to encode the variable"));
02558   g_signal_connect
02559     (window->spin_bits, "value-changed", window_update_variable, NULL);
02560   window->label_step = (GtkLabel *) gtk_label_new (gettext ("Step size"));
02561   window->spin_step = (GtkSpinButton *) gtk_spin_button_new_with_range
02562     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
02563   gtk_widget_set_tooltip_text
02564     (GTK_WIDGET (window->spin_step),
02565      gettext ("Initial step size for the direction search method"));
02566   window->scrolled_step
02567     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02568   gtk_container_add (GTK_CONTAINER (window->scrolled_step),
02569                      GTK_WIDGET (window->spin_step));
02570   g_signal_connect
02571     (window->spin_step, "value-changed", window_step_variable, NULL);
02572   window->grid_variable = (GtkGrid *) gtk_grid_new ();
02573   gtk_grid_attach (window->grid_variable,
02574                    GTK_WIDGET (window->combo_variable), 0, 0, 2, 1);
02575   gtk_grid_attach (window->grid_variable,
02576                    GTK_WIDGET (window->button_add_variable), 2, 0, 1, 1);
02577   gtk_grid_attach (window->grid_variable,
02578                    GTK_WIDGET (window->button_remove_variable), 3, 0, 1, 1);
02579   gtk_grid_attach (window->grid_variable,
02580                    GTK_WIDGET (window->label_variable), 0, 1, 1, 1);
02581   gtk_grid_attach (window->grid_variable,
02582                    GTK_WIDGET (window->entry_variable), 1, 1, 3, 1);
02583   gtk_grid_attach (window->grid_variable,
02584                    GTK_WIDGET (window->label_min), 0, 2, 1, 1);
02585   gtk_grid_attach (window->grid_variable,
02586                    GTK_WIDGET (window->scrolled_min), 1, 2, 3, 1);
02587   gtk_grid_attach (window->grid_variable,
02588                    GTK_WIDGET (window->label_max), 0, 3, 1, 1);
02589   gtk_grid_attach (window->grid_variable,
02590                    GTK_WIDGET (window->scrolled_max), 1, 3, 3, 1);
02591   gtk_grid_attach (window->grid_variable,
02592                    GTK_WIDGET (window->check_minabs), 0, 4, 1, 1);
02593   gtk_grid_attach (window->grid_variable,
02594                    GTK_WIDGET (window->scrolled_minabs), 1, 4, 3, 1);
02595   gtk_grid_attach (window->grid_variable,
02596                    GTK_WIDGET (window->check_maxabs), 0, 5, 1, 1);
02597   gtk_grid_attach (window->grid_variable,
02598                    GTK_WIDGET (window->scrolled_maxabs), 1, 5, 3, 1);
02599   gtk_grid_attach (window->grid_variable,
02600                    GTK_WIDGET (window->label_precision), 0, 6, 1, 1);
02601   gtk_grid_attach (window->grid_variable,
02602                    GTK_WIDGET (window->spin_precision), 1, 6, 3, 1);
02603   gtk_grid_attach (window->grid_variable,
02604                    GTK_WIDGET (window->label_sweeps), 0, 7, 1, 1);
02605   gtk_grid_attach (window->grid_variable,
02606                    GTK_WIDGET (window->spin_sweeps), 1, 7, 3, 1);
02607   gtk_grid_attach (window->grid_variable,
02608                    GTK_WIDGET (window->label_bits), 0, 8, 1, 1);
02609   gtk_grid_attach (window->grid_variable,
02610                    GTK_WIDGET (window->spin_bits), 1, 8, 3, 1);
02611   gtk_grid_attach (window->grid_variable,
02612                    GTK_WIDGET (window->label_step), 0, 9, 1, 1);
02613   gtk_grid_attach (window->grid_variable,
02614                    GTK_WIDGET (window->scrolled_step), 1, 9, 3, 1);
02615   window->frame_variable = (GtkFrame *) gtk_frame_new (gettext ("Variable"));
02616   gtk_container_add (GTK_CONTAINER (window->frame_variable),
02617                      GTK_WIDGET (window->grid_variable));
02618
02619   // Creating the experiment widgets
02620   window->combo_experiment = (GtkComboBoxText *) gtk_combo_box_text_new ();
02621   gtk_widget_set_tooltip_text (GTK_WIDGET (window->combo_experiment),
02622                                gettext ("Experiment selector"));
```

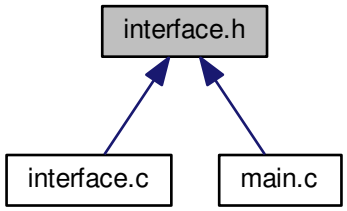
```
02623   window->id_experiment = g_signal_connect
02624     (window->combo_experiment, "changed", window_set_experiment, NULL)
    ;
02625   window->button_add_experiment
02626     = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
02627                                                    GTK_ICON_SIZE_BUTTON);
02628   g_signal_connect
02629     (window->button_add_experiment, "clicked",
    window_add_experiment, NULL);
02630   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_experiment),
02631                                gettext ("Add experiment"));
02632   window->button_remove_experiment
02633     = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
02634                                                    GTK_ICON_SIZE_BUTTON);
02635   g_signal_connect (window->button_remove_experiment, "clicked",
02636                     window_remove_experiment, NULL);
02637   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_remove_experiment),
02638                                gettext ("Remove experiment"));
02639   window->label_experiment
02640     = (GtkLabel *) gtk_label_new (gettext ("Experimental data file"));
02641   window->button_experiment = (GtkFileChooserButton *)
02642     gtk_file_chooser_button_new (gettext ("Experimental data file"),
02643                                  GTK_FILE_CHOOSER_ACTION_OPEN);
02644   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_experiment),
02645                                gettext ("Experimental data file"));
02646   window->id_experiment_name
02647     = g_signal_connect (window->button_experiment, "selection-changed",
02648                         window_name_experiment, NULL);
02649   gtk_widget_set_hexpand (GTK_WIDGET (window->button_experiment), TRUE);
02650   window->label_weight = (GtkLabel *) gtk_label_new (gettext ("Weight"));
02651   window->spin_weight
02652     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
02653   gtk_widget_set_tooltip_text
02654     (GTK_WIDGET (window->spin_weight),
02655      gettext ("Weight factor to build the objective function"));
02656   g_signal_connect
02657     (window->spin_weight, "value-changed", window_weight_experiment,
    NULL);
02658   window->grid_experiment = (GtkGrid *) gtk_grid_new ();
02659   gtk_grid_attach (window->grid_experiment,
02660                    GTK_WIDGET (window->combo_experiment), 0, 0, 2, 1);
02661   gtk_grid_attach (window->grid_experiment,
02662                    GTK_WIDGET (window->button_add_experiment), 2, 0, 1, 1);
02663   gtk_grid_attach (window->grid_experiment,
02664                    GTK_WIDGET (window->button_remove_experiment), 3, 0, 1, 1);
02665   gtk_grid_attach (window->grid_experiment,
02666                    GTK_WIDGET (window->label_experiment), 0, 1, 1, 1);
02667   gtk_grid_attach (window->grid_experiment,
02668                    GTK_WIDGET (window->button_experiment), 1, 1, 3, 1);
02669   gtk_grid_attach (window->grid_experiment,
02670                    GTK_WIDGET (window->label_weight), 0, 2, 1, 1);
02671   gtk_grid_attach (window->grid_experiment,
02672                    GTK_WIDGET (window->spin_weight), 1, 2, 3, 1);
02673   for (i = 0; i < MAX_NINPUTS; ++i)
02674     {
02675       snprintf (buffer3, 64, "%s %u", gettext ("Input template"), i + 1);
02676       window->check_template[i] = (GtkCheckButton *)
02677         gtk_check_button_new_with_label (buffer3);
02678       window->id_template[i]
02679         = g_signal_connect (window->check_template[i], "toggled",
02680                             window_inputs_experiment, NULL);
02681       gtk_grid_attach (window->grid_experiment,
02682                        GTK_WIDGET (window->check_template[i]), 0, 3 + i, 1, 1);
02683       window->button_template[i] = (GtkFileChooserButton *)
02684         gtk_file_chooser_button_new (gettext ("Input template"),
02685                                      GTK_FILE_CHOOSER_ACTION_OPEN);
02686       gtk_widget_set_tooltip_text
02687         (GTK_WIDGET (window->button_template[i]),
02688          gettext ("Experimental input template file"));
02689       window->id_input[i]
02690         = g_signal_connect_swapped (window->button_template[i],
02691                                     "selection-changed",
02692                                     (void (*)) window_template_experiment,
02693                                     (void *) (size_t) i);
02694       gtk_grid_attach (window->grid_experiment,
02695                        GTK_WIDGET (window->button_template[i]), 1, 3 + i, 3, 1);
02696     }
02697   window->frame_experiment
02698     = (GtkFrame *) gtk_frame_new (gettext ("Experiment"));
02699   gtk_container_add (GTK_CONTAINER (window->frame_experiment),
02700                      GTK_WIDGET (window->grid_experiment));
02701
02702   // Creating the error norm widgets
02703   window->frame_norm = (GtkFrame *) gtk_frame_new (gettext ("Error norm"));
02704   window->grid_norm = (GtkGrid *) gtk_grid_new ();
02705   gtk_container_add (GTK_CONTAINER (window->frame_norm),
02706                      GTK_WIDGET (window->grid_norm));
```

```
02707   window->button_norm[0] = (GtkRadioButton *)
02708     gtk_radio_button_new_with_mnemonic (NULL, label_norm[0]);
02709   gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[0]),
02710                                tip_norm[0]);
02711   gtk_grid_attach (window->grid_norm,
02712                    GTK_WIDGET (window->button_norm[0]), 0, 0, 1, 1);
02713   g_signal_connect (window->button_norm[0], "clicked", window_update, NULL);
02714   for (i = 0; ++i < NNORMS;)
02715     {
02716       window->button_norm[i] = (GtkRadioButton *)
02717         gtk_radio_button_new_with_mnemonic
02718         (gtk_radio_button_get_group (window->button_norm[0]), label_norm[i]);
02719       gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[i]),
02720                                    tip_norm[i]);
02721       gtk_grid_attach (window->grid_norm,
02722                        GTK_WIDGET (window->button_norm[i]), 0, i, 1, 1);
02723       g_signal_connect (window->button_norm[i], "clicked",
      window_update, NULL);
02724     }
02725   window->label_p = (GtkLabel *) gtk_label_new (gettext ("P parameter"));
02726   gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->label_p), 1, 1, 1, 1);
02727   window->spin_p = (GtkSpinButton *)
02728     gtk_spin_button_new_with_range (-G_MAXDOUBLE, G_MAXDOUBLE, 0.01);
02729   gtk_widget_set_tooltip_text
02730     (GTK_WIDGET (window->spin_p), gettext ("P parameter for the P error norm"));
02731   window->scrolled_p
02732     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
02733   gtk_container_add (GTK_CONTAINER (window->scrolled_p),
02734                      GTK_WIDGET (window->spin_p));
02735   gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_p), TRUE);
02736   gtk_widget_set_halign (GTK_WIDGET (window->scrolled_p), GTK_ALIGN_FILL);
02737   gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->scrolled_p),
02738                    1, 2, 1, 2);
02739
02740   // Creating the grid and attaching the widgets to the grid
02741   window->grid = (GtkGrid *) gtk_grid_new ();
02742   gtk_grid_attach (window->grid, GTK_WIDGET (window->bar_buttons), 0, 0, 3, 1);
02743   gtk_grid_attach (window->grid, GTK_WIDGET (window->grid_files), 0, 1, 1, 1);
02744   gtk_grid_attach (window->grid,
02745                    GTK_WIDGET (window->frame_algorithm), 0, 2, 1, 1);
02746   gtk_grid_attach (window->grid,
02747                    GTK_WIDGET (window->frame_variable), 1, 2, 1, 1);
02748   gtk_grid_attach (window->grid,
02749                    GTK_WIDGET (window->frame_experiment), 2, 2, 1, 1);
02750   gtk_grid_attach (window->grid, GTK_WIDGET (window->frame_norm), 1, 1, 2, 1);
02751   gtk_container_add (GTK_CONTAINER (window->window), GTK_WIDGET (window->
      grid));
02752
02753   // Setting the window logo
02754   window->logo = gdk_pixbuf_new_from_xpm_data (logo);
02755   gtk_window_set_icon (window->window, window->logo);
02756
02757   // Showing the window
02758   gtk_widget_show_all (GTK_WIDGET (window->window));
02759
02760   // In GTK+ 3.16 and 3.18 the default scrolled size is wrong
02761 #if GTK_MINOR_VERSION >= 16
02762   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_min), -1, 40);
02763   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_max), -1, 40);
02764   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_minabs), -1, 40);
02765   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_maxabs), -1, 40);
02766   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_step), -1, 40);
02767   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_p), -1, 40);
02768   gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_threshold), -1, 40);
02769 #endif
02770
02771   // Reading initial example
02772   input_new ();
02773   buffer2 = g_get_current_dir ();
02774   buffer = g_build_filename (buffer2, "..", "tests", "test1", INPUT_FILE, NULL);
02775   g_free (buffer2);
02776   window_read (buffer);
02777   g_free (buffer);
02778
02779 #if DEBUG_INTERFACE
02780   fprintf (stderr, "window_new: start\n");
02781 #endif
02782 }
```

5.13 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 ()

  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.

5.13.1 Detailed Description

Header file to define the graphical interface functions.

Authors

Javier Burguete.

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Definition in file interface.h.

5.13.2 Function Documentation

5.13.2.1 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 565 of file utils.c.

```
00566 {
```

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

5.13.2.2 input_save()

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

Function to save the input file.

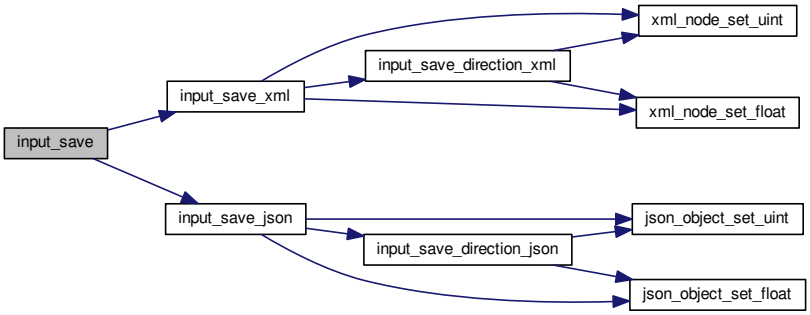
Parameters

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:



5.13.2.3 window_get_algorithm()

```
unsigned int window_get_algorithm ( )
```

Function to get the stochastic algorithm number.

Returns

Stochastic algorithm number.

Definition at line 726 of file interface.c.

```
00727 {
00728   unsigned int i;
00729 #if DEBUG_INTERFACE
00730   fprintf (stderr, "window_get_algorithm: start\n");
00731 #endif
00732   i = gtk_array_get_active (window->button_algorithm,
      NALGORITHMS);
00733 #if DEBUG_INTERFACE
00734   fprintf (stderr, "window_get_algorithm: %u\n", i);
00735   fprintf (stderr, "window_get_algorithm: end\n");
00736 #endif
00737   return i;
00738 }
```

Here is the call graph for this function:

5.13.2.4 window_get_direction()

```
unsigned int window_get_direction ( )
```

Function to get the direction search method number.

Returns

Direction search method number.

Definition at line 746 of file interface.c.

```
00747 {
00748   unsigned int i;
00749 #if DEBUG_INTERFACE
00750   fprintf (stderr, "window_get_direction: start\n");
00751 #endif
00752   i = gtk_array_get_active (window->button_direction,
      NDIRECTIONS);
00753 #if DEBUG_INTERFACE
00754   fprintf (stderr, "window_get_direction: %u\n", i);
00755   fprintf (stderr, "window_get_direction: end\n");
00756 #endif
00757   return i;
00758 }
```

Here is the call graph for this function:

5.13.2.5 window_get_norm()

```
unsigned int window_get_norm ( )
```

Function to get the norm method number.

Returns

Norm method number.

Definition at line 766 of file interface.c.

```
00767 {
00768   unsigned int i;
00769 #if DEBUG_INTERFACE
00770   fprintf (stderr, "window_get_norm: start\n");
00771 #endif
00772   i = gtk_array_get_active (window->button_norm,
      NNORMS);
00773 #if DEBUG_INTERFACE
00774   fprintf (stderr, "window_get_norm: %u\n", i);
00775   fprintf (stderr, "window_get_norm: end\n");
00776 #endif
00777   return i;
00778 }
```

Here is the call graph for this function:

5.13.2.6 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.

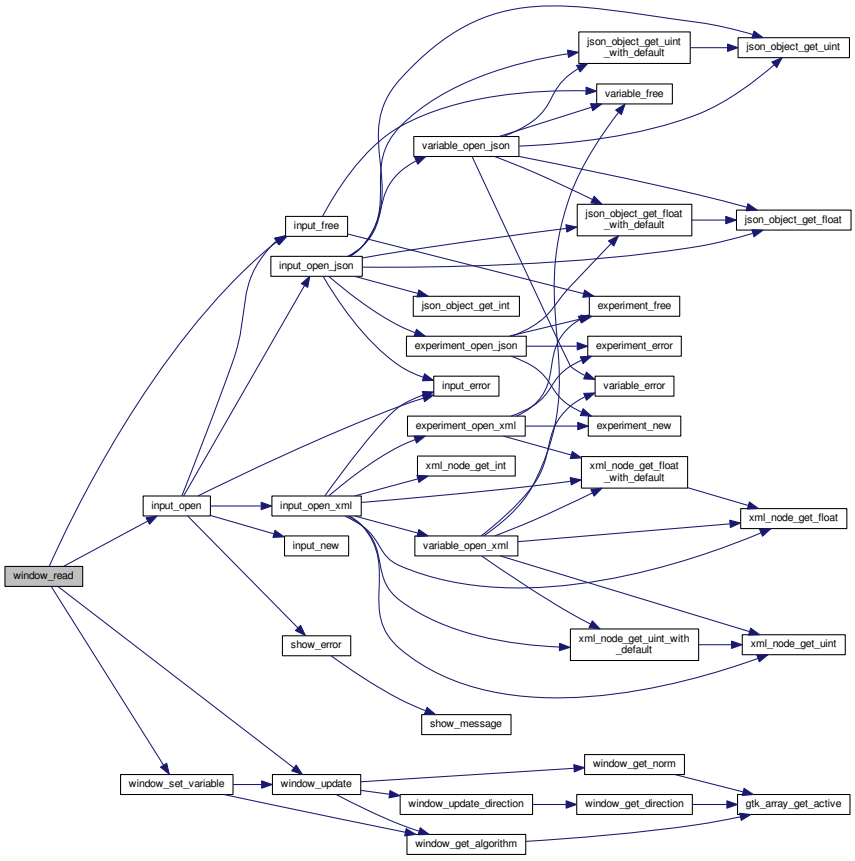
Definition at line 1874 of file interface.c.

```
01875 {
01876   unsigned int i;
01877   char *buffer;
01878 #if DEBUG_INTERFACE
01879   fprintf (stderr, "window_read: start\n");
01880 #endif
01881
01882   // Reading new input file
01883   input_free ();
01884   if (!input_open (filename))
01885     {
01886 #if DEBUG_INTERFACE
01887       fprintf (stderr, "window_read: end\n");
01888 #endif
01889       return 0;
01890     }
01891
01892   // Setting GTK+ widgets data
01893   gtk_entry_set_text (window->entry_result, input->result);
01894   gtk_entry_set_text (window->entry_variables, input->
      variables);
01895   buffer = g_build_filename (input->directory, input->
      simulator, NULL);
01896   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01897                                  (window->button_simulator), buffer);
01898   g_free (buffer);
01899   gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
01900                                 (size_t) input->evaluator);
01901   if (input->evaluator)
01902     {
01903       buffer = g_build_filename (input->directory, input->
      evaluator, NULL);
01904       gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
01905                                      (window->button_evaluator), buffer);
01906       g_free (buffer);
```

```
01907     }
01908   gtk_toggle_button_set_active
01909     (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
      algorithm]), TRUE);
01910   switch (input->algorithm)
01911     {
01912     case ALGORITHM_MONTE_CARLO:
01913       gtk_spin_button_set_value (window->spin_simulations,
01914                                  (gdouble) input->nsimulations);
01915     case ALGORITHM_SWEEP:
01916       gtk_spin_button_set_value (window->spin_iterations,
01917                                  (gdouble) input->niterations);
01918       gtk_spin_button_set_value (window->spin_bests, (gdouble)
      input->nbest);
01919       gtk_spin_button_set_value (window->spin_tolerance,
      input->tolerance);
01920       gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->
      check_direction),
01921                                     input->nsteps);
01922       if (input->nsteps)
01923         {
01924           gtk_toggle_button_set_active
01925             (GTK_TOGGLE_BUTTON (window->button_direction
01926                                 [input->direction]), TRUE);
01927           gtk_spin_button_set_value (window->spin_steps,
01928                                      (gdouble) input->nsteps);
01929           gtk_spin_button_set_value (window->spin_relaxation,
01930                                      (gdouble) input->relaxation);
01931           switch (input->direction)
01932             {
01933             case DIRECTION_METHOD_RANDOM:
01934               gtk_spin_button_set_value (window->spin_estimates,
01935                                          (gdouble) input->nestimates);
01936             }
01937         }
01938       break;
01939     default:
01940       gtk_spin_button_set_value (window->spin_population,
01941                                  (gdouble) input->nsimulations);
01942       gtk_spin_button_set_value (window->spin_generations,
01943                                  (gdouble) input->niterations);
01944       gtk_spin_button_set_value (window->spin_mutation, input->
      mutation_ratio);
01945       gtk_spin_button_set_value (window->spin_reproduction,
01946                                  input->reproduction_ratio);
01947       gtk_spin_button_set_value (window->spin_adaptation,
01948                                  input->adaptation_ratio);
01949     }
01950   gtk_toggle_button_set_active
01951     (GTK_TOGGLE_BUTTON (window->button_norm[input->norm]), TRUE);
01952   gtk_spin_button_set_value (window->spin_p, input->p);
01953   gtk_spin_button_set_value (window->spin_threshold, input->
      threshold);
01954   g_signal_handler_block (window->combo_experiment, window->
      id_experiment);
01955   g_signal_handler_block (window->button_experiment,
01956                           window->id_experiment_name);
01957   gtk_combo_box_text_remove_all (window->combo_experiment);
01958   for (i = 0; i < input->nexperiments; ++i)
01959     gtk_combo_box_text_append_text (window->combo_experiment,
01960                                     input->experiment[i].name);
01961   g_signal_handler_unblock
01962     (window->button_experiment, window->
      id_experiment_name);
01963   g_signal_handler_unblock (window->combo_experiment,
      window->id_experiment);
01964   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
01965   g_signal_handler_block (window->combo_variable, window->
      id_variable);
01966   g_signal_handler_block (window->entry_variable, window->
      id_variable_label);
01967   gtk_combo_box_text_remove_all (window->combo_variable);
01968   for (i = 0; i < input->nvariables; ++i)
01969     gtk_combo_box_text_append_text (window->combo_variable,
01970                                     input->variable[i].name);
01971   g_signal_handler_unblock (window->entry_variable, window->
      id_variable_label);
01972   g_signal_handler_unblock (window->combo_variable, window->
      id_variable);
01973   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
01974   window_set_variable ();
01975   window_update ();
01976
01977 #if DEBUG_INTERFACE
01978   fprintf (stderr, "window_read: end\n");
01979 #endif
01980   return 1;
```

```
01981 }
```

Here is the call graph for this function:



5.13.2.7 window_save()

```
int window_save ( )
```

Function to save the input file.

Returns

1 on OK, 0 on Cancel.

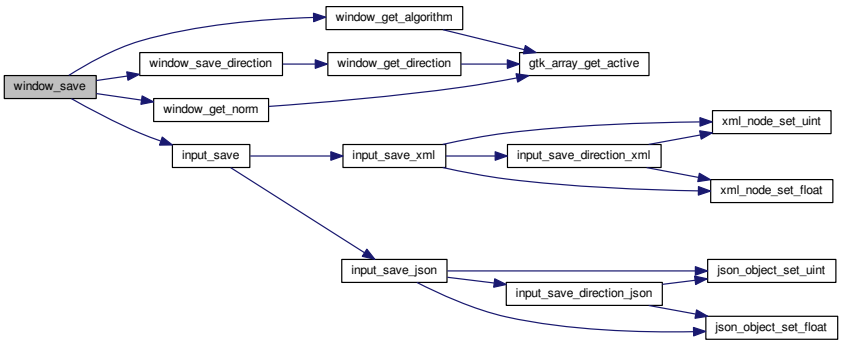
Definition at line 819 of file interface.c.

```
00820 {
00821   GtkFileChooserDialog *dlg;
00822   GtkFileFilter *filter1, *filter2;
00823   char *buffer;
00824
00825 #if DEBUG_INTERFACE
00826   fprintf (stderr, "window_save: start\n");
00827 #endif
00828
```

```
00829   // Opening the saving dialog
00830   dlg = (GtkFileChooserDialog *)
00831     gtk_file_chooser_dialog_new (gettext ("Save file"),
00832                                  window->window,
00833                                  GTK_FILE_CHOOSER_ACTION_SAVE,
00834                                  gettext ("_Cancel"),
00835                                  GTK_RESPONSE_CANCEL,
00836                                  gettext ("_OK"), GTK_RESPONSE_OK, NULL);
00837   gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
00838   buffer = g_build_filename (input->directory, input->name, NULL);
00839   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER (dlg), buffer);
00840   g_free (buffer);
00841
00842   // Adding XML filter
00843   filter1 = (GtkFileFilter *) gtk_file_filter_new ();
00844   gtk_file_filter_set_name (filter1, "XML");
00845   gtk_file_filter_add_pattern (filter1, "*.xml");
00846   gtk_file_filter_add_pattern (filter1, "*.XML");
00847   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter1);
00848
00849   // Adding JSON filter
00850   filter2 = (GtkFileFilter *) gtk_file_filter_new ();
00851   gtk_file_filter_set_name (filter2, "JSON");
00852   gtk_file_filter_add_pattern (filter2, "*.json");
00853   gtk_file_filter_add_pattern (filter2, "*.JSON");
00854   gtk_file_filter_add_pattern (filter2, "*.js");
00855   gtk_file_filter_add_pattern (filter2, "*.JS");
00856   gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter2);
00857
00858   if (input->type == INPUT_TYPE_XML)
00859     gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter1);
00860   else
00861     gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter2);
00862
00863   // If OK response then saving
00864   if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
00865     {
00866       // Setting input file type
00867       filter1 = gtk_file_chooser_get_filter (GTK_FILE_CHOOSER (dlg));
00868       buffer = (char *) gtk_file_filter_get_name (filter1);
00869       if (!strcmp (buffer, "XML"))
00870         input->type = INPUT_TYPE_XML;
00871       else
00872         input->type = INPUT_TYPE_JSON;
00873
00874       // Adding properties to the root XML node
00875       input->simulator = gtk_file_chooser_get_filename
00876         (GTK_FILE_CHOOSER (window->button_simulator));
00877       if (gtk_toggle_button_get_active
00878           (GTK_TOGGLE_BUTTON (window->check_evaluator)))
00879         input->evaluator = gtk_file_chooser_get_filename
00880           (GTK_FILE_CHOOSER (window->button_evaluator));
00881       else
00882         input->evaluator = NULL;
00883       if (input->type == INPUT_TYPE_XML)
00884         {
00885           input->result
00886             = (char *) xmlStrdup ((const xmlChar *)
00887                                   gtk_entry_get_text (window->entry_result));
00888           input->variables
00889             = (char *) xmlStrdup ((const xmlChar *)
00890                                   gtk_entry_get_text (window->
      entry_variables));
00891         }
00892       else
00893         {
00894           input->result = g_strdup (gtk_entry_get_text (window->
      entry_result));
00895           input->variables
00896             = g_strdup (gtk_entry_get_text (window->entry_variables));
00897         }
00898
00899       // Setting the algorithm
00900       switch (window_get_algorithm ())
00901         {
00902         case ALGORITHM_MONTE_CARLO:
00903           input->algorithm = ALGORITHM_MONTE_CARLO;
00904           input->nsimulations
00905             = gtk_spin_button_get_value_as_int (window->spin_simulations);
00906           input->niterations
00907             = gtk_spin_button_get_value_as_int (window->spin_iterations);
00908           input->tolerance = gtk_spin_button_get_value (window->
      spin_tolerance);
00909           input->nbest = gtk_spin_button_get_value_as_int (window->
      spin_bests);
00910           window_save_direction ();
00911           break;
```

```
00912         case ALGORITHM_SWEEP:
00913           input->algorithm = ALGORITHM_SWEEP;
00914           input->niterations
00915             = gtk_spin_button_get_value_as_int (window->spin_iterations);
00916           input->tolerance = gtk_spin_button_get_value (window->
      spin_tolerance);
00917           input->nbest = gtk_spin_button_get_value_as_int (window->
      spin_bests);
00918           window_save_direction ();
00919           break;
00920         default:
00921           input->algorithm = ALGORITHM_GENETIC;
00922           input->nsimulations
00923             = gtk_spin_button_get_value_as_int (window->spin_population);
00924           input->niterations
00925             = gtk_spin_button_get_value_as_int (window->spin_generations);
00926           input->mutation_ratio
00927             = gtk_spin_button_get_value (window->spin_mutation);
00928           input->reproduction_ratio
00929             = gtk_spin_button_get_value (window->spin_reproduction);
00930           input->adaptation_ratio
00931             = gtk_spin_button_get_value (window->spin_adaptation);
00932           break;
00933         }
00934       input->norm = window_get_norm ();
00935       input->p = gtk_spin_button_get_value (window->spin_p);
00936       input->threshold = gtk_spin_button_get_value (window->
      spin_threshold);
00937
00938       // Saving the XML file
00939       buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
00940       input_save (buffer);
00941
00942       // Closing and freeing memory
00943       g_free (buffer);
00944       gtk_widget_destroy (GTK_WIDGET (dlg));
00945 #if DEBUG_INTERFACE
00946       fprintf (stderr, "window_save: end\n");
00947 #endif
00948       return 1;
00949     }
00950
00951   // Closing and freeing memory
00952   gtk_widget_destroy (GTK_WIDGET (dlg));
00953 #if DEBUG_INTERFACE
00954   fprintf (stderr, "window_save: end\n");
00955 #endif
00956   return 0;
00957 }
```

Here is the call graph for this function:



5.13.2.8 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 1518 of file interface.c.

```
01519 {
01520   unsigned int i, j;
01521   char *buffer;
01522   GFile *file1, *file2;
01523 #if DEBUG_INTERFACE
01524   fprintf (stderr, "window_template_experiment: start\n");
01525 #endif
01526   i = (size_t) data;
01527   j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01528   file1
01529     = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
01530   file2 = g_file_new_for_path (input->directory);
01531   buffer = g_file_get_relative_path (file2, file1);
01532   if (input->type == INPUT_TYPE_XML)
01533     input->experiment[j].template[i] = (char *) xmlStrdup ((xmlChar *) buffer);
01534   else
01535     input->experiment[j].template[i] = g_strdup (buffer);
01536   g_free (buffer);
01537   g_object_unref (file2);
01538   g_object_unref (file1);
01539 #if DEBUG_INTERFACE
01540   fprintf (stderr, "window_template_experiment: end\n");
01541 #endif
01542 }
```

5.14 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 2012-2016, 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 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 ();
00271
00272 #endif
```

5.15 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 dependency graph for main.c:

Macros

- #define **_GNU_SOURCE**
- #define DEBUG_MAIN 0

  Macro to debug main functions.

Functions

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

  Main function.

5.15.1 Detailed Description

Main source file.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file main.c.

5.15.2 Function Documentation

5.15.2.1 main()

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

Main function.

Parameters

argn	Arguments number.
argc	Arguments pointer.

Returns

0 on success, >0 on error.

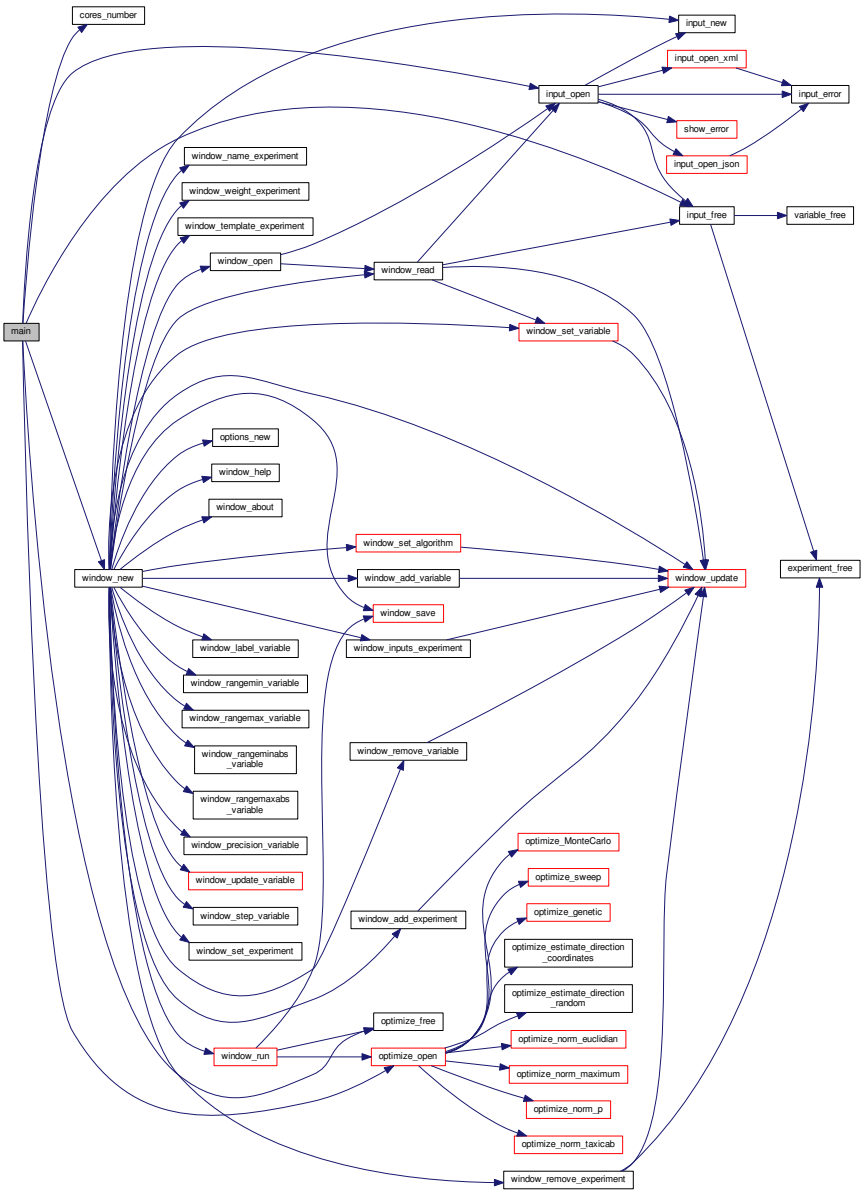
Definition at line 86 of file main.c.

```
00088 {
00089 #if HAVE_GTK
00090   char *buffer;
00091 #endif
00092
00093   // Starting pseudo-random numbers generator
00094 #if DEBUG_MAIN
00095   fprintf (stderr, "main: starting pseudo-random numbers generator\n");
00096 #endif
00097   optimize->rng = gsl_rng_alloc (gsl_rng_taus2);
00098
00099   // Allowing spaces in the XML data file
00100 #if DEBUG_MAIN
00101   fprintf (stderr, "main: allowing spaces in the XML data file\n");
00102 #endif
00103   xmlKeepBlanksDefault (0);
00104
00105   // Starting MPI
00106 #if HAVE_MPI
00107 #if DEBUG_MAIN
00108   fprintf (stderr, "main: starting MPI\n");
00109 #endif
00110   MPI_Init (&argn, &argc);
```

```
00111   MPI_Comm_size (MPI_COMM_WORLD, &ntasks);
00112   MPI_Comm_rank (MPI_COMM_WORLD, &optimize->mpi_rank);
00113   printf ("rank=%d tasks=%d\n", optimize->mpi_rank, ntasks);
00114 #else
00115   ntasks = 1;
00116 #endif
00117
00118   // Resetting result and variables file names
00119 #if DEBUG_MAIN
00120   fprintf (stderr, "main: resetting result and variables file names\n");
00121 #endif
00122   input->result = input->variables = NULL;
00123
00124 #if HAVE_GTK
00125
00126   // Getting threads number and pseudo-random numbers generator seed
00127   nthreads_direction = nthreads = cores_number ();
00128   optimize->seed = DEFAULT_RANDOM_SEED;
00129
00130   // Setting local language and international floating point numbers notation
00131   setlocale (LC_ALL, "");
00132   setlocale (LC_NUMERIC, "C");
00133   window->application_directory = g_get_current_dir ();
00134   buffer = g_build_filename (window->application_directory,
      LOCALE_DIR, NULL);
00135   bindtextdomain (PROGRAM_INTERFACE, buffer);
00136   bind_textdomain_codeset (PROGRAM_INTERFACE, "UTF-8");
00137   textdomain (PROGRAM_INTERFACE);
00138
00139   // Initing GTK+
00140   gtk_disable_setlocale ();
00141   gtk_init (&argn, &argc);
00142
00143   // Opening the main window
00144   window_new ();
00145   gtk_main ();
00146
00147   // Freeing memory
00148   input_free ();
00149   g_free (buffer);
00150   gtk_widget_destroy (GTK_WIDGET (window->window));
00151   g_free (window->application_directory);
00152
00153 #else
00154
00155   // Checking syntax
00156   if (argn < 2)
00157     {
00158       printf ("The syntax is:\n"
00159               "./mpcotoolbin [-nthreads x] [-seed s] data_file [result_file] "
00160               "[variables_file]\n");
00161       return 1;
00162     }
00163
00164   // Getting threads number and pseudo-random numbers generator seed
00165 #if DEBUG_MAIN
00166   fprintf (stderr, "main: getting threads number and pseudo-random numbers "
00167            "generator seed\n");
00168 #endif
00169   nthreads_direction = nthreads = cores_number ();
00170   optimize->seed = DEFAULT_RANDOM_SEED;
00171   if (argn > 2 && !strcmp (argc[1], "-nthreads"))
00172     {
00173       nthreads_direction = nthreads = atoi (argc[2]);
00174       if (!nthreads)
00175         {
00176           printf ("Bad threads number\n");
00177           return 2;
00178         }
00179       argc += 2;
00180       argn -= 2;
00181       if (argn > 2 && !strcmp (argc[1], "-seed"))
00182         {
00183           optimize->seed = atoi (argc[2]);
00184           argc += 2;
00185           argn -= 2;
00186         }
00187     }
00188   else if (argn > 2 && !strcmp (argc[1], "-seed"))
00189     {
00190       optimize->seed = atoi (argc[2]);
00191       argc += 2;
00192       argn -= 2;
00193       if (argn > 2 && !strcmp (argc[1], "-nthreads"))
00194         {
00195           nthreads_direction = nthreads = atoi (argc[2]);
00196           if (!nthreads)
```

```
00197             {
00198               printf ("Bad threads number\n");
00199               return 2;
00200             }
00201           argc += 2;
00202           argn -= 2;
00203         }
00204     }
00205   printf ("nthreads=%u\n", nthreads);
00206   printf ("seed=%lu\n", optimize->seed);
00207
00208   // Checking arguments
00209 #if DEBUG_MAIN
00210   fprintf (stderr, "main: checking arguments\n");
00211 #endif
00212   if (argn > 4 || argn < 2)
00213     {
00214       printf ("The syntax is:\n"
00215               "./mpcotoolbin [-nthreads x] [-seed s] data_file [result_file] "
00216               "[variables_file]\n");
00217       return 1;
00218     }
00219   if (argn > 2)
00220     input->result = (char *) xmlStrdup ((xmlChar *) argc[2]);
00221   if (argn == 4)
00222     input->variables = (char *) xmlStrdup ((xmlChar *) argc[3]);
00223
00224   // Making optimization
00225 #if DEBUG_MAIN
00226   fprintf (stderr, "main: making optimization\n");
00227 #endif
00228   if (input_open (argc[1]))
00229     optimize_open ();
00230
00231   // Freeing memory
00232 #if DEBUG_MAIN
00233   fprintf (stderr, "main: freeing memory and closing\n");
00234 #endif
00235   optimize_free ();
00236
00237 #endif
00238
00239   // Closing MPI
00240 #if HAVE_MPI
00241   MPI_Finalize ();
00242 #endif
00243
00244   // Freeing memory
00245   gsl_rng_free (optimize->rng);
00246
00247   // Closing
00248   return 0;
00249 }
```

Here is the call graph for this function:



5.16 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
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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 <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
00070 #define DEBUG_MAIN 0
00071
00072
00081 #if EXTERNAL_LIBRARY
00082 int
00083 mpcotool (int argn, char **argc)
00084 #else
00085 int
00086 main (int argn, char **argc)
00087 #endif
00088 {
00089 #if HAVE_GTK
00090   char *buffer;
00091 #endif
00092
00093   // Starting pseudo-random numbers generator
00094 #if DEBUG_MAIN
00095   fprintf (stderr, "main: starting pseudo-random numbers generator\n");
00096 #endif
00097   optimize->rng = gsl_rng_alloc (gsl_rng_taus2);
00098
00099   // Allowing spaces in the XML data file
00100 #if DEBUG_MAIN
00101   fprintf (stderr, "main: allowing spaces in the XML data file\n");
00102 #endif
00103   xmlKeepBlanksDefault (0);
00104
00105   // Starting MPI
00106 #if HAVE_MPI
00107 #if DEBUG_MAIN
00108   fprintf (stderr, "main: starting MPI\n");
00109 #endif
00110   MPI_Init (&argn, &argc);
00111   MPI_Comm_size (MPI_COMM_WORLD, &ntasks);
00112   MPI_Comm_rank (MPI_COMM_WORLD, &optimize->mpi_rank);
00113   printf ("rank=%d tasks=%d\n", optimize->mpi_rank, ntasks);
00114 #else
00115   ntasks = 1;
00116 #endif
```

```
00117
00118   // Resetting result and variables file names
00119 #if DEBUG_MAIN
00120   fprintf (stderr, "main: resetting result and variables file names\n");
00121 #endif
00122   input->result = input->variables = NULL;
00123
00124 #if HAVE_GTK
00125
00126   // Getting threads number and pseudo-random numbers generator seed
00127   nthreads_direction = nthreads = cores_number ();
00128   optimize->seed = DEFAULT_RANDOM_SEED;
00129
00130   // Setting local language and international floating point numbers notation
00131   setlocale (LC_ALL, "");
00132   setlocale (LC_NUMERIC, "C");
00133   window->application_directory = g_get_current_dir ();
00134   buffer = g_build_filename (window->application_directory,
      LOCALE_DIR, NULL);
00135   bindtextdomain (PROGRAM_INTERFACE, buffer);
00136   bind_textdomain_codeset (PROGRAM_INTERFACE, "UTF-8");
00137   textdomain (PROGRAM_INTERFACE);
00138
00139   // Initing GTK+
00140   gtk_disable_setlocale ();
00141   gtk_init (&argn, &argc);
00142
00143   // Opening the main window
00144   window_new ();
00145   gtk_main ();
00146
00147   // Freeing memory
00148   input_free ();
00149   g_free (buffer);
00150   gtk_widget_destroy (GTK_WIDGET (window->window));
00151   g_free (window->application_directory);
00152
00153 #else
00154
00155   // Checking syntax
00156   if (argn < 2)
00157     {
00158       printf ("The syntax is:\n"
00159               "./mpcotoolbin [-nthreads x] [-seed s] data_file [result_file] "
00160               "[variables_file]\n");
00161       return 1;
00162     }
00163
00164   // Getting threads number and pseudo-random numbers generator seed
00165 #if DEBUG_MAIN
00166   fprintf (stderr, "main: getting threads number and pseudo-random numbers "
00167            "generator seed\n");
00168 #endif
00169   nthreads_direction = nthreads = cores_number ();
00170   optimize->seed = DEFAULT_RANDOM_SEED;
00171   if (argn > 2 && !strcmp (argc[1], "-nthreads"))
00172     {
00173       nthreads_direction = nthreads = atoi (argc[2]);
00174       if (!nthreads)
00175         {
00176           printf ("Bad threads number\n");
00177           return 2;
00178         }
00179       argc += 2;
00180       argn -= 2;
00181       if (argn > 2 && !strcmp (argc[1], "-seed"))
00182         {
00183           optimize->seed = atoi (argc[2]);
00184           argc += 2;
00185           argn -= 2;
00186         }
00187     }
00188   else if (argn > 2 && !strcmp (argc[1], "-seed"))
00189     {
00190       optimize->seed = atoi (argc[2]);
00191       argc += 2;
00192       argn -= 2;
00193       if (argn > 2 && !strcmp (argc[1], "-nthreads"))
00194         {
00195           nthreads_direction = nthreads = atoi (argc[2]);
00196           if (!nthreads)
00197             {
00198               printf ("Bad threads number\n");
00199               return 2;
00200             }
00201           argc += 2;
00202           argn -= 2;
```

```
00203         }
00204     }
00205   printf ("nthreads=%u\n", nthreads);
00206   printf ("seed=%lu\n", optimize->seed);
00207
00208   // Checking arguments
00209 #if DEBUG_MAIN
00210   fprintf (stderr, "main: checking arguments\n");
00211 #endif
00212   if (argn > 4 || argn < 2)
00213     {
00214       printf ("The syntax is:\n"
00215               "./mpcotoolbin [-nthreads x] [-seed s] data_file [result_file] "
00216               "[variables_file]\n");
00217       return 1;
00218     }
00219   if (argn > 2)
00220     input->result = (char *) xmlStrdup ((xmlChar *) argc[2]);
00221   if (argn == 4)
00222     input->variables = (char *) xmlStrdup ((xmlChar *) argc[3]);
00223
00224   // Making optimization
00225 #if DEBUG_MAIN
00226   fprintf (stderr, "main: making optimization\n");
00227 #endif
00228   if (input_open (argc[1]))
00229     optimize_open ();
00230
00231   // Freeing memory
00232 #if DEBUG_MAIN
00233   fprintf (stderr, "main: freeing memory and closing\n");
00234 #endif
00235   optimize_free ();
00236
00237 #endif
00238
00239   // Closing MPI
00240 #if HAVE_MPI
00241   MPI_Finalize ();
00242 #endif
00243
00244   // Freeing memory
00245   gsl_rng_free (optimize->rng);
00246
00247   // Closing
00248   return 0;
00249 }
```

5.17 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 **_GNU_SOURCE**
- #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 *template)

  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

  Number of tasks.
- unsigned int nthreads

  Number of threads.
- unsigned int nthreads_direction

  Number of threads for the direction search method.
- GMutex mutex [1]

  Mutex struct.
- 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.

5.17.1 Detailed Description

Source file to define the optimization functions.

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Definition in file optimize.c.

5.17.2 Function Documentation

5.17.2.1 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 463 of file optimize.c.

```
00464 {
00465   unsigned int i, j;
00466   double e;
00467 #if DEBUG_OPTIMIZE
00468   fprintf (stderr, "optimize_best: start\n");
00469   fprintf (stderr, "optimize_best: nsaveds=%u nbest=%u\n",
00470            optimize->nsaveds, optimize->nbest);
00471 #endif
00472   if (optimize->nsaveds < optimize->nbest
00473       || value < optimize->error_best[optimize->nsaveds - 1])
00474     {
00475       if (optimize->nsaveds < optimize->nbest)
00476         ++optimize->nsaveds;
00477       optimize->error_best[optimize->nsaveds - 1] = value;
00478       optimize->simulation_best[optimize->nsaveds - 1] = simulation;
00479       for (i = optimize->nsaveds; --i;)
00480         {
00481           if (optimize->error_best[i] < optimize->
      error_best[i - 1])
00482             {
00483               j = optimize->simulation_best[i];
00484               e = optimize->error_best[i];
00485               optimize->simulation_best[i] = optimize->
      simulation_best[i - 1];
00486               optimize->error_best[i] = optimize->
      error_best[i - 1];
00487               optimize->simulation_best[i - 1] = j;
00488               optimize->error_best[i - 1] = e;
00489             }
```

```
00490           else
00491             break;
00492         }
00493     }
00494 #if DEBUG_OPTIMIZE
00495   fprintf (stderr, "optimize_best: end\n");
00496 #endif
00497 }
```

5.17.2.2 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 788 of file optimize.c.

```
00789 {
00790 #if DEBUG_OPTIMIZE
00791   fprintf (stderr, "optimize_best_direction: start\n");
00792   fprintf (stderr,
00793            "optimize_best_direction: simulation=%u value=%.14le best=%.14le\n",
00794            simulation, value, optimize->error_best[0]);
00795 #endif
00796   if (value < optimize->error_best[0])
00797     {
00798       optimize->error_best[0] = value;
00799       optimize->simulation_best[0] = simulation;
00800 #if DEBUG_OPTIMIZE
00801       fprintf (stderr,
00802                "optimize_best_direction: BEST simulation=%u value=%.14le\n",
00803                simulation, value);
00804 #endif
00805     }
00806 #if DEBUG_OPTIMIZE
00807   fprintf (stderr, "optimize_best_direction: end\n");
00808 #endif
00809 }
```

5.17.2.3 optimize_direction_sequential()

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

Function to estimate the direction search sequentially.

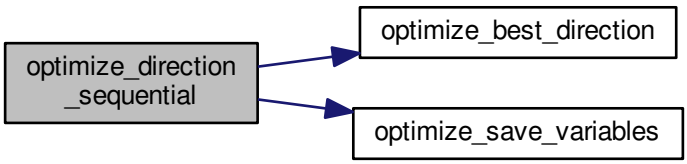
Parameters

simulation	Simulation number.

Definition at line 818 of file optimize.c.

```
00819 {
00820   unsigned int i, j;
00821   double e;
00822 #if DEBUG_OPTIMIZE
00823   fprintf (stderr, "optimize_direction_sequential: start\n");
00824   fprintf (stderr, "optimize_direction_sequential: nstart_direction=%u "
00825            "nend_direction=%u\n",
00826            optimize->nstart_direction, optimize->
      nend_direction);
00827 #endif
00828   for (i = optimize->nstart_direction; i < optimize->nend_direction; ++i)
00829     {
00830       j = simulation + i;
00831       e = optimize_norm (j);
00832       optimize_best_direction (j, e);
00833       optimize_save_variables (j, e);
00834       if (e < optimize->threshold)
00835         {
00836           optimize->stop = 1;
00837           break;
00838         }
00839 #if DEBUG_OPTIMIZE
00840       fprintf (stderr, "optimize_direction_sequential: i=%u e=%lg\n", i, e);
00841 #endif
00842     }
00843 #if DEBUG_OPTIMIZE
00844   fprintf (stderr, "optimize_direction_sequential: end\n");
00845 #endif
00846 }
```

Here is the call graph for this function:



5.17.2.4 optimize_direction_thread()

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

Function to estimate the direction search on a thread.

Parameters

data	Function data.

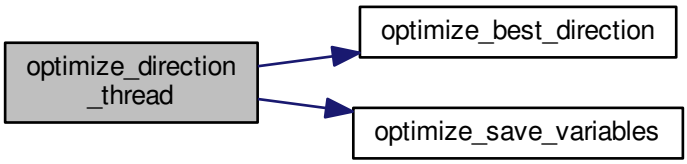
Returns

NULL

Definition at line 856 of file optimize.c.

```
00857 {
00858   unsigned int i, thread;
00859   double e;
00860 #if DEBUG_OPTIMIZE
00861   fprintf (stderr, "optimize_direction_thread: start\n");
00862 #endif
00863   thread = data->thread;
00864 #if DEBUG_OPTIMIZE
00865   fprintf (stderr, "optimize_direction_thread: thread=%u start=%u end=%u\n",
00866            thread,
00867            optimize->thread_direction[thread],
00868            optimize->thread_direction[thread + 1]);
00869 #endif
00870   for (i = optimize->thread_direction[thread];
00871        i < optimize->thread_direction[thread + 1]; ++i)
00872     {
00873       e = optimize_norm (i);
00874       g_mutex_lock (mutex);
00875       optimize_best_direction (i, e);
00876       optimize_save_variables (i, e);
00877       if (e < optimize->threshold)
00878         optimize->stop = 1;
00879       g_mutex_unlock (mutex);
00880       if (optimize->stop)
00881         break;
00882 #if DEBUG_OPTIMIZE
00883       fprintf (stderr, "optimize_direction_thread: i=%u e=%lg\n", i, e);
00884 #endif
00885     }
00886 #if DEBUG_OPTIMIZE
00887   fprintf (stderr, "optimize_direction_thread: end\n");
00888 #endif
00889   g_thread_exit (NULL);
00890   return NULL;
00891 }
```

Here is the call graph for this function:



5.17.2.5 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 930 of file optimize.c.

```
00932 {
00933   double x;
00934 #if DEBUG_OPTIMIZE
00935   fprintf (stderr, "optimize_estimate_direction_coordinates: start\n");
00936 #endif
00937   x = optimize->direction[variable];
00938   if (estimate >= (2 * variable) && estimate < (2 * variable + 2))
00939     {
00940       if (estimate & 1)
00941         x += optimize->step[variable];
00942       else
00943         x -= optimize->step[variable];
00944     }
00945 #if DEBUG_OPTIMIZE
00946   fprintf (stderr,
00947            "optimize_estimate_direction_coordinates: direction%u=%lg\n",
00948            variable, x);
00949   fprintf (stderr, "optimize_estimate_direction_coordinates: end\n");
00950 #endif
00951   return x;
00952 }
```

5.17.2.6 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 903 of file optimize.c.

```
00905 {
00906   double x;
00907 #if DEBUG_OPTIMIZE
00908   fprintf (stderr, "optimize_estimate_direction_random: start\n");
00909 #endif
00910   x = optimize->direction[variable]
00911     + (1. - 2. * gsl_rng_uniform (optimize->rng)) * optimize->
     step[variable];
00912 #if DEBUG_OPTIMIZE
00913   fprintf (stderr, "optimize_estimate_direction_random: direction%u=%lg\n",
00914            variable, x);
00915   fprintf (stderr, "optimize_estimate_direction_random: end\n");
00916 #endif
00917   return x;
00918 }
```

5.17.2.7 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 1097 of file optimize.c.

```
01098 {
01099   unsigned int j;
01100   double objective;
01101   char buffer[64];
01102 #if DEBUG_OPTIMIZE
01103   fprintf (stderr, "optimize_genetic_objective: start\n");
01104 #endif
01105   for (j = 0; j < optimize->nvariables; ++j)
01106     {
01107       optimize->value[entity->id * optimize->nvariables + j]
01108         = genetic_get_variable (entity, optimize->genetic_variable + j);
01109     }
01110   objective = optimize_norm (entity->id);
01111   g_mutex_lock (mutex);
01112   for (j = 0; j < optimize->nvariables; ++j)
01113     {
01114       snprintf (buffer, 64, "%s ", format[optimize->precision[j]]);
01115       fprintf (optimize->file_variables, buffer,
01116                genetic_get_variable (entity, optimize->genetic_variable + j));
01117     }
01118   fprintf (optimize->file_variables, "%.14le\n", objective);
01119   g_mutex_unlock (mutex);
01120 #if DEBUG_OPTIMIZE
01121   fprintf (stderr, "optimize_genetic_objective: end\n");
01122 #endif
01123   return objective;
01124 }
```

5.17.2.8 optimize_input()

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

Function to write the simulation input file.

Parameters

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

Definition at line 104 of file optimize.c.

```
00105 {
00106   unsigned int i;
00107   char buffer[32], value[32], *buffer2, *buffer3, *content;
00108   FILE *file;
00109   gsize length;
00110   GRegex *regex;
00111
00112 #if DEBUG_OPTIMIZE
00113   fprintf (stderr, "optimize_input: start\n");
00114 #endif
00115
00116   // Checking the file
00117   if (!template)
00118     goto optimize_input_end;
00119
```

```
00120   // Opening template
00121   content = g_mapped_file_get_contents (template);
00122   length = g_mapped_file_get_length (template);
00123 #if DEBUG_OPTIMIZE
00124   fprintf (stderr, "optimize_input: length=%lu\ncontent:\n%s", length, content);
00125 #endif
00126   file = g_fopen (input, "w");
00127
00128   // Parsing template
00129   for (i = 0; i < optimize->nvariables; ++i)
00130     {
00131 #if DEBUG_OPTIMIZE
00132       fprintf (stderr, "optimize_input: variable=%u\n", i);
00133 #endif
00134       snprintf (buffer, 32, "@variable%u@", i + 1);
00135       regex = g_regex_new (buffer, 0, 0, NULL);
00136       if (i == 0)
00137         {
00138           buffer2 = g_regex_replace_literal (regex, content, length, 0,
00139                                              optimize->label[i], 0, NULL);
00140 #if DEBUG_OPTIMIZE
00141           fprintf (stderr, "optimize_input: buffer2\n%s", buffer2);
00142 #endif
00143         }
00144       else
00145         {
00146           length = strlen (buffer3);
00147           buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
00148                                              optimize->label[i], 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, 0, 0, NULL);
00155       snprintf (value, 32, format[optimize->precision[i]],
00156                 optimize->value[simulation * optimize->
      nvariables + i]);
00157
00158 #if DEBUG_OPTIMIZE
00159       fprintf (stderr, "optimize_input: value=%s\n", value);
00160 #endif
00161       buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
00162                                          0, NULL);
00163       g_free (buffer2);
00164       g_regex_unref (regex);
00165     }
00166
00167   // Saving input file
00168   fwrite (buffer3, strlen (buffer3), sizeof (char), file);
00169   g_free (buffer3);
00170   fclose (file);
00171
00172 optimize_input_end:
00173 #if DEBUG_OPTIMIZE
00174   fprintf (stderr, "optimize_input: end\n");
00175 #endif
00176   return;
00177 }
```

5.17.2.9 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 586 of file optimize.c.

```
00588 {
00589   unsigned int i, j, k, s[optimize->nbest];
00590   double e[optimize->nbest];
00591 #if DEBUG_OPTIMIZE
00592   fprintf (stderr, "optimize_merge: start\n");
00593 #endif
00594   i = j = k = 0;
00595   do
00596     {
00597       if (i == optimize->nsaveds)
00598         {
00599           s[k] = simulation_best[j];
00600           e[k] = error_best[j];
00601           ++j;
00602           ++k;
00603           if (j == nsaveds)
00604             break;
00605         }
00606       else if (j == nsaveds)
00607         {
00608           s[k] = optimize->simulation_best[i];
00609           e[k] = optimize->error_best[i];
00610           ++i;
00611           ++k;
00612           if (i == optimize->nsaveds)
00613             break;
00614         }
00615       else if (optimize->error_best[i] > error_best[j])
00616         {
00617           s[k] = simulation_best[j];
00618           e[k] = error_best[j];
00619           ++j;
00620           ++k;
00621         }
00622       else
00623         {
00624           s[k] = optimize->simulation_best[i];
00625           e[k] = optimize->error_best[i];
00626           ++i;
00627           ++k;
00628         }
00629     }
00630   while (k < optimize->nbest);
00631   optimize->nsaveds = k;
00632   memcpy (optimize->simulation_best, s, k * sizeof (unsigned int));
00633   memcpy (optimize->error_best, e, k * sizeof (double));
00634 #if DEBUG_OPTIMIZE
00635   fprintf (stderr, "optimize_merge: end\n");
00636 #endif
00637 }
```

5.17.2.10 optimize_norm_euclidian()

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

Function to calculate the Euclidian error norm.

Parameters

simulation	simulation number.

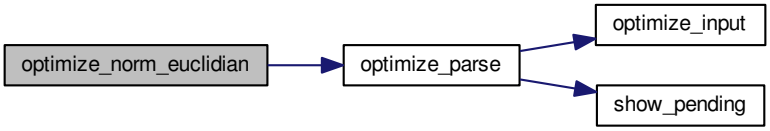
Returns

Euclidian error norm.

Definition at line 296 of file optimize.c.

```
00297 {
00298   double e, ei;
00299   unsigned int i;
00300 #if DEBUG_OPTIMIZE
00301   fprintf (stderr, "optimize_norm_euclidian: start\n");
00302 #endif
00303   e = 0.;
00304   for (i = 0; i < optimize->nexperiments; ++i)
00305     {
00306       ei = optimize_parse (simulation, i);
00307       e += ei * ei;
00308     }
00309   e = sqrt (e);
00310 #if DEBUG_OPTIMIZE
00311   fprintf (stderr, "optimize_norm_euclidian: error=%lg\n", e);
00312   fprintf (stderr, "optimize_norm_euclidian: end\n");
00313 #endif
00314   return e;
00315 }
```

Here is the call graph for this function:



5.17.2.11 optimize_norm_maximum()

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

Function to calculate the maximum error norm.

Parameters

simulation	simulation number.

Returns

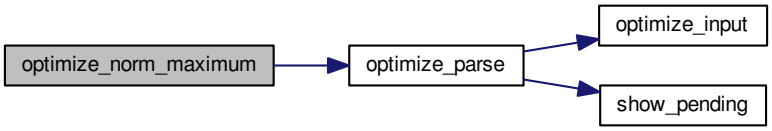
Maximum error norm.

Definition at line 325 of file optimize.c.

```
00326 {
00327   double e, ei;
00328   unsigned int i;
00329 #if DEBUG_OPTIMIZE
00330   fprintf (stderr, "optimize_norm_maximum: start\n");
00331 #endif
00332   e = 0.;
00333   for (i = 0; i < optimize->nexperiments; ++i)
00334     {
00335       ei = fabs (optimize_parse (simulation, i));
00336       e = fmax (e, ei);
00337     }
```

```
00338 #if DEBUG_OPTIMIZE
00339   fprintf (stderr, "optimize_norm_maximum: error=%lg\n", e);
00340   fprintf (stderr, "optimize_norm_maximum: end\n");
00341 #endif
00342   return e;
00343 }
```

Here is the call graph for this function:



5.17.2.12 optimize_norm_p()

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

Function to calculate the P error norm.

Parameters

simulation	simulation number.

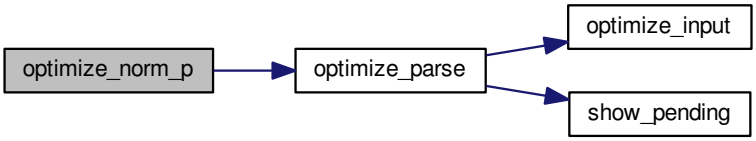
Returns

P error norm.

Definition at line 353 of file optimize.c.

```
00354 {
00355   double e, ei;
00356   unsigned int i;
00357 #if DEBUG_OPTIMIZE
00358   fprintf (stderr, "optimize_norm_p: start\n");
00359 #endif
00360   e = 0.;
00361   for (i = 0; i < optimize->nexperiments; ++i)
00362     {
00363       ei = fabs (optimize_parse (simulation, i));
00364       e += pow (ei, optimize->p);
00365     }
00366   e = pow (e, 1. / optimize->p);
00367 #if DEBUG_OPTIMIZE
00368   fprintf (stderr, "optimize_norm_p: error=%lg\n", e);
00369   fprintf (stderr, "optimize_norm_p: end\n");
00370 #endif
00371   return e;
00372 }
```

Here is the call graph for this function:



5.17.2.13 optimize_norm_taxicab()

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

Function to calculate the taxicab error norm.

Parameters

simulation	simulation number.

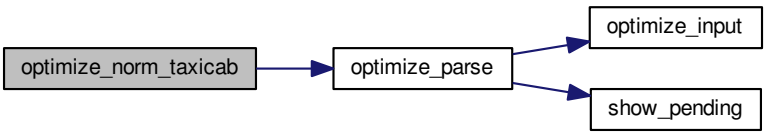
Returns

Taxicab error norm.

Definition at line 382 of file optimize.c.

```
00383 {
00384   double e;
00385   unsigned int i;
00386 #if DEBUG_OPTIMIZE
00387   fprintf (stderr, "optimize_norm_taxicab: start\n");
00388 #endif
00389   e = 0.;
00390   for (i = 0; i < optimize->nexperiments; ++i)
00391     e += fabs (optimize_parse (simulation, i));
00392 #if DEBUG_OPTIMIZE
00393   fprintf (stderr, "optimize_norm_taxicab: error=%lg\n", e);
00394   fprintf (stderr, "optimize_norm_taxicab: end\n");
00395 #endif
00396   return e;
00397 }
```

Here is the call graph for this function:



5.17.2.14 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

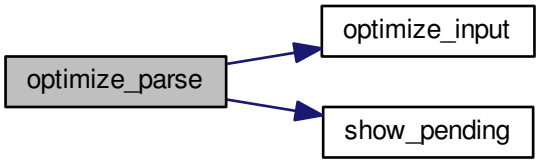
Objective function value.

Definition at line 190 of file optimize.c.

```
00191 {
00192   unsigned int i;
00193   double e;
00194   char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
00195     *buffer3, *buffer4;
00196   FILE *file_result;
00197
00198 #if DEBUG_OPTIMIZE
00199   fprintf (stderr, "optimize_parse: start\n");
00200   fprintf (stderr, "optimize_parse: simulation=%u experiment=%u\n", simulation,
00201            experiment);
00202 #endif
00203
00204   // Opening input files
00205   for (i = 0; i < optimize->ninputs; ++i)
00206     {
00207       snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
00208 #if DEBUG_OPTIMIZE
00209       fprintf (stderr, "optimize_parse: i=%u input=%s\n", i, &input[i][0]);
00210 #endif
00211       optimize_input (simulation, &input[i][0], optimize->
     file[i][experiment]);
00212     }
00213   for (; i < MAX_NINPUTS; ++i)
00214     strcpy (&input[i][0], "");
00215 #if DEBUG_OPTIMIZE
00216   fprintf (stderr, "optimize_parse: parsing end\n");
00217 #endif
00218
00219   // Performing the simulation
00220   snprintf (output, 32, "output-%u-%u", simulation, experiment);
00221   buffer2 = g_path_get_dirname (optimize->simulator);
00222   buffer3 = g_path_get_basename (optimize->simulator);
00223   buffer4 = g_build_filename (buffer2, buffer3, NULL);
00224   snprintf (buffer, 512, "\"%s\" %s %s %s %s %s %s %s %s %s",
00225             buffer4, input[0], input[1], input[2], input[3], input[4], input[5],
00226             input[6], input[7], output);
00227   g_free (buffer4);
00228   g_free (buffer3);
00229   g_free (buffer2);
00230 #if DEBUG_OPTIMIZE
00231   fprintf (stderr, "optimize_parse: %s\n", buffer);
00232 #endif
00233   system (buffer);
00234
00235   // Checking the objective value function
00236   if (optimize->evaluator)
00237     {
00238       snprintf (result, 32, "result-%u-%u", simulation, experiment);
00239       buffer2 = g_path_get_dirname (optimize->evaluator);
00240       buffer3 = g_path_get_basename (optimize->evaluator);
00241       buffer4 = g_build_filename (buffer2, buffer3, NULL);
00242       snprintf (buffer, 512, "\"%s\" %s %s %s",
00243                 buffer4, output, optimize->experiment[experiment], result);
```

```
00244       g_free (buffer4);
00245       g_free (buffer3);
00246       g_free (buffer2);
00247 #if DEBUG_OPTIMIZE
00248       fprintf (stderr, "optimize_parse: %s\n", buffer);
00249 #endif
00250       system (buffer);
00251       file_result = g_fopen (result, "r");
00252       e = atof (fgets (buffer, 512, file_result));
00253       fclose (file_result);
00254     }
00255   else
00256     {
00257       strcpy (result, "");
00258       file_result = g_fopen (output, "r");
00259       e = atof (fgets (buffer, 512, file_result));
00260       fclose (file_result);
00261     }
00262
00263   // Removing files
00264 #if !DEBUG_OPTIMIZE
00265   for (i = 0; i < optimize->ninputs; ++i)
00266     {
00267       if (optimize->file[i][0])
00268         {
00269           snprintf (buffer, 512, RM " %s", &input[i][0]);
00270           system (buffer);
00271         }
00272     }
00273   snprintf (buffer, 512, RM " %s %s", output, result);
00274   system (buffer);
00275 #endif
00276
00277   // Processing pending events
00278   show_pending ();
00279
00280 #if DEBUG_OPTIMIZE
00281   fprintf (stderr, "optimize_parse: end\n");
00282 #endif
00283
00284   // Returning the objective function
00285   return e * optimize->weight[experiment];
00286 }
```

Here is the call graph for this function:



5.17.2.15 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 435 of file optimize.c.

```
00436 {
00437   unsigned int i;
00438   char buffer[64];
00439 #if DEBUG_OPTIMIZE
00440   fprintf (stderr, "optimize_save_variables: start\n");
00441 #endif
00442   for (i = 0; i < optimize->nvariables; ++i)
00443     {
00444       snprintf (buffer, 64, "%s ", format[optimize->precision[i]]);
00445       fprintf (optimize->file_variables, buffer,
00446                optimize->value[simulation * optimize->
      nvariables + i]);
00447     }
00448   fprintf (optimize->file_variables, "%.14le\n", error);
00449 #if DEBUG_OPTIMIZE
00450   fprintf (stderr, "optimize_save_variables: end\n");
00451 #endif
00452 }
```

5.17.2.16 optimize_step_direction()

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

Function to do a step of the direction search method.

Parameters

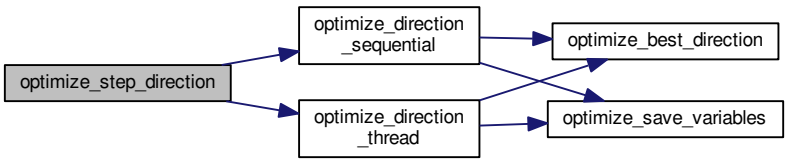
simulation	Simulation number.

Definition at line 961 of file optimize.c.

```
00962 {
00963   GThread *thread[nthreads_direction];
00964   ParallelData data[nthreads_direction];
00965   unsigned int i, j, k, b;
00966 #if DEBUG_OPTIMIZE
00967   fprintf (stderr, "optimize_step_direction: start\n");
00968 #endif
00969   for (i = 0; i < optimize->nestimates; ++i)
00970     {
00971       k = (simulation + i) * optimize->nvariables;
00972       b = optimize->simulation_best[0] * optimize->
      nvariables;
00973 #if DEBUG_OPTIMIZE
00974       fprintf (stderr, "optimize_step_direction: simulation=%u best=%u\n",
00975                simulation + i, optimize->simulation_best[0]);
00976 #endif
00977       for (j = 0; j < optimize->nvariables; ++j, ++k, ++b)
00978         {
00979 #if DEBUG_OPTIMIZE
00980           fprintf (stderr,
00981                    "optimize_step_direction: estimate=%u best%u=%.14le\n",
00982                    i, j, optimize->value[b]);
00983 #endif
00984           optimize->value[k]
00985             = optimize->value[b] + optimize_estimate_direction (j,
      i);
00986           optimize->value[k] = fmin (fmax (optimize->value[k],
```

```
00987                                       optimize->rangeminabs[j]),
00988                                     optimize->rangemaxabs[j]);
00989 #if DEBUG_OPTIMIZE
00990           fprintf (stderr,
00991                    "optimize_step_direction: estimate=%u variable%u=%.14le\n",
00992                    i, j, optimize->value[k]);
00993 #endif
00994         }
00995     }
00996   if (nthreads_direction == 1)
00997     optimize_direction_sequential (simulation);
00998   else
00999     {
01000       for (i = 0; i <= nthreads_direction; ++i)
01001         {
01002           optimize->thread_direction[i]
01003             = simulation + optimize->nstart_direction
01004             + i * (optimize->nend_direction - optimize->
      nstart_direction)
01005             / nthreads_direction;
01006 #if DEBUG_OPTIMIZE
01007           fprintf (stderr,
01008                    "optimize_step_direction: i=%u thread_direction=%u\n",
01009                    i, optimize->thread_direction[i]);
01010 #endif
01011         }
01012       for (i = 0; i < nthreads_direction; ++i)
01013         {
01014           data[i].thread = i;
01015           thread[i] = g_thread_new
01016             (NULL, (void (*)) optimize_direction_thread, &data[i]);
01017         }
01018       for (i = 0; i < nthreads_direction; ++i)
01019         g_thread_join (thread[i]);
01020     }
01021 #if DEBUG_OPTIMIZE
01022   fprintf (stderr, "optimize_step_direction: end\n");
01023 #endif
01024 }
```

Here is the call graph for this function:



5.17.2.17 optimize_thread()

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

Function to optimize on a thread.

Parameters

data	Function data.

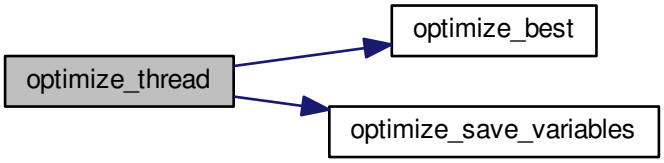
Returns

NULL

Definition at line 540 of file optimize.c.

```
00541 {
00542   unsigned int i, thread;
00543   double e;
00544 #if DEBUG_OPTIMIZE
00545   fprintf (stderr, "optimize_thread: start\n");
00546 #endif
00547   thread = data->thread;
00548 #if DEBUG_OPTIMIZE
00549   fprintf (stderr, "optimize_thread: thread=%u start=%u end=%u\n", thread,
00550            optimize->thread[thread], optimize->thread[thread + 1]);
00551 #endif
00552   for (i = optimize->thread[thread]; i < optimize->thread[thread + 1]; ++i)
00553     {
00554       e = optimize_norm (i);
00555       g_mutex_lock (mutex);
00556       optimize_best (i, e);
00557       optimize_save_variables (i, e);
00558       if (e < optimize->threshold)
00559         optimize->stop = 1;
00560       g_mutex_unlock (mutex);
00561       if (optimize->stop)
00562         break;
00563 #if DEBUG_OPTIMIZE
00564       fprintf (stderr, "optimize_thread: i=%u e=%lg\n", i, e);
00565 #endif
00566     }
00567 #if DEBUG_OPTIMIZE
00568   fprintf (stderr, "optimize_thread: end\n");
00569 #endif
00570   g_thread_exit (NULL);
00571   return NULL;
00572 }
```

Here is the call graph for this function:



5.18 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 2012-2016, 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 <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 int ntasks;
00079 unsigned int nthreads;
00080 unsigned int nthreads_direction;
00082 GMutex mutex[1];
00083 void (*optimize_algorithm) ();
00085 double (*optimize_estimate_direction) (unsigned int variable,
00086                                        unsigned int estimate);
00088 double (*optimize_norm) (unsigned int simulation);
00090 Optimize optimize[1];
00091
00103 void
00104 optimize_input (unsigned int simulation, char *input, GMappedFile * template)
00105 {
00106   unsigned int i;
00107   char buffer[32], value[32], *buffer2, *buffer3, *content;
00108   FILE *file;
00109   gsize length;
00110   GRegex *regex;
00111
00112 #if DEBUG_OPTIMIZE
00113   fprintf (stderr, "optimize_input: start\n");
00114 #endif
00115
00116   // Checking the file
00117   if (!template)
00118     goto optimize_input_end;
00119
00120   // Opening template
00121   content = g_mapped_file_get_contents (template);
00122   length = g_mapped_file_get_length (template);
00123 #if DEBUG_OPTIMIZE
00124   fprintf (stderr, "optimize_input: length=%lu\ncontent:\n%s", length, content);
```

```
00125 #endif
00126   file = g_fopen (input, "w");
00127
00128   // Parsing template
00129   for (i = 0; i < optimize->nvariables; ++i)
00130     {
00131 #if DEBUG_OPTIMIZE
00132       fprintf (stderr, "optimize_input: variable=%u\n", i);
00133 #endif
00134       snprintf (buffer, 32, "@variable%u@", i + 1);
00135       regex = g_regex_new (buffer, 0, 0, NULL);
00136       if (i == 0)
00137         {
00138           buffer2 = g_regex_replace_literal (regex, content, length, 0,
00139                                              optimize->label[i], 0, NULL);
00140 #if DEBUG_OPTIMIZE
00141           fprintf (stderr, "optimize_input: buffer2\n%s", buffer2);
00142 #endif
00143         }
00144       else
00145         {
00146           length = strlen (buffer3);
00147           buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
00148                                              optimize->label[i], 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, 0, 0, NULL);
00155       snprintf (value, 32, format[optimize->precision[i]],
00156                 optimize->value[simulation * optimize->nvariables + i]);
00157
00158 #if DEBUG_OPTIMIZE
00159       fprintf (stderr, "optimize_input: value=%s\n", value);
00160 #endif
00161       buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
00162                                          0, NULL);
00163       g_free (buffer2);
00164       g_regex_unref (regex);
00165     }
00166
00167   // Saving input file
00168   fwrite (buffer3, strlen (buffer3), sizeof (char), file);
00169   g_free (buffer3);
00170   fclose (file);
00171
00172 optimize_input_end:
00173 #if DEBUG_OPTIMIZE
00174   fprintf (stderr, "optimize_input: end\n");
00175 #endif
00176   return;
00177 }
00178
00189 double
00190 optimize_parse (unsigned int simulation, unsigned int experiment)
00191 {
00192   unsigned int i;
00193   double e;
00194   char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
00195     *buffer3, *buffer4;
00196   FILE *file_result;
00197
00198 #if DEBUG_OPTIMIZE
00199   fprintf (stderr, "optimize_parse: start\n");
00200   fprintf (stderr, "optimize_parse: simulation=%u experiment=%u\n", simulation,
00201            experiment);
00202 #endif
00203
00204   // Opening input files
00205   for (i = 0; i < optimize->ninputs; ++i)
00206     {
00207       snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
00208 #if DEBUG_OPTIMIZE
00209       fprintf (stderr, "optimize_parse: i=%u input=%s\n", i, &input[i][0]);
00210 #endif
00211       optimize_input (simulation, &input[i][0], optimize->file[i][experiment]);
00212     }
00213   for (; i < MAX_NINPUTS; ++i)
00214     strcpy (&input[i][0], "");
00215 #if DEBUG_OPTIMIZE
00216   fprintf (stderr, "optimize_parse: parsing end\n");
00217 #endif
00218
00219   // Performing the simulation
00220   snprintf (output, 32, "output-%u-%u", simulation, experiment);
00221   buffer2 = g_path_get_dirname (optimize->simulator);
```

```
00222   buffer3 = g_path_get_basename (optimize->simulator);
00223   buffer4 = g_build_filename (buffer2, buffer3, NULL);
00224   snprintf (buffer, 512, "\"%s\" %s %s %s %s %s %s %s %s %s",
00225             buffer4, input[0], input[1], input[2], input[3], input[4], input[5],
00226             input[6], input[7], output);
00227   g_free (buffer4);
00228   g_free (buffer3);
00229   g_free (buffer2);
00230 #if DEBUG_OPTIMIZE
00231   fprintf (stderr, "optimize_parse: %s\n", buffer);
00232 #endif
00233   system (buffer);
00234
00235   // Checking the objective value function
00236   if (optimize->evaluator)
00237     {
00238       snprintf (result, 32, "result-%u-%u", simulation, experiment);
00239       buffer2 = g_path_get_dirname (optimize->evaluator);
00240       buffer3 = g_path_get_basename (optimize->evaluator);
00241       buffer4 = g_build_filename (buffer2, buffer3, NULL);
00242       snprintf (buffer, 512, "\"%s\" %s %s %s",
00243                 buffer4, output, optimize->experiment[experiment], result);
00244       g_free (buffer4);
00245       g_free (buffer3);
00246       g_free (buffer2);
00247 #if DEBUG_OPTIMIZE
00248       fprintf (stderr, "optimize_parse: %s\n", buffer);
00249 #endif
00250       system (buffer);
00251       file_result = g_fopen (result, "r");
00252       e = atof (fgets (buffer, 512, file_result));
00253       fclose (file_result);
00254     }
00255   else
00256     {
00257       strcpy (result, "");
00258       file_result = g_fopen (output, "r");
00259       e = atof (fgets (buffer, 512, file_result));
00260       fclose (file_result);
00261     }
00262
00263   // Removing files
00264 #if !DEBUG_OPTIMIZE
00265   for (i = 0; i < optimize->ninputs; ++i)
00266     {
00267       if (optimize->file[i][0])
00268         {
00269           snprintf (buffer, 512, RM " %s", &input[i][0]);
00270           system (buffer);
00271         }
00272     }
00273   snprintf (buffer, 512, RM " %s %s", output, result);
00274   system (buffer);
00275 #endif
00276
00277   // Processing pending events
00278   show_pending ();
00279
00280 #if DEBUG_OPTIMIZE
00281   fprintf (stderr, "optimize_parse: end\n");
00282 #endif
00283
00284   // Returning the objective function
00285   return e * optimize->weight[experiment];
00286 }
00287
00295 double
00296 optimize_norm_euclidian (unsigned int simulation)
00297 {
00298   double e, ei;
00299   unsigned int i;
00300 #if DEBUG_OPTIMIZE
00301   fprintf (stderr, "optimize_norm_euclidian: start\n");
00302 #endif
00303   e = 0.;
00304   for (i = 0; i < optimize->nexperiments; ++i)
00305     {
00306       ei = optimize_parse (simulation, i);
00307       e += ei * ei;
00308     }
00309   e = sqrt (e);
00310 #if DEBUG_OPTIMIZE
00311   fprintf (stderr, "optimize_norm_euclidian: error=%lg\n", e);
00312   fprintf (stderr, "optimize_norm_euclidian: end\n");
00313 #endif
00314   return e;
00315 }
```

```
00316
00324 double
00325 optimize_norm_maximum (unsigned int simulation)
00326 {
00327   double e, ei;
00328   unsigned int i;
00329 #if DEBUG_OPTIMIZE
00330   fprintf (stderr, "optimize_norm_maximum: start\n");
00331 #endif
00332   e = 0.;
00333   for (i = 0; i < optimize->nexperiments; ++i)
00334     {
00335       ei = fabs (optimize_parse (simulation, i));
00336       e = fmax (e, ei);
00337     }
00338 #if DEBUG_OPTIMIZE
00339   fprintf (stderr, "optimize_norm_maximum: error=%lg\n", e);
00340   fprintf (stderr, "optimize_norm_maximum: end\n");
00341 #endif
00342   return e;
00343 }
00344
00352 double
00353 optimize_norm_p (unsigned int simulation)
00354 {
00355   double e, ei;
00356   unsigned int i;
00357 #if DEBUG_OPTIMIZE
00358   fprintf (stderr, "optimize_norm_p: start\n");
00359 #endif
00360   e = 0.;
00361   for (i = 0; i < optimize->nexperiments; ++i)
00362     {
00363       ei = fabs (optimize_parse (simulation, i));
00364       e += pow (ei, optimize->p);
00365     }
00366   e = pow (e, 1. / optimize->p);
00367 #if DEBUG_OPTIMIZE
00368   fprintf (stderr, "optimize_norm_p: error=%lg\n", e);
00369   fprintf (stderr, "optimize_norm_p: end\n");
00370 #endif
00371   return e;
00372 }
00373
00381 double
00382 optimize_norm_taxicab (unsigned int simulation)
00383 {
00384   double e;
00385   unsigned int i;
00386 #if DEBUG_OPTIMIZE
00387   fprintf (stderr, "optimize_norm_taxicab: start\n");
00388 #endif
00389   e = 0.;
00390   for (i = 0; i < optimize->nexperiments; ++i)
00391     e += fabs (optimize_parse (simulation, i));
00392 #if DEBUG_OPTIMIZE
00393   fprintf (stderr, "optimize_norm_taxicab: error=%lg\n", e);
00394   fprintf (stderr, "optimize_norm_taxicab: end\n");
00395 #endif
00396   return e;
00397 }
00398
00403 void
00404 optimize_print ()
00405 {
00406   unsigned int i;
00407   char buffer[512];
00408 #if HAVE_MPI
00409   if (optimize->mpi_rank)
00410     return;
00411 #endif
00412   printf ("%s\n", gettext ("Best result"));
00413   fprintf (optimize->file_result, "%s\n", gettext ("Best result"));
00414   printf ("error = %.15le\n", optimize->error_old[0]);
00415   fprintf (optimize->file_result, "error = %.15le\n", optimize->
      error_old[0]);
00416   for (i = 0; i < optimize->nvariables; ++i)
00417     {
00418       snprintf (buffer, 512, "%s = %s\n",
00419                 optimize->label[i], format[optimize->precision[i]]);
00420       printf (buffer, optimize->value_old[i]);
00421       fprintf (optimize->file_result, buffer, optimize->value_old[i]);
00422     }
00423   fflush (optimize->file_result);
00424 }
00425
00434 void
```

```
00435 optimize_save_variables (unsigned int simulation, double error)
00436 {
00437   unsigned int i;
00438   char buffer[64];
00439 #if DEBUG_OPTIMIZE
00440   fprintf (stderr, "optimize_save_variables: start\n");
00441 #endif
00442   for (i = 0; i < optimize->nvariables; ++i)
00443     {
00444       snprintf (buffer, 64, "%s ", format[optimize->precision[i]]);
00445       fprintf (optimize->file_variables, buffer,
00446                optimize->value[simulation * optimize->nvariables + i]);
00447     }
00448   fprintf (optimize->file_variables, "%.14le\n", error);
00449 #if DEBUG_OPTIMIZE
00450   fprintf (stderr, "optimize_save_variables: end\n");
00451 #endif
00452 }
00453
00462 void
00463 optimize_best (unsigned int simulation, double value)
00464 {
00465   unsigned int i, j;
00466   double e;
00467 #if DEBUG_OPTIMIZE
00468   fprintf (stderr, "optimize_best: start\n");
00469   fprintf (stderr, "optimize_best: nsaveds=%u nbest=%u\n",
00470            optimize->nsaveds, optimize->nbest);
00471 #endif
00472   if (optimize->nsaveds < optimize->nbest
00473       || value < optimize->error_best[optimize->nsaveds - 1])
00474     {
00475       if (optimize->nsaveds < optimize->nbest)
00476         ++optimize->nsaveds;
00477       optimize->error_best[optimize->nsaveds - 1] = value;
00478       optimize->simulation_best[optimize->nsaveds - 1] = simulation;
00479       for (i = optimize->nsaveds; --i;)
00480         {
00481           if (optimize->error_best[i] < optimize->error_best[i - 1])
00482             {
00483               j = optimize->simulation_best[i];
00484               e = optimize->error_best[i];
00485               optimize->simulation_best[i] = optimize->
      simulation_best[i - 1];
00486               optimize->error_best[i] = optimize->error_best[i - 1];
00487               optimize->simulation_best[i - 1] = j;
00488               optimize->error_best[i - 1] = e;
00489             }
00490           else
00491             break;
00492         }
00493     }
00494 #if DEBUG_OPTIMIZE
00495   fprintf (stderr, "optimize_best: end\n");
00496 #endif
00497 }
00498
00503 void
00504 optimize_sequential ()
00505 {
00506   unsigned int i;
00507   double e;
00508 #if DEBUG_OPTIMIZE
00509   fprintf (stderr, "optimize_sequential: start\n");
00510   fprintf (stderr, "optimize_sequential: nstart=%u nend=%u\n",
00511            optimize->nstart, optimize->nend);
00512 #endif
00513   for (i = optimize->nstart; i < optimize->nend; ++i)
00514     {
00515       e = optimize_norm (i);
00516       optimize_best (i, e);
00517       optimize_save_variables (i, e);
00518       if (e < optimize->threshold)
00519         {
00520           optimize->stop = 1;
00521           break;
00522         }
00523 #if DEBUG_OPTIMIZE
00524       fprintf (stderr, "optimize_sequential: i=%u e=%lg\n", i, e);
00525 #endif
00526     }
00527 #if DEBUG_OPTIMIZE
00528   fprintf (stderr, "optimize_sequential: end\n");
00529 #endif
00530 }
00531
00539 void *
```

```
00540 optimize_thread (ParallelData * data)
00541 {
00542   unsigned int i, thread;
00543   double e;
00544 #if DEBUG_OPTIMIZE
00545   fprintf (stderr, "optimize_thread: start\n");
00546 #endif
00547   thread = data->thread;
00548 #if DEBUG_OPTIMIZE
00549   fprintf (stderr, "optimize_thread: thread=%u start=%u end=%u\n", thread,
00550            optimize->thread[thread], optimize->thread[thread + 1]);
00551 #endif
00552   for (i = optimize->thread[thread]; i < optimize->thread[thread + 1]; ++i)
00553     {
00554       e = optimize_norm (i);
00555       g_mutex_lock (mutex);
00556       optimize_best (i, e);
00557       optimize_save_variables (i, e);
00558       if (e < optimize->threshold)
00559         optimize->stop = 1;
00560       g_mutex_unlock (mutex);
00561       if (optimize->stop)
00562         break;
00563 #if DEBUG_OPTIMIZE
00564       fprintf (stderr, "optimize_thread: i=%u e=%lg\n", i, e);
00565 #endif
00566     }
00567 #if DEBUG_OPTIMIZE
00568   fprintf (stderr, "optimize_thread: end\n");
00569 #endif
00570   g_thread_exit (NULL);
00571   return NULL;
00572 }
00573
00585 void
00586 optimize_merge (unsigned int nsaveds, unsigned int *simulation_best,
00587                 double *error_best)
00588 {
00589   unsigned int i, j, k, s[optimize->nbest];
00590   double e[optimize->nbest];
00591 #if DEBUG_OPTIMIZE
00592   fprintf (stderr, "optimize_merge: start\n");
00593 #endif
00594   i = j = k = 0;
00595   do
00596     {
00597       if (i == optimize->nsaveds)
00598         {
00599           s[k] = simulation_best[j];
00600           e[k] = error_best[j];
00601           ++j;
00602           ++k;
00603           if (j == nsaveds)
00604             break;
00605         }
00606       else if (j == nsaveds)
00607         {
00608           s[k] = optimize->simulation_best[i];
00609           e[k] = optimize->error_best[i];
00610           ++i;
00611           ++k;
00612           if (i == optimize->nsaveds)
00613             break;
00614         }
00615       else if (optimize->error_best[i] > error_best[j])
00616         {
00617           s[k] = simulation_best[j];
00618           e[k] = error_best[j];
00619           ++j;
00620           ++k;
00621         }
00622       else
00623         {
00624           s[k] = optimize->simulation_best[i];
00625           e[k] = optimize->error_best[i];
00626           ++i;
00627           ++k;
00628         }
00629     }
00630   while (k < optimize->nbest);
00631   optimize->nsaveds = k;
00632   memcpy (optimize->simulation_best, s, k * sizeof (unsigned int));
00633   memcpy (optimize->error_best, e, k * sizeof (double));
00634 #if DEBUG_OPTIMIZE
00635   fprintf (stderr, "optimize_merge: end\n");
00636 #endif
00637 }
```

```
00638
00643 #if HAVE_MPI
00644 void
00645 optimize_synchronise ()
00646 {
00647   unsigned int i, nsaveds, simulation_best[optimize->nbest], stop;
00648   double error_best[optimize->nbest];
00649   MPI_Status mpi_stat;
00650 #if DEBUG_OPTIMIZE
00651   fprintf (stderr, "optimize_synchronise: start\n");
00652 #endif
00653   if (optimize->mpi_rank == 0)
00654     {
00655       for (i = 1; i < ntasks; ++i)
00656         {
00657           MPI_Recv (&nsaveds, 1, MPI_INT, i, 1, MPI_COMM_WORLD, &mpi_stat);
00658           MPI_Recv (simulation_best, nsaveds, MPI_INT, i, 1,
00659                     MPI_COMM_WORLD, &mpi_stat);
00660           MPI_Recv (error_best, nsaveds, MPI_DOUBLE, i, 1,
00661                     MPI_COMM_WORLD, &mpi_stat);
00662           optimize_merge (nsaveds, simulation_best, error_best);
00663           MPI_Recv (&stop, 1, MPI_UNSIGNED, i, 1, MPI_COMM_WORLD, &mpi_stat);
00664           if (stop)
00665             optimize->stop = 1;
00666         }
00667       for (i = 1; i < ntasks; ++i)
00668         MPI_Send (&optimize->stop, 1, MPI_UNSIGNED, i, 1, MPI_COMM_WORLD);
00669     }
00670   else
00671     {
00672       MPI_Send (&optimize->nsaveds, 1, MPI_INT, 0, 1, MPI_COMM_WORLD);
00673       MPI_Send (optimize->simulation_best, optimize->nsaveds, MPI_INT, 0, 1,
00674                 MPI_COMM_WORLD);
00675       MPI_Send (optimize->error_best, optimize->nsaveds, MPI_DOUBLE, 0, 1,
00676                 MPI_COMM_WORLD);
00677       MPI_Send (&optimize->stop, 1, MPI_UNSIGNED, 0, 1, MPI_COMM_WORLD);
00678       MPI_Recv (&stop, 1, MPI_UNSIGNED, 0, 1, MPI_COMM_WORLD, &mpi_stat);
00679       if (stop)
00680         optimize->stop = 1;
00681     }
00682 #if DEBUG_OPTIMIZE
00683   fprintf (stderr, "optimize_synchronise: end\n");
00684 #endif
00685 }
00686 #endif
00687
00692 void
00693 optimize_sweep ()
00694 {
00695   unsigned int i, j, k, l;
00696   double e;
00697   GThread *thread[nthreads];
00698   ParallelData data[nthreads];
00699 #if DEBUG_OPTIMIZE
00700   fprintf (stderr, "optimize_sweep: start\n");
00701 #endif
00702   for (i = 0; i < optimize->nsimulations; ++i)
00703     {
00704       k = i;
00705       for (j = 0; j < optimize->nvariables; ++j)
00706         {
00707           l = k % optimize->nsweeps[j];
00708           k /= optimize->nsweeps[j];
00709           e = optimize->rangemin[j];
00710           if (optimize->nsweeps[j] > 1)
00711             e += l * (optimize->rangemax[j] - optimize->rangemin[j])
00712               / (optimize->nsweeps[j] - 1);
00713           optimize->value[i * optimize->nvariables + j] = e;
00714         }
00715     }
00716   optimize->nsaveds = 0;
00717   if (nthreads <= 1)
00718     optimize_sequential ();
00719   else
00720     {
00721       for (i = 0; i < nthreads; ++i)
00722         {
00723           data[i].thread = i;
00724           thread[i] = g_thread_new (NULL, (void (*)) optimize_thread, &data[i]);
00725         }
00726       for (i = 0; i < nthreads; ++i)
00727         g_thread_join (thread[i]);
00728     }
00729 #if HAVE_MPI
00730   // Communicating tasks results
00731   optimize_synchronise ();
00732 #endif
```

```
00733 #if DEBUG_OPTIMIZE
00734   fprintf (stderr, "optimize_sweep: end\n");
00735 #endif
00736 }
00737
00742 void
00743 optimize_MonteCarlo ()
00744 {
00745   unsigned int i, j;
00746   GThread *thread[nthreads];
00747   ParallelData data[nthreads];
00748 #if DEBUG_OPTIMIZE
00749   fprintf (stderr, "optimize_MonteCarlo: start\n");
00750 #endif
00751   for (i = 0; i < optimize->nsimulations; ++i)
00752     for (j = 0; j < optimize->nvariables; ++j)
00753       optimize->value[i * optimize->nvariables + j]
00754         = optimize->rangemin[j] + gsl_rng_uniform (optimize->rng)
00755         * (optimize->rangemax[j] - optimize->rangemin[j]);
00756   optimize->nsaveds = 0;
00757   if (nthreads <= 1)
00758     optimize_sequential ();
00759   else
00760     {
00761       for (i = 0; i < nthreads; ++i)
00762         {
00763           data[i].thread = i;
00764           thread[i] = g_thread_new (NULL, (void (*)) optimize_thread, &data[i]);
00765         }
00766       for (i = 0; i < nthreads; ++i)
00767         g_thread_join (thread[i]);
00768     }
00769 #if HAVE_MPI
00770   // Communicating tasks results
00771   optimize_synchronise ();
00772 #endif
00773 #if DEBUG_OPTIMIZE
00774   fprintf (stderr, "optimize_MonteCarlo: end\n");
00775 #endif
00776 }
00777
00787 void
00788 optimize_best_direction (unsigned int simulation, double value)
00789 {
00790 #if DEBUG_OPTIMIZE
00791   fprintf (stderr, "optimize_best_direction: start\n");
00792   fprintf (stderr,
00793            "optimize_best_direction: simulation=%u value=%.14le best=%.14le\n",
00794            simulation, value, optimize->error_best[0]);
00795 #endif
00796   if (value < optimize->error_best[0])
00797     {
00798       optimize->error_best[0] = value;
00799       optimize->simulation_best[0] = simulation;
00800 #if DEBUG_OPTIMIZE
00801       fprintf (stderr,
00802                "optimize_best_direction: BEST simulation=%u value=%.14le\n",
00803                simulation, value);
00804 #endif
00805     }
00806 #if DEBUG_OPTIMIZE
00807   fprintf (stderr, "optimize_best_direction: end\n");
00808 #endif
00809 }
00810
00817 void
00818 optimize_direction_sequential (unsigned int simulation)
00819 {
00820   unsigned int i, j;
00821   double e;
00822 #if DEBUG_OPTIMIZE
00823   fprintf (stderr, "optimize_direction_sequential: start\n");
00824   fprintf (stderr, "optimize_direction_sequential: nstart_direction=%u "
00825            "nend_direction=%u\n",
00826            optimize->nstart_direction, optimize->nend_direction);
00827 #endif
00828   for (i = optimize->nstart_direction; i < optimize->nend_direction; ++i)
00829     {
00830       j = simulation + i;
00831       e = optimize_norm (j);
00832       optimize_best_direction (j, e);
00833       optimize_save_variables (j, e);
00834       if (e < optimize->threshold)
00835         {
00836           optimize->stop = 1;
00837           break;
00838         }
```

```
00839 #if DEBUG_OPTIMIZE
00840       fprintf (stderr, "optimize_direction_sequential: i=%u e=%lg\n", i, e);
00841 #endif
00842     }
00843 #if DEBUG_OPTIMIZE
00844   fprintf (stderr, "optimize_direction_sequential: end\n");
00845 #endif
00846 }
00847
00855 void *
00856 optimize_direction_thread (ParallelData * data)
00857 {
00858   unsigned int i, thread;
00859   double e;
00860 #if DEBUG_OPTIMIZE
00861   fprintf (stderr, "optimize_direction_thread: start\n");
00862 #endif
00863   thread = data->thread;
00864 #if DEBUG_OPTIMIZE
00865   fprintf (stderr, "optimize_direction_thread: thread=%u start=%u end=%u\n",
00866            thread,
00867            optimize->thread_direction[thread],
00868            optimize->thread_direction[thread + 1]);
00869 #endif
00870   for (i = optimize->thread_direction[thread];
00871        i < optimize->thread_direction[thread + 1]; ++i)
00872     {
00873       e = optimize_norm (i);
00874       g_mutex_lock (mutex);
00875       optimize_best_direction (i, e);
00876       optimize_save_variables (i, e);
00877       if (e < optimize->threshold)
00878         optimize->stop = 1;
00879       g_mutex_unlock (mutex);
00880       if (optimize->stop)
00881         break;
00882 #if DEBUG_OPTIMIZE
00883       fprintf (stderr, "optimize_direction_thread: i=%u e=%lg\n", i, e);
00884 #endif
00885     }
00886 #if DEBUG_OPTIMIZE
00887   fprintf (stderr, "optimize_direction_thread: end\n");
00888 #endif
00889   g_thread_exit (NULL);
00890   return NULL;
00891 }
00892
00902 double
00903 optimize_estimate_direction_random (unsigned int variable,
00904                                     unsigned int estimate)
00905 {
00906   double x;
00907 #if DEBUG_OPTIMIZE
00908   fprintf (stderr, "optimize_estimate_direction_random: start\n");
00909 #endif
00910   x = optimize->direction[variable]
00911     + (1. - 2. * gsl_rng_uniform (optimize->rng)) * optimize->step[variable];
00912 #if DEBUG_OPTIMIZE
00913   fprintf (stderr, "optimize_estimate_direction_random: direction%u=%lg\n",
00914            variable, x);
00915   fprintf (stderr, "optimize_estimate_direction_random: end\n");
00916 #endif
00917   return x;
00918 }
00919
00929 double
00930 optimize_estimate_direction_coordinates (unsigned int variable,
00931                                          unsigned int estimate)
00932 {
00933   double x;
00934 #if DEBUG_OPTIMIZE
00935   fprintf (stderr, "optimize_estimate_direction_coordinates: start\n");
00936 #endif
00937   x = optimize->direction[variable];
00938   if (estimate >= (2 * variable) && estimate < (2 * variable + 2))
00939     {
00940       if (estimate & 1)
00941         x += optimize->step[variable];
00942       else
00943         x -= optimize->step[variable];
00944     }
00945 #if DEBUG_OPTIMIZE
00946   fprintf (stderr,
00947            "optimize_estimate_direction_coordinates: direction%u=%lg\n",
00948            variable, x);
00949   fprintf (stderr, "optimize_estimate_direction_coordinates: end\n");
00950 #endif
```

```
00951   return x;
00952 }
00953
00960 void
00961 optimize_step_direction (unsigned int simulation)
00962 {
00963   GThread *thread[nthreads_direction];
00964   ParallelData data[nthreads_direction];
00965   unsigned int i, j, k, b;
00966 #if DEBUG_OPTIMIZE
00967   fprintf (stderr, "optimize_step_direction: start\n");
00968 #endif
00969   for (i = 0; i < optimize->nestimates; ++i)
00970     {
00971       k = (simulation + i) * optimize->nvariables;
00972       b = optimize->simulation_best[0] * optimize->nvariables;
00973 #if DEBUG_OPTIMIZE
00974       fprintf (stderr, "optimize_step_direction: simulation=%u best=%u\n",
00975                simulation + i, optimize->simulation_best[0]);
00976 #endif
00977       for (j = 0; j < optimize->nvariables; ++j, ++k, ++b)
00978         {
00979 #if DEBUG_OPTIMIZE
00980           fprintf (stderr,
00981                    "optimize_step_direction: estimate=%u best%u=%.14le\n",
00982                    i, j, optimize->value[b]);
00983 #endif
00984           optimize->value[k]
00985             = optimize->value[b] + optimize_estimate_direction (j, i);
00986           optimize->value[k] = fmin (fmax (optimize->value[k],
00987                                            optimize->rangeminabs[j]),
00988                                      optimize->rangemaxabs[j]);
00989 #if DEBUG_OPTIMIZE
00990           fprintf (stderr,
00991                    "optimize_step_direction: estimate=%u variable%u=%.14le\n",
00992                    i, j, optimize->value[k]);
00993 #endif
00994         }
00995     }
00996   if (nthreads_direction == 1)
00997     optimize_direction_sequential (simulation);
00998   else
00999     {
01000       for (i = 0; i <= nthreads_direction; ++i)
01001         {
01002           optimize->thread_direction[i]
01003             = simulation + optimize->nstart_direction
01004             + i * (optimize->nend_direction - optimize->
      nstart_direction)
01005             / nthreads_direction;
01006 #if DEBUG_OPTIMIZE
01007           fprintf (stderr,
01008                    "optimize_step_direction: i=%u thread_direction=%u\n",
01009                    i, optimize->thread_direction[i]);
01010 #endif
01011         }
01012       for (i = 0; i < nthreads_direction; ++i)
01013         {
01014           data[i].thread = i;
01015           thread[i] = g_thread_new
01016             (NULL, (void (*)) optimize_direction_thread, &data[i]);
01017         }
01018       for (i = 0; i < nthreads_direction; ++i)
01019         g_thread_join (thread[i]);
01020     }
01021 #if DEBUG_OPTIMIZE
01022   fprintf (stderr, "optimize_step_direction: end\n");
01023 #endif
01024 }
01025
01030 void
01031 optimize_direction ()
01032 {
01033   unsigned int i, j, k, b, s, adjust;
01034 #if DEBUG_OPTIMIZE
01035   fprintf (stderr, "optimize_direction: start\n");
01036 #endif
01037   for (i = 0; i < optimize->nvariables; ++i)
01038     optimize->direction[i] = 0.;
01039   b = optimize->simulation_best[0] * optimize->nvariables;
01040   s = optimize->nsimulations;
01041   adjust = 1;
01042   for (i = 0; i < optimize->nsteps; ++i, s += optimize->nestimates, b = k)
01043     {
01044 #if DEBUG_OPTIMIZE
01045       fprintf (stderr, "optimize_direction: step=%u old_best=%u\n",
01046                i, optimize->simulation_best[0]);
```

```
01047 #endif
01048       optimize_step_direction (s);
01049       k = optimize->simulation_best[0] * optimize->nvariables;
01050 #if DEBUG_OPTIMIZE
01051       fprintf (stderr, "optimize_direction: step=%u best=%u\n",
01052                i, optimize->simulation_best[0]);
01053 #endif
01054       if (k == b)
01055         {
01056           if (adjust)
01057             for (j = 0; j < optimize->nvariables; ++j)
01058               optimize->step[j] *= 0.5;
01059           for (j = 0; j < optimize->nvariables; ++j)
01060             optimize->direction[j] = 0.;
01061           adjust = 1;
01062         }
01063       else
01064         {
01065           for (j = 0; j < optimize->nvariables; ++j)
01066             {
01067 #if DEBUG_OPTIMIZE
01068               fprintf (stderr,
01069                        "optimize_direction: best%u=%.14le old%u=%.14le\n",
01070                        j, optimize->value[k + j], j, optimize->value[b + j]);
01071 #endif
01072               optimize->direction[j]
01073                 = (1. - optimize->relaxation) * optimize->direction[j]
01074                 + optimize->relaxation
01075                 * (optimize->value[k + j] - optimize->value[b + j]);
01076 #if DEBUG_OPTIMIZE
01077               fprintf (stderr, "optimize_direction: direction%u=%.14le\n",
01078                        j, optimize->direction[j]);
01079 #endif
01080             }
01081           adjust = 0;
01082         }
01083     }
01084 #if DEBUG_OPTIMIZE
01085   fprintf (stderr, "optimize_direction: end\n");
01086 #endif
01087 }
01088
01096 double
01097 optimize_genetic_objective (Entity * entity)
01098 {
01099   unsigned int j;
01100   double objective;
01101   char buffer[64];
01102 #if DEBUG_OPTIMIZE
01103   fprintf (stderr, "optimize_genetic_objective: start\n");
01104 #endif
01105   for (j = 0; j < optimize->nvariables; ++j)
01106     {
01107       optimize->value[entity->id * optimize->nvariables + j]
01108         = genetic_get_variable (entity, optimize->genetic_variable + j);
01109     }
01110   objective = optimize_norm (entity->id);
01111   g_mutex_lock (mutex);
01112   for (j = 0; j < optimize->nvariables; ++j)
01113     {
01114       snprintf (buffer, 64, "%s ", format[optimize->precision[j]]);
01115       fprintf (optimize->file_variables, buffer,
01116                genetic_get_variable (entity, optimize->genetic_variable + j));
01117     }
01118   fprintf (optimize->file_variables, "%.14le\n", objective);
01119   g_mutex_unlock (mutex);
01120 #if DEBUG_OPTIMIZE
01121   fprintf (stderr, "optimize_genetic_objective: end\n");
01122 #endif
01123   return objective;
01124 }
01125
01130 void
01131 optimize_genetic ()
01132 {
01133   char *best_genome;
01134   double best_objective, *best_variable;
01135 #if DEBUG_OPTIMIZE
01136   fprintf (stderr, "optimize_genetic: start\n");
01137   fprintf (stderr, "optimize_genetic: ntasks=%u nthreads=%u\n", ntasks,
01138            nthreads);
01139   fprintf (stderr,
01140            "optimize_genetic: nvariables=%u population=%u generations=%u\n",
01141            optimize->nvariables, optimize->nsimulations, optimize->
      niterations);
01142   fprintf (stderr,
01143            "optimize_genetic: mutation=%lg reproduction=%lg adaptation=%lg\n",
```

```
01144           optimize->mutation_ratio, optimize->reproduction_ratio,
01145           optimize->adaptation_ratio);
01146 #endif
01147   genetic_algorithm_default (optimize->nvariables,
01148                              optimize->genetic_variable,
01149                              optimize->nsimulations,
01150                              optimize->niterations,
01151                              optimize->mutation_ratio,
01152                              optimize->reproduction_ratio,
01153                              optimize->adaptation_ratio,
01154                              optimize->seed,
01155                              optimize->threshold,
01156                              &optimize_genetic_objective,
01157                              &best_genome, &best_variable, &best_objective);
01158 #if DEBUG_OPTIMIZE
01159   fprintf (stderr, "optimize_genetic: the best\n");
01160 #endif
01161   optimize->error_old = (double *) g_malloc (sizeof (double));
01162   optimize->value_old
01163     = (double *) g_malloc (optimize->nvariables * sizeof (double));
01164   optimize->error_old[0] = best_objective;
01165   memcpy (optimize->value_old, best_variable,
01166           optimize->nvariables * sizeof (double));
01167   g_free (best_genome);
01168   g_free (best_variable);
01169   optimize_print ();
01170 #if DEBUG_OPTIMIZE
01171   fprintf (stderr, "optimize_genetic: end\n");
01172 #endif
01173 }
01174
01179 void
01180 optimize_save_old ()
01181 {
01182   unsigned int i, j;
01183 #if DEBUG_OPTIMIZE
01184   fprintf (stderr, "optimize_save_old: start\n");
01185   fprintf (stderr, "optimize_save_old: nsaveds=%u\n", optimize->nsaveds);
01186 #endif
01187   memcpy (optimize->error_old, optimize->error_best,
01188           optimize->nbest * sizeof (double));
01189   for (i = 0; i < optimize->nbest; ++i)
01190     {
01191       j = optimize->simulation_best[i];
01192 #if DEBUG_OPTIMIZE
01193       fprintf (stderr, "optimize_save_old: i=%u j=%u\n", i, j);
01194 #endif
01195       memcpy (optimize->value_old + i * optimize->nvariables,
01196               optimize->value + j * optimize->nvariables,
01197               optimize->nvariables * sizeof (double));
01198     }
01199 #if DEBUG_OPTIMIZE
01200   for (i = 0; i < optimize->nvariables; ++i)
01201     fprintf (stderr, "optimize_save_old: best variable %u=%lg\n",
01202              i, optimize->value_old[i]);
01203   fprintf (stderr, "optimize_save_old: end\n");
01204 #endif
01205 }
01206
01212 void
01213 optimize_merge_old ()
01214 {
01215   unsigned int i, j, k;
01216   double v[optimize->nbest * optimize->nvariables], e[optimize->
      nbest],
01217     *enew, *eold;
01218 #if DEBUG_OPTIMIZE
01219   fprintf (stderr, "optimize_merge_old: start\n");
01220 #endif
01221   enew = optimize->error_best;
01222   eold = optimize->error_old;
01223   i = j = k = 0;
01224   do
01225     {
01226       if (*enew < *eold)
01227         {
01228           memcpy (v + k * optimize->nvariables,
01229                   optimize->value
01230                   + optimize->simulation_best[i] * optimize->
      nvariables,
01231                   optimize->nvariables * sizeof (double));
01232           e[k] = *enew;
01233           ++k;
01234           ++enew;
01235           ++i;
01236         }
01237       else
```

```
01238         {
01239           memcpy (v + k * optimize->nvariables,
01240                   optimize->value_old + j * optimize->nvariables,
01241                   optimize->nvariables * sizeof (double));
01242           e[k] = *eold;
01243           ++k;
01244           ++eold;
01245           ++j;
01246         }
01247     }
01248   while (k < optimize->nbest);
01249   memcpy (optimize->value_old, v, k * optimize->nvariables * sizeof (double));
01250   memcpy (optimize->error_old, e, k * sizeof (double));
01251 #if DEBUG_OPTIMIZE
01252   fprintf (stderr, "optimize_merge_old: end\n");
01253 #endif
01254 }
01255
01261 void
01262 optimize_refine ()
01263 {
01264   unsigned int i, j;
01265   double d;
01266 #if HAVE_MPI
01267   MPI_Status mpi_stat;
01268 #endif
01269 #if DEBUG_OPTIMIZE
01270   fprintf (stderr, "optimize_refine: start\n");
01271 #endif
01272 #if HAVE_MPI
01273   if (!optimize->mpi_rank)
01274     {
01275 #endif
01276       for (j = 0; j < optimize->nvariables; ++j)
01277         {
01278           optimize->rangemin[j] = optimize->rangemax[j]
01279             = optimize->value_old[j];
01280         }
01281       for (i = 0; ++i < optimize->nbest;)
01282         {
01283           for (j = 0; j < optimize->nvariables; ++j)
01284             {
01285               optimize->rangemin[j]
01286                 = fmin (optimize->rangemin[j],
01287                         optimize->value_old[i * optimize->nvariables + j]);
01288               optimize->rangemax[j]
01289                 = fmax (optimize->rangemax[j],
01290                         optimize->value_old[i * optimize->nvariables + j]);
01291             }
01292         }
01293       for (j = 0; j < optimize->nvariables; ++j)
01294         {
01295           d = optimize->tolerance
01296             * (optimize->rangemax[j] - optimize->rangemin[j]);
01297           switch (optimize->algorithm)
01298             {
01299             case ALGORITHM_MONTE_CARLO:
01300               d *= 0.5;
01301               break;
01302             default:
01303               if (optimize->nsweeps[j] > 1)
01304                 d /= optimize->nsweeps[j] - 1;
01305               else
01306                 d = 0.;
01307             }
01308           optimize->rangemin[j] -= d;
01309           optimize->rangemin[j]
01310             = fmax (optimize->rangemin[j], optimize->rangeminabs[j]);
01311           optimize->rangemax[j] += d;
01312           optimize->rangemax[j]
01313             = fmin (optimize->rangemax[j], optimize->rangemaxabs[j]);
01314           printf ("%s min=%lg max=%lg\n", optimize->label[j],
01315                   optimize->rangemin[j], optimize->rangemax[j]);
01316           fprintf (optimize->file_result, "%s min=%lg max=%lg\n",
01317                    optimize->label[j], optimize->rangemin[j],
01318                    optimize->rangemax[j]);
01319         }
01320 #if HAVE_MPI
01321       for (i = 1; i < ntasks; ++i)
01322         {
01323           MPI_Send (optimize->rangemin, optimize->nvariables, MPI_DOUBLE, i,
01324                     1, MPI_COMM_WORLD);
01325           MPI_Send (optimize->rangemax, optimize->nvariables, MPI_DOUBLE, i,
01326                     1, MPI_COMM_WORLD);
01327         }
01328     }
01329   else
```

```
01330     {
01331       MPI_Recv (optimize->rangemin, optimize->nvariables, MPI_DOUBLE, 0, 1,
01332                 MPI_COMM_WORLD, &mpi_stat);
01333       MPI_Recv (optimize->rangemax, optimize->nvariables, MPI_DOUBLE, 0, 1,
01334                 MPI_COMM_WORLD, &mpi_stat);
01335     }
01336 #endif
01337 #if DEBUG_OPTIMIZE
01338   fprintf (stderr, "optimize_refine: end\n");
01339 #endif
01340 }
01341
01346 void
01347 optimize_step ()
01348 {
01349 #if DEBUG_OPTIMIZE
01350   fprintf (stderr, "optimize_step: start\n");
01351 #endif
01352   optimize_algorithm ();
01353   if (optimize->nsteps)
01354     optimize_direction ();
01355 #if DEBUG_OPTIMIZE
01356   fprintf (stderr, "optimize_step: end\n");
01357 #endif
01358 }
01359
01364 void
01365 optimize_iterate ()
01366 {
01367   unsigned int i;
01368 #if DEBUG_OPTIMIZE
01369   fprintf (stderr, "optimize_iterate: start\n");
01370 #endif
01371   optimize->error_old = (double *) g_malloc (optimize->nbest * sizeof (double));
01372   optimize->value_old = (double *)
01373     g_malloc (optimize->nbest * optimize->nvariables * sizeof (double));
01374   optimize_step ();
01375   optimize_save_old ();
01376   optimize_refine ();
01377   optimize_print ();
01378   for (i = 1; i < optimize->niterations && !optimize->stop; ++i)
01379     {
01380       optimize_step ();
01381       optimize_merge_old ();
01382       optimize_refine ();
01383       optimize_print ();
01384     }
01385 #if DEBUG_OPTIMIZE
01386   fprintf (stderr, "optimize_iterate: end\n");
01387 #endif
01388 }
01389
01394 void
01395 optimize_free ()
01396 {
01397   unsigned int i, j;
01398 #if DEBUG_OPTIMIZE
01399   fprintf (stderr, "optimize_free: start\n");
01400 #endif
01401   for (j = 0; j < optimize->ninputs; ++j)
01402     {
01403       for (i = 0; i < optimize->nexperiments; ++i)
01404         g_mapped_file_unref (optimize->file[j][i]);
01405       g_free (optimize->file[j]);
01406     }
01407   g_free (optimize->error_old);
01408   g_free (optimize->value_old);
01409   g_free (optimize->value);
01410   g_free (optimize->genetic_variable);
01411 #if DEBUG_OPTIMIZE
01412   fprintf (stderr, "optimize_free: end\n");
01413 #endif
01414 }
01415
01420 void
01421 optimize_open ()
01422 {
01423   GTimeZone *tz;
01424   GDateTime *t0, *t;
01425   unsigned int i, j;
01426
01427 #if DEBUG_OPTIMIZE
01428   char *buffer;
01429   fprintf (stderr, "optimize_open: start\n");
01430 #endif
01431
01432   // Getting initial time
```

```
01433 #if DEBUG_OPTIMIZE
01434   fprintf (stderr, "optimize_open: getting initial time\n");
01435 #endif
01436   tz = g_time_zone_new_utc ();
01437   t0 = g_date_time_new_now (tz);
01438
01439   // Obtaining and initing the pseudo-random numbers generator seed
01440 #if DEBUG_OPTIMIZE
01441   fprintf (stderr, "optimize_open: getting initial seed\n");
01442 #endif
01443   if (optimize->seed == DEFAULT_RANDOM_SEED)
01444     optimize->seed = input->seed;
01445   gsl_rng_set (optimize->rng, optimize->seed);
01446
01447   // Replacing the working directory
01448 #if DEBUG_OPTIMIZE
01449   fprintf (stderr, "optimize_open: replacing the working directory\n");
01450 #endif
01451   g_chdir (input->directory);
01452
01453   // Getting results file names
01454   optimize->result = input->result;
01455   optimize->variables = input->variables;
01456
01457   // Obtaining the simulator file
01458   optimize->simulator = input->simulator;
01459
01460   // Obtaining the evaluator file
01461   optimize->evaluator = input->evaluator;
01462
01463   // Reading the algorithm
01464   optimize->algorithm = input->algorithm;
01465   switch (optimize->algorithm)
01466     {
01467     case ALGORITHM_MONTE_CARLO:
01468       optimize_algorithm = optimize_MonteCarlo;
01469       break;
01470     case ALGORITHM_SWEEP:
01471       optimize_algorithm = optimize_sweep;
01472       break;
01473     default:
01474       optimize_algorithm = optimize_genetic;
01475       optimize->mutation_ratio = input->mutation_ratio;
01476       optimize->reproduction_ratio = input->
      reproduction_ratio;
01477       optimize->adaptation_ratio = input->adaptation_ratio;
01478     }
01479   optimize->nvariables = input->nvariables;
01480   optimize->nsimulations = input->nsimulations;
01481   optimize->niterations = input->niterations;
01482   optimize->nbest = input->nbest;
01483   optimize->tolerance = input->tolerance;
01484   optimize->nsteps = input->nsteps;
01485   optimize->nestimates = 0;
01486   optimize->threshold = input->threshold;
01487   optimize->stop = 0;
01488   if (input->nsteps)
01489     {
01490       optimize->relaxation = input->relaxation;
01491       switch (input->direction)
01492         {
01493         case DIRECTION_METHOD_COORDINATES:
01494           optimize->nestimates = 2 * optimize->nvariables;
01495           optimize_estimate_direction =
      optimize_estimate_direction_coordinates;
01496           break;
01497         default:
01498           optimize->nestimates = input->nestimates;
01499           optimize_estimate_direction =
      optimize_estimate_direction_random;
01500         }
01501     }
01502
01503 #if DEBUG_OPTIMIZE
01504   fprintf (stderr, "optimize_open: nbest=%u\n", optimize->nbest);
01505 #endif
01506   optimize->simulation_best
01507     = (unsigned int *) alloca (optimize->nbest * sizeof (unsigned int));
01508   optimize->error_best = (double *) alloca (optimize->nbest * sizeof (double));
01509
01510   // Reading the experimental data
01511 #if DEBUG_OPTIMIZE
01512   buffer = g_get_current_dir ();
01513   fprintf (stderr, "optimize_open: current directory=%s\n", buffer);
01514   g_free (buffer);
01515 #endif
01516   optimize->nexperiments = input->nexperiments;
```

```
01517   optimize->ninputs = input->experiment->ninputs;
01518   optimize->experiment
01519     = (char **) alloca (input->nexperiments * sizeof (char *));
01520   optimize->weight = (double *) alloca (input->nexperiments * sizeof (double));
01521   for (i = 0; i < input->experiment->ninputs; ++i)
01522     optimize->file[i] = (GMappedFile **)
01523       g_malloc (input->nexperiments * sizeof (GMappedFile *));
01524   for (i = 0; i < input->nexperiments; ++i)
01525     {
01526 #if DEBUG_OPTIMIZE
01527       fprintf (stderr, "optimize_open: i=%u\n", i);
01528 #endif
01529       optimize->experiment[i] = input->experiment[i].
      name;
01530       optimize->weight[i] = input->experiment[i].weight;
01531 #if DEBUG_OPTIMIZE
01532       fprintf (stderr, "optimize_open: experiment=%s weight=%lg\n",
01533                optimize->experiment[i], optimize->weight[i]);
01534 #endif
01535       for (j = 0; j < input->experiment->ninputs; ++j)
01536         {
01537 #if DEBUG_OPTIMIZE
01538           fprintf (stderr, "optimize_open: template%u\n", j + 1);
01539 #endif
01540           optimize->file[j][i]
01541             = g_mapped_file_new (input->experiment[i].template[j], 0, NULL);
01542         }
01543     }
01544
01545   // Reading the variables data
01546 #if DEBUG_OPTIMIZE
01547   fprintf (stderr, "optimize_open: reading variables\n");
01548 #endif
01549   optimize->label = (char **) alloca (input->nvariables * sizeof (char *));
01550   j = input->nvariables * sizeof (double);
01551   optimize->rangemin = (double *) alloca (j);
01552   optimize->rangeminabs = (double *) alloca (j);
01553   optimize->rangemax = (double *) alloca (j);
01554   optimize->rangemaxabs = (double *) alloca (j);
01555   optimize->step = (double *) alloca (j);
01556   j = input->nvariables * sizeof (unsigned int);
01557   optimize->precision = (unsigned int *) alloca (j);
01558   optimize->nsweeps = (unsigned int *) alloca (j);
01559   optimize->nbits = (unsigned int *) alloca (j);
01560   for (i = 0; i < input->nvariables; ++i)
01561     {
01562       optimize->label[i] = input->variable[i].name;
01563       optimize->rangemin[i] = input->variable[i].rangemin;
01564       optimize->rangeminabs[i] = input->variable[i].
      rangeminabs;
01565       optimize->rangemax[i] = input->variable[i].rangemax;
01566       optimize->rangemaxabs[i] = input->variable[i].
      rangemaxabs;
01567       optimize->precision[i] = input->variable[i].
      precision;
01568       optimize->step[i] = input->variable[i].step;
01569       optimize->nsweeps[i] = input->variable[i].nsweeps;
01570       optimize->nbits[i] = input->variable[i].nbits;
01571     }
01572   if (input->algorithm == ALGORITHM_SWEEP)
01573     {
01574       optimize->nsimulations = 1;
01575       for (i = 0; i < input->nvariables; ++i)
01576         {
01577           if (input->algorithm == ALGORITHM_SWEEP)
01578             {
01579               optimize->nsimulations *= optimize->nsweeps[i];
01580 #if DEBUG_OPTIMIZE
01581               fprintf (stderr, "optimize_open: nsweeps=%u nsimulations=%u\n",
01582                        optimize->nsweeps[i], optimize->nsimulations);
01583 #endif
01584             }
01585         }
01586     }
01587   if (optimize->nsteps)
01588     optimize->direction
01589       = (double *) alloca (optimize->nvariables * sizeof (double));
01590
01591   // Setting error norm
01592   switch (input->norm)
01593     {
01594     case ERROR_NORM_EUCLIDIAN:
01595       optimize_norm = optimize_norm_euclidian;
01596       break;
01597     case ERROR_NORM_MAXIMUM:
01598       optimize_norm = optimize_norm_maximum;
01599       break;
```

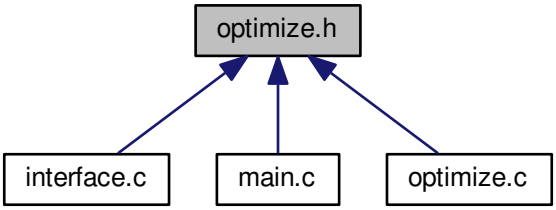
```
01600     case ERROR_NORM_P:
01601       optimize_norm = optimize_norm_p;
01602       optimize->p = input->p;
01603       break;
01604     default:
01605       optimize_norm = optimize_norm_taxicab;
01606     }
01607
01608   // Allocating values
01609 #if DEBUG_OPTIMIZE
01610   fprintf (stderr, "optimize_open: allocating variables\n");
01611   fprintf (stderr, "optimize_open: nvariables=%u algorithm=%u\n",
01612            optimize->nvariables, optimize->algorithm);
01613 #endif
01614   optimize->genetic_variable = NULL;
01615   if (optimize->algorithm == ALGORITHM_GENETIC)
01616     {
01617       optimize->genetic_variable = (GeneticVariable *)
01618         g_malloc (optimize->nvariables * sizeof (GeneticVariable));
01619       for (i = 0; i < optimize->nvariables; ++i)
01620         {
01621 #if DEBUG_OPTIMIZE
01622           fprintf (stderr, "optimize_open: i=%u min=%lg max=%lg nbits=%u\n",
01623                    i, optimize->rangemin[i], optimize->rangemax[i],
01624                    optimize->nbits[i]);
01625 #endif
01626           optimize->genetic_variable[i].minimum = optimize->
    rangemin[i];
01627           optimize->genetic_variable[i].maximum = optimize->
    rangemax[i];
01628           optimize->genetic_variable[i].nbits = optimize->nbits[i];
01629         }
01630     }
01631 #if DEBUG_OPTIMIZE
01632   fprintf (stderr, "optimize_open: nvariables=%u nsimulations=%u\n",
01633            optimize->nvariables, optimize->nsimulations);
01634 #endif
01635   optimize->value = (double *)
01636     g_malloc ((optimize->nsimulations
01637                + optimize->nestimates * optimize->nsteps)
01638               * optimize->nvariables * sizeof (double));
01639
01640   // Calculating simulations to perform for each task
01641 #if HAVE_MPI
01642 #if DEBUG_OPTIMIZE
01643   fprintf (stderr, "optimize_open: rank=%u ntasks=%u\n",
01644            optimize->mpi_rank, ntasks);
01645 #endif
01646   optimize->nstart = optimize->mpi_rank * optimize->nsimulations /
    ntasks;
01647   optimize->nend = (1 + optimize->mpi_rank) * optimize->nsimulations /
    ntasks;
01648   if (optimize->nsteps)
01649     {
01650       optimize->nstart_direction
01651         = optimize->mpi_rank * optimize->nestimates / ntasks;
01652       optimize->nend_direction
01653         = (1 + optimize->mpi_rank) * optimize->nestimates /
    ntasks;
01654     }
01655 #else
01656   optimize->nstart = 0;
01657   optimize->nend = optimize->nsimulations;
01658   if (optimize->nsteps)
01659     {
01660       optimize->nstart_direction = 0;
01661       optimize->nend_direction = optimize->nestimates;
01662     }
01663 #endif
01664 #if DEBUG_OPTIMIZE
01665   fprintf (stderr, "optimize_open: nstart=%u nend=%u\n", optimize->nstart,
01666            optimize->nend);
01667 #endif
01668
01669   // Calculating simulations to perform for each thread
01670   optimize->thread
01671     = (unsigned int *) alloca ((1 + nthreads) * sizeof (unsigned int));
01672   for (i = 0; i <= nthreads; ++i)
01673     {
01674       optimize->thread[i] = optimize->nstart
01675         + i * (optimize->nend - optimize->nstart) / nthreads;
01676 #if DEBUG_OPTIMIZE
01677       fprintf (stderr, "optimize_open: i=%u thread=%u\n", i,
01678                optimize->thread[i]);
01679 #endif
01680     }
01681   if (optimize->nsteps)
```

```
01682     optimize->thread_direction = (unsigned int *)
01683       alloca ((1 + nthreads_direction) * sizeof (unsigned int));
01684
01685   // Opening result files
01686   optimize->file_result = g_fopen (optimize->result, "w");
01687   optimize->file_variables = g_fopen (optimize->variables, "w");
01688
01689   // Performing the algorithm
01690   switch (optimize->algorithm)
01691     {
01692       // Genetic algorithm
01693     case ALGORITHM_GENETIC:
01694       optimize_genetic ();
01695       break;
01696
01697       // Iterative algorithm
01698     default:
01699       optimize_iterate ();
01700     }
01701
01702   // Getting calculation time
01703   t = g_date_time_new_now (tz);
01704   optimize->calculation_time = 0.000001 * g_date_time_difference (t, t0);
01705   g_date_time_unref (t);
01706   g_date_time_unref (t0);
01707   g_time_zone_unref (tz);
01708   printf ("%s = %.6lg s\n",
01709           gettext ("Calculation time"), optimize->calculation_time);
01710   fprintf (optimize->file_result, "%s = %.6lg s\n",
01711            gettext ("Calculation time"), optimize->calculation_time);
01712
01713   // Closing result files
01714   fclose (optimize->file_variables);
01715   fclose (optimize->file_result);
01716
01717 #if DEBUG_OPTIMIZE
01718   fprintf (stderr, "optimize_open: end\n");
01719 #endif
01720 }
```

5.19 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 *template)

  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

  Number of tasks.
- unsigned int nthreads

  Number of threads.
- unsigned int nthreads_direction

  Number of threads for the direction search method.
- GMutex mutex [1]

  Mutex struct.
- 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.

5.19.1 Detailed Description

Header file to define the optimization functions.

Authors

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Definition in file optimize.h.

5.19.2 Function Documentation

5.19.2.1 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 463 of file optimize.c.

```
00464 {
00465   unsigned int i, j;
00466   double e;
00467 #if DEBUG_OPTIMIZE
00468   fprintf (stderr, "optimize_best: start\n");
00469   fprintf (stderr, "optimize_best: nsaveds=%u nbest=%u\n",
00470            optimize->nsaveds, optimize->nbest);
00471 #endif
00472   if (optimize->nsaveds < optimize->nbest
00473       || value < optimize->error_best[optimize->nsaveds - 1])
00474     {
00475       if (optimize->nsaveds < optimize->nbest)
00476         ++optimize->nsaveds;
00477       optimize->error_best[optimize->nsaveds - 1] = value;
00478       optimize->simulation_best[optimize->nsaveds - 1] = simulation;
00479       for (i = optimize->nsaveds; --i;)
00480         {
00481           if (optimize->error_best[i] < optimize->
      error_best[i - 1])
00482             {
00483               j = optimize->simulation_best[i];
00484               e = optimize->error_best[i];
00485               optimize->simulation_best[i] = optimize->
      simulation_best[i - 1];
00486               optimize->error_best[i] = optimize->
      error_best[i - 1];
00487               optimize->simulation_best[i - 1] = j;
00488               optimize->error_best[i - 1] = e;
00489             }
00490           else
00491             break;
00492         }
00493     }
00494 #if DEBUG_OPTIMIZE
00495   fprintf (stderr, "optimize_best: end\n");
00496 #endif
00497 }
```

5.19.2.2 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 788 of file optimize.c.

```
00789 {
00790 #if DEBUG_OPTIMIZE
00791   fprintf (stderr, "optimize_best_direction: start\n");
00792   fprintf (stderr,
00793            "optimize_best_direction: simulation=%u value=%.14le best=%.14le\n",
```

```
00794             simulation, value, optimize->error_best[0]);
00795 #endif
00796   if (value < optimize->error_best[0])
00797     {
00798       optimize->error_best[0] = value;
00799       optimize->simulation_best[0] = simulation;
00800 #if DEBUG_OPTIMIZE
00801       fprintf (stderr,
00802                "optimize_best_direction: BEST simulation=%u value=%.14le\n",
00803                simulation, value);
00804 #endif
00805     }
00806 #if DEBUG_OPTIMIZE
00807   fprintf (stderr, "optimize_best_direction: end\n");
00808 #endif
00809 }
```

5.19.2.3 optimize_direction_sequential()

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

Function to estimate the direction search sequentially.

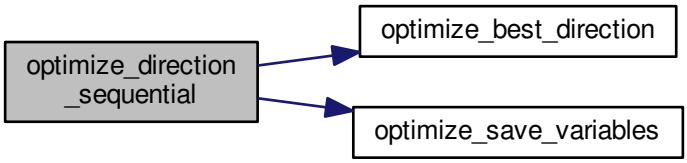
Parameters

simulation	Simulation number.

Definition at line 818 of file optimize.c.

```
00819 {
00820   unsigned int i, j;
00821   double e;
00822 #if DEBUG_OPTIMIZE
00823   fprintf (stderr, "optimize_direction_sequential: start\n");
00824   fprintf (stderr, "optimize_direction_sequential: nstart_direction=%u "
00825            "nend_direction=%u\n",
00826            optimize->nstart_direction, optimize->
      nend_direction);
00827 #endif
00828   for (i = optimize->nstart_direction; i < optimize->nend_direction; ++i)
00829     {
00830       j = simulation + i;
00831       e = optimize_norm (j);
00832       optimize_best_direction (j, e);
00833       optimize_save_variables (j, e);
00834       if (e < optimize->threshold)
00835         {
00836           optimize->stop = 1;
00837           break;
00838         }
00839 #if DEBUG_OPTIMIZE
00840       fprintf (stderr, "optimize_direction_sequential: i=%u e=%lg\n", i, e);
00841 #endif
00842     }
00843 #if DEBUG_OPTIMIZE
00844   fprintf (stderr, "optimize_direction_sequential: end\n");
00845 #endif
00846 }
```

Here is the call graph for this function:



5.19.2.4 optimize_direction_thread()

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

Function to estimate the direction search on a thread.

Parameters

data	Function data.

Returns

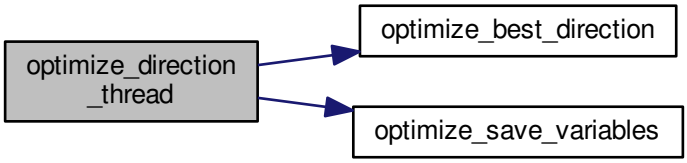
NULL

Definition at line 856 of file optimize.c.

```
00857 {
00858   unsigned int i, thread;
00859   double e;
00860 #if DEBUG_OPTIMIZE
00861   fprintf (stderr, "optimize_direction_thread: start\n");
00862 #endif
00863   thread = data->thread;
00864 #if DEBUG_OPTIMIZE
00865   fprintf (stderr, "optimize_direction_thread: thread=%u start=%u end=%u\n",
00866            thread,
00867            optimize->thread_direction[thread],
00868            optimize->thread_direction[thread + 1]);
00869 #endif
00870   for (i = optimize->thread_direction[thread];
00871        i < optimize->thread_direction[thread + 1]; ++i)
00872     {
00873       e = optimize_norm (i);
00874       g_mutex_lock (mutex);
00875       optimize_best_direction (i, e);
00876       optimize_save_variables (i, e);
00877       if (e < optimize->threshold)
00878         optimize->stop = 1;
00879       g_mutex_unlock (mutex);
00880       if (optimize->stop)
00881         break;
00882 #if DEBUG_OPTIMIZE
00883       fprintf (stderr, "optimize_direction_thread: i=%u e=%lg\n", i, e);
00884 #endif
00885     }
00886 #if DEBUG_OPTIMIZE
00887   fprintf (stderr, "optimize_direction_thread: end\n");
```

```
00888 #endif
00889   g_thread_exit (NULL);
00890   return NULL;
00891 }
```

Here is the call graph for this function:



5.19.2.5 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 930 of file optimize.c.

```
00932 {
00933   double x;
00934 #if DEBUG_OPTIMIZE
00935   fprintf (stderr, "optimize_estimate_direction_coordinates: start\n");
00936 #endif
00937   x = optimize->direction[variable];
00938   if (estimate >= (2 * variable) && estimate < (2 * variable + 2))
00939     {
00940       if (estimate & 1)
00941         x += optimize->step[variable];
00942       else
00943         x -= optimize->step[variable];
00944     }
00945 #if DEBUG_OPTIMIZE
00946   fprintf (stderr,
00947            "optimize_estimate_direction_coordinates: direction%u=%lg\n",
00948            variable, x);
00949   fprintf (stderr, "optimize_estimate_direction_coordinates: end\n");
00950 #endif
00951   return x;
00952 }
```

5.19.2.6 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 903 of file optimize.c.

```
00905 {
00906   double x;
00907 #if DEBUG_OPTIMIZE
00908   fprintf (stderr, "optimize_estimate_direction_random: start\n");
00909 #endif
00910   x = optimize->direction[variable]
00911     + (1. - 2. * gsl_rng_uniform (optimize->rng)) * optimize->
     step[variable];
00912 #if DEBUG_OPTIMIZE
00913   fprintf (stderr, "optimize_estimate_direction_random: direction%u=%lg\n",
00914            variable, x);
00915   fprintf (stderr, "optimize_estimate_direction_random: end\n");
00916 #endif
00917   return x;
00918 }
```

5.19.2.7 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 1097 of file optimize.c.

```
01098 {
01099   unsigned int j;
01100   double objective;
01101   char buffer[64];
01102 #if DEBUG_OPTIMIZE
01103   fprintf (stderr, "optimize_genetic_objective: start\n");
01104 #endif
01105   for (j = 0; j < optimize->nvariables; ++j)
01106     {
01107       optimize->value[entity->id * optimize->nvariables + j]
```

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

5.19.2.8 optimize_input()

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

Function to write the simulation input file.

Parameters

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

Definition at line 104 of file optimize.c.

```
00105 {
00106   unsigned int i;
00107   char buffer[32], value[32], *buffer2, *buffer3, *content;
00108   FILE *file;
00109   gsize length;
00110   GRegex *regex;
00111
00112 #if DEBUG_OPTIMIZE
00113   fprintf (stderr, "optimize_input: start\n");
00114 #endif
00115
00116   // Checking the file
00117   if (!template)
00118     goto optimize_input_end;
00119
00120   // Opening template
00121   content = g_mapped_file_get_contents (template);
00122   length = g_mapped_file_get_length (template);
00123 #if DEBUG_OPTIMIZE
00124   fprintf (stderr, "optimize_input: length=%lu\ncontent:\n%s", length, content);
00125 #endif
00126   file = g_fopen (input, "w");
00127
00128   // Parsing template
00129   for (i = 0; i < optimize->nvariables; ++i)
00130     {
00131 #if DEBUG_OPTIMIZE
00132       fprintf (stderr, "optimize_input: variable=%u\n", i);
00133 #endif
00134       snprintf (buffer, 32, "@variable%u@", i + 1);
00135       regex = g_regex_new (buffer, 0, 0, NULL);
00136       if (i == 0)
00137         {
00138           buffer2 = g_regex_replace_literal (regex, content, length, 0,
00139                                              optimize->label[i], 0, NULL);
```

```
00140 #if DEBUG_OPTIMIZE
00141           fprintf (stderr, "optimize_input: buffer2\n%s", buffer2);
00142 #endif
00143         }
00144       else
00145         {
00146           length = strlen (buffer3);
00147           buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
00148                                              optimize->label[i], 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, 0, 0, NULL);
00155       snprintf (value, 32, format[optimize->precision[i]],
00156                 optimize->value[simulation * optimize->
      nvariables + i]);
00157
00158 #if DEBUG_OPTIMIZE
00159       fprintf (stderr, "optimize_input: value=%s\n", value);
00160 #endif
00161       buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
00162                                          0, NULL);
00163       g_free (buffer2);
00164       g_regex_unref (regex);
00165     }
00166
00167   // Saving input file
00168   fwrite (buffer3, strlen (buffer3), sizeof (char), file);
00169   g_free (buffer3);
00170   fclose (file);
00171
00172 optimize_input_end:
00173 #if DEBUG_OPTIMIZE
00174   fprintf (stderr, "optimize_input: end\n");
00175 #endif
00176   return;
00177 }
```

5.19.2.9 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 586 of file optimize.c.

```
00588 {
00589   unsigned int i, j, k, s[optimize->nbest];
00590   double e[optimize->nbest];
00591 #if DEBUG_OPTIMIZE
00592   fprintf (stderr, "optimize_merge: start\n");
00593 #endif
00594   i = j = k = 0;
00595   do
00596     {
00597       if (i == optimize->nsaveds)
00598         {
00599           s[k] = simulation_best[j];
00600           e[k] = error_best[j];
```

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

5.19.2.10 optimize_norm_euclidian()

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

Function to calculate the Euclidian error norm.

Parameters

simulation	simulation number.

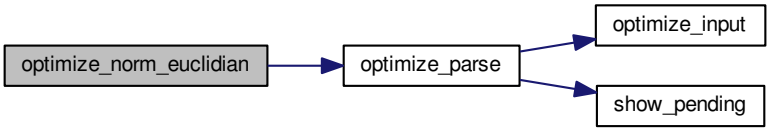
Returns

Euclidian error norm.

Definition at line 296 of file optimize.c.

```
00297 {
00298   double e, ei;
00299   unsigned int i;
00300 #if DEBUG_OPTIMIZE
00301   fprintf (stderr, "optimize_norm_euclidian: start\n");
00302 #endif
00303   e = 0.;
00304   for (i = 0; i < optimize->nexperiments; ++i)
00305     {
00306       ei = optimize_parse (simulation, i);
00307       e += ei * ei;
00308     }
00309   e = sqrt (e);
00310 #if DEBUG_OPTIMIZE
00311   fprintf (stderr, "optimize_norm_euclidian: error=%lg\n", e);
00312   fprintf (stderr, "optimize_norm_euclidian: end\n");
00313 #endif
00314   return e;
00315 }
```

Here is the call graph for this function:



5.19.2.11 optimize_norm_maximum()

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

Function to calculate the maximum error norm.

Parameters

simulation	simulation number.

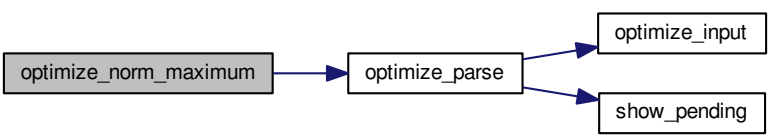
Returns

Maximum error norm.

Definition at line 325 of file optimize.c.

```
00326 {
00327   double e, ei;
00328   unsigned int i;
00329 #if DEBUG_OPTIMIZE
00330   fprintf (stderr, "optimize_norm_maximum: start\n");
00331 #endif
00332   e = 0.;
00333   for (i = 0; i < optimize->nexperiments; ++i)
00334     {
00335       ei = fabs (optimize_parse (simulation, i));
00336       e = fmax (e, ei);
00337     }
00338 #if DEBUG_OPTIMIZE
00339   fprintf (stderr, "optimize_norm_maximum: error=%lg\n", e);
00340   fprintf (stderr, "optimize_norm_maximum: end\n");
00341 #endif
00342   return e;
00343 }
```

Here is the call graph for this function:



5.19.2.12 optimize_norm_p()

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

Function to calculate the P error norm.

Parameters

simulation	simulation number.

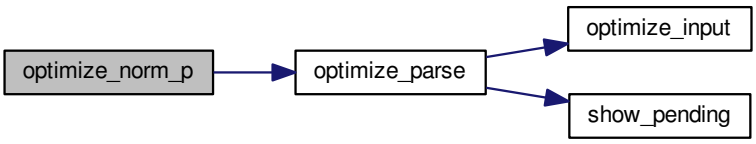
Returns

P error norm.

Definition at line 353 of file optimize.c.

```
00354 {
00355   double e, ei;
00356   unsigned int i;
00357 #if DEBUG_OPTIMIZE
00358   fprintf (stderr, "optimize_norm_p: start\n");
00359 #endif
00360   e = 0.;
00361   for (i = 0; i < optimize->nexperiments; ++i)
00362     {
00363       ei = fabs (optimize_parse (simulation, i));
00364       e += pow (ei, optimize->p);
00365     }
00366   e = pow (e, 1. / optimize->p);
00367 #if DEBUG_OPTIMIZE
00368   fprintf (stderr, "optimize_norm_p: error=%lg\n", e);
00369   fprintf (stderr, "optimize_norm_p: end\n");
00370 #endif
00371   return e;
00372 }
```

Here is the call graph for this function:



5.19.2.13 optimize_norm_taxicab()

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

Function to calculate the taxicab error norm.

Parameters

simulation	simulation number.

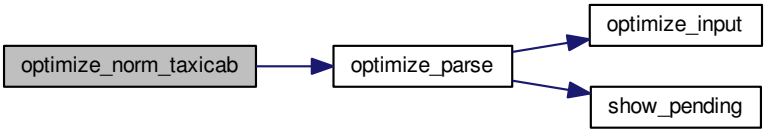
Returns

Taxicab error norm.

Definition at line 382 of file optimize.c.

```
00383 {
00384   double e;
00385   unsigned int i;
00386 #if DEBUG_OPTIMIZE
00387   fprintf (stderr, "optimize_norm_taxicab: start\n");
00388 #endif
00389   e = 0.;
00390   for (i = 0; i < optimize->nexperiments; ++i)
00391     e += fabs (optimize_parse (simulation, i));
00392 #if DEBUG_OPTIMIZE
00393   fprintf (stderr, "optimize_norm_taxicab: error=%lg\n", e);
00394   fprintf (stderr, "optimize_norm_taxicab: end\n");
00395 #endif
00396   return e;
00397 }
```

Here is the call graph for this function:



5.19.2.14 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

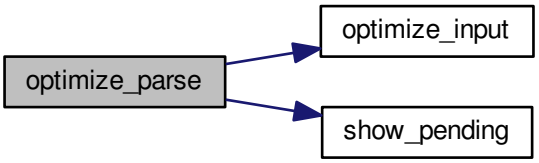
Objective function value.

Definition at line 190 of file optimize.c.

```
00191 {
00192   unsigned int i;
00193   double e;
00194   char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
00195     *buffer3, *buffer4;
00196   FILE *file_result;
00197
00198 #if DEBUG_OPTIMIZE
00199   fprintf (stderr, "optimize_parse: start\n");
00200   fprintf (stderr, "optimize_parse: simulation=%u experiment=%u\n", simulation,
00201            experiment);
00202 #endif
00203
00204   // Opening input files
00205   for (i = 0; i < optimize->ninputs; ++i)
00206     {
00207       snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
00208 #if DEBUG_OPTIMIZE
00209       fprintf (stderr, "optimize_parse: i=%u input=%s\n", i, &input[i][0]);
00210 #endif
00211       optimize_input (simulation, &input[i][0], optimize->
      file[i][experiment]);
00212     }
00213   for (; i < MAX_NINPUTS; ++i)
00214     strcpy (&input[i][0], "");
00215 #if DEBUG_OPTIMIZE
00216   fprintf (stderr, "optimize_parse: parsing end\n");
00217 #endif
00218
00219   // Performing the simulation
00220   snprintf (output, 32, "output-%u-%u", simulation, experiment);
00221   buffer2 = g_path_get_dirname (optimize->simulator);
00222   buffer3 = g_path_get_basename (optimize->simulator);
00223   buffer4 = g_build_filename (buffer2, buffer3, NULL);
00224   snprintf (buffer, 512, "\"%s\" %s %s %s %s %s %s %s %s %s",
00225             buffer4, input[0], input[1], input[2], input[3], input[4], input[5],
00226             input[6], input[7], output);
00227   g_free (buffer4);
00228   g_free (buffer3);
00229   g_free (buffer2);
00230 #if DEBUG_OPTIMIZE
00231   fprintf (stderr, "optimize_parse: %s\n", buffer);
00232 #endif
00233   system (buffer);
00234
00235   // Checking the objective value function
00236   if (optimize->evaluator)
00237     {
00238       snprintf (result, 32, "result-%u-%u", simulation, experiment);
00239       buffer2 = g_path_get_dirname (optimize->evaluator);
00240       buffer3 = g_path_get_basename (optimize->evaluator);
00241       buffer4 = g_build_filename (buffer2, buffer3, NULL);
00242       snprintf (buffer, 512, "\"%s\" %s %s %s",
00243                 buffer4, output, optimize->experiment[experiment], result);
00244       g_free (buffer4);
00245       g_free (buffer3);
00246       g_free (buffer2);
00247 #if DEBUG_OPTIMIZE
00248       fprintf (stderr, "optimize_parse: %s\n", buffer);
00249 #endif
00250       system (buffer);
00251       file_result = g_fopen (result, "r");
00252       e = atof (fgets (buffer, 512, file_result));
00253       fclose (file_result);
00254     }
00255   else
00256     {
00257       strcpy (result, "");
00258       file_result = g_fopen (output, "r");
00259       e = atof (fgets (buffer, 512, file_result));
00260       fclose (file_result);
00261     }
00262
00263   // Removing files
00264 #if !DEBUG_OPTIMIZE
00265   for (i = 0; i < optimize->ninputs; ++i)
00266     {
00267       if (optimize->file[i][0])
00268         {
00269           snprintf (buffer, 512, RM " %s", &input[i][0]);
00270           system (buffer);
00271         }
00272     }
00273   snprintf (buffer, 512, RM " %s %s", output, result);
```

```
00274   system (buffer);
00275 #endif
00276
00277   // Processing pending events
00278   show_pending ();
00279
00280 #if DEBUG_OPTIMIZE
00281   fprintf (stderr, "optimize_parse: end\n");
00282 #endif
00283
00284   // Returning the objective function
00285   return e * optimize->weight[experiment];
00286 }
```

Here is the call graph for this function:



5.19.2.15 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 435 of file optimize.c.

```
00436 {
00437   unsigned int i;
00438   char buffer[64];
00439 #if DEBUG_OPTIMIZE
00440   fprintf (stderr, "optimize_save_variables: start\n");
00441 #endif
00442   for (i = 0; i < optimize->nvariables; ++i)
00443     {
00444       snprintf (buffer, 64, "%s ", format[optimize->precision[i]]);
00445       fprintf (optimize->file_variables, buffer,
00446                optimize->value[simulation * optimize->
      nvariables + i]);
00447     }
00448   fprintf (optimize->file_variables, "%.14le\n", error);
00449 #if DEBUG_OPTIMIZE
00450   fprintf (stderr, "optimize_save_variables: end\n");
00451 #endif
00452 }
```

5.19.2.16 optimize_step_direction()

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

Function to do a step of the direction search method.

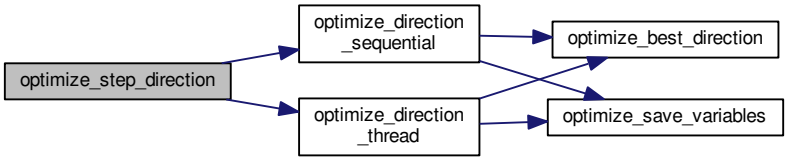
Parameters

simulation	Simulation number.

Definition at line 961 of file optimize.c.

```
00962 {
00963   GThread *thread[nthreads_direction];
00964   ParallelData data[nthreads_direction];
00965   unsigned int i, j, k, b;
00966 #if DEBUG_OPTIMIZE
00967   fprintf (stderr, "optimize_step_direction: start\n");
00968 #endif
00969   for (i = 0; i < optimize->nestimates; ++i)
00970     {
00971       k = (simulation + i) * optimize->nvariables;
00972       b = optimize->simulation_best[0] * optimize->
      nvariables;
00973 #if DEBUG_OPTIMIZE
00974       fprintf (stderr, "optimize_step_direction: simulation=%u best=%u\n",
00975                simulation + i, optimize->simulation_best[0]);
00976 #endif
00977       for (j = 0; j < optimize->nvariables; ++j, ++k, ++b)
00978         {
00979 #if DEBUG_OPTIMIZE
00980           fprintf (stderr,
00981                    "optimize_step_direction: estimate=%u best%u=%.14le\n",
00982                    i, j, optimize->value[b]);
00983 #endif
00984           optimize->value[k]
00985             = optimize->value[b] + optimize_estimate_direction (j,
      i);
00986           optimize->value[k] = fmin (fmax (optimize->value[k],
00987                                            optimize->rangeminabs[j]),
00988                                      optimize->rangemaxabs[j]);
00989 #if DEBUG_OPTIMIZE
00990           fprintf (stderr,
00991                    "optimize_step_direction: estimate=%u variable%u=%.14le\n",
00992                    i, j, optimize->value[k]);
00993 #endif
00994         }
00995     }
00996   if (nthreads_direction == 1)
00997     optimize_direction_sequential (simulation);
00998   else
00999     {
01000       for (i = 0; i <= nthreads_direction; ++i)
01001         {
01002           optimize->thread_direction[i]
01003             = simulation + optimize->nstart_direction
01004             + i * (optimize->nend_direction - optimize->
      nstart_direction)
01005               / nthreads_direction;
01006 #if DEBUG_OPTIMIZE
01007           fprintf (stderr,
01008                    "optimize_step_direction: i=%u thread_direction=%u\n",
01009                    i, optimize->thread_direction[i]);
01010 #endif
01011         }
01012       for (i = 0; i < nthreads_direction; ++i)
01013         {
01014           data[i].thread = i;
01015           thread[i] = g_thread_new
01016             (NULL, (void (*)) optimize_direction_thread, &data[i]);
01017         }
01018       for (i = 0; i < nthreads_direction; ++i)
01019         g_thread_join (thread[i]);
01020     }
01021 #if DEBUG_OPTIMIZE
01022   fprintf (stderr, "optimize_step_direction: end\n");
01023 #endif
01024 }
```

Here is the call graph for this function:



5.19.2.17 optimize_thread()

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

Function to optimize on a thread.

Parameters

data	Function data.

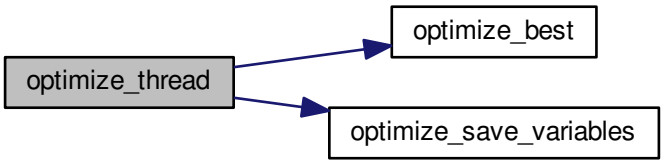
Returns

NULL

Definition at line 540 of file optimize.c.

```
00541 {
00542   unsigned int i, thread;
00543   double e;
00544 #if DEBUG_OPTIMIZE
00545   fprintf (stderr, "optimize_thread: start\n");
00546 #endif
00547   thread = data->thread;
00548 #if DEBUG_OPTIMIZE
00549   fprintf (stderr, "optimize_thread: thread=%u start=%u end=%u\n", thread,
00550            optimize->thread[thread], optimize->thread[thread + 1]);
00551 #endif
00552   for (i = optimize->thread[thread]; i < optimize->thread[thread + 1]; ++i)
00553     {
00554       e = optimize_norm (i);
00555       g_mutex_lock (mutex);
00556       optimize_best (i, e);
00557       optimize_save_variables (i, e);
00558       if (e < optimize->threshold)
00559         optimize->stop = 1;
00560       g_mutex_unlock (mutex);
00561       if (optimize->stop)
00562         break;
00563 #if DEBUG_OPTIMIZE
00564       fprintf (stderr, "optimize_thread: i=%u e=%lg\n", i, e);
00565 #endif
00566     }
00567 #if DEBUG_OPTIMIZE
00568   fprintf (stderr, "optimize_thread: end\n");
00569 #endif
00570   g_thread_exit (NULL);
00571   return NULL;
00572 }
```

Here is the call graph for this function:



5.20 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 2012-2016, 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 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 * template);
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 ();
```

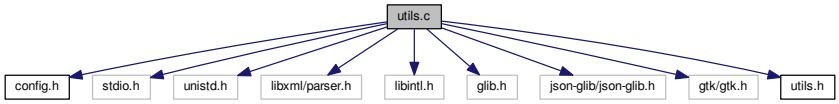
```
00172 void optimize_step ();
00173 void optimize_iterate ();
00174 void optimize_free ();
00175 void optimize_open ();
00176
00177 #endif
```

5.21 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_pending ()

  Function to show events on long computation.
- 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.
- 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.

5.21.1 Detailed Description

Source file to define some useful functions.

Authors

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Definition in file utils.c.

5.21.2 Function Documentation

5.21.2.1 cores_number()

```
int cores_number ( )
```

Function to obtain the cores number.

Returns

Cores number.

Definition at line 541 of file utils.c.

```
00542 {
00543 #ifdef G_OS_WIN32
00544   SYSTEM_INFO sysinfo;
00545   GetSystemInfo (&sysinfo);
00546   return sysinfo.dwNumberOfProcessors;
00547 #else
00548   return (int) sysconf (_SC_NPROCESSORS_ONLN);
00549 #endif
00550 }
```

5.21.2.2 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 565 of file utils.c.

```
00566 {
00567   unsigned int i;
00568   for (i = 0; i < n; ++i)
00569     if (gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (array[i])))
00570       break;
00571   return i;
00572 }
```

5.21.2.3 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 431 of file utils.c.

```
00432 {
00433   const char *buffer;
00434   double x = 0.;
00435   buffer = json_object_get_string_member (object, prop);
00436   if (!buffer)
00437     *error_code = 1;
00438   else
00439     {
00440       if (sscanf (buffer, "%lf", &x) != 1)
00441         *error_code = 2;
00442       else
00443         *error_code = 0;
00444     }
00445   return x;
00446 }
```

5.21.2.4 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.

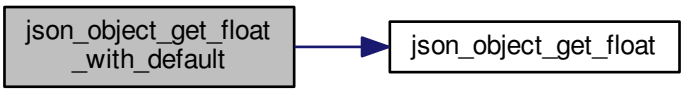
Returns

Floating point number value.

Definition at line 464 of file utils.c.

```
00466 {
00467   double x;
00468   if (json_object_get_member (object, prop))
00469     x = json_object_get_float (object, prop, error_code);
00470   else
00471     {
00472       x = default_value;
00473       *error_code = 0;
00474     }
00475   return x;
00476 }
```

Here is the call graph for this function:



5.21.2.5 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 341 of file utils.c.

```
00342 {
00343   const char *buffer;
00344   int i = 0;
```

```
00345   buffer = json_object_get_string_member (object, prop);
00346   if (!buffer)
00347     *error_code = 1;
00348   else
00349     {
00350       if (sscanf (buffer, "%d", &i) != 1)
00351         *error_code = 2;
00352       else
00353         *error_code = 0;
00354     }
00355   return i;
00356 }
```

5.21.2.6 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 371 of file utils.c.

```
00372 {
00373   const char *buffer;
00374   unsigned int i = 0;
00375   buffer = json_object_get_string_member (object, prop);
00376   if (!buffer)
00377     *error_code = 1;
00378   else
00379     {
00380       if (sscanf (buffer, "%u", &i) != 1)
00381         *error_code = 2;
00382       else
00383         *error_code = 0;
00384     }
00385   return i;
00386 }
```

5.21.2.7 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.

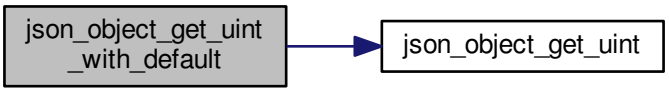
Returns

Unsigned integer number value.

Definition at line 404 of file utils.c.

```
00406 {
00407   unsigned int i;
00408   if (json_object_get_member (object, prop))
00409     i = json_object_get_uint (object, prop, error_code);
00410   else
00411     {
00412       i = default_value;
00413       *error_code = 0;
00414     }
00415   return i;
00416 }
```

Here is the call graph for this function:



5.21.2.8 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 528 of file utils.c.

```
00529 {
00530   char buffer[64];
00531   snprintf (buffer, 64, "%.14lg", value);
00532   json_object_set_string_member (object, prop, buffer);
00533 }
```

5.21.2.9 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 490 of file utils.c.

```
00491 {
00492   char buffer[64];
00493   snprintf (buffer, 64, "%d", value);
00494   json_object_set_string_member (object, prop, buffer);
00495 }
```

5.21.2.10 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 509 of file utils.c.

```
00510 {
00511   char buffer[64];
00512   snprintf (buffer, 64, "%u", value);
00513   json_object_set_string_member (object, prop, buffer);
00514 }
```

5.21.2.11 show_error()

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

Function to show a dialog with an error message.

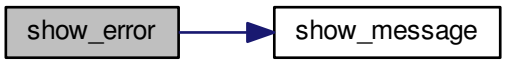
Parameters

msg	Error message.

Definition at line 114 of file utils.c.

```
00115 {
00116   show_message (gettext ("ERROR!"), msg, ERROR_TYPE);
00117 }
```

Here is the call graph for this function:



5.21.2.12 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 84 of file utils.c.

```
00085 {
00086 #if HAVE_GTK
00087   GtkMessageDialog *dlg;
00088
00089   // Creating the dialog
```

```
00090   dlg = (GtkMessageDialog *) gtk_message_dialog_new
00091     (main_window, GTK_DIALOG_MODAL, type, GTK_BUTTONS_OK, "%s", msg);
00092
00093   // Setting the dialog title
00094   gtk_window_set_title (GTK_WINDOW (dlg), title);
00095
00096   // Showing the dialog and waiting response
00097   gtk_dialog_run (GTK_DIALOG (dlg));
00098
00099   // Closing and freeing memory
00100   gtk_widget_destroy (GTK_WIDGET (dlg));
00101
00102 #else
00103   printf ("%s: %s\n", title, msg);
00104 #endif
00105 }
```

5.21.2.13 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 224 of file utils.c.

```
00225 {
00226   double x = 0.;
00227   xmlChar *buffer;
00228   buffer = xmlGetProp (node, prop);
00229   if (!buffer)
00230     *error_code = 1;
00231   else
00232     {
00233       if (sscanf ((char *) buffer, "%lf", &x) != 1)
00234         *error_code = 2;
00235       else
00236         *error_code = 0;
00237       xmlFree (buffer);
00238     }
00239   return x;
00240 }
```

5.21.2.14 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.

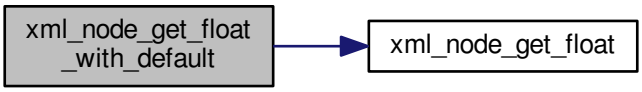
Returns

Floating point number value.

Definition at line 258 of file utils.c.

```
00260 {
00261   double x;
00262   if (xmlHasProp (node, prop))
00263     x = xml_node_get_float (node, prop, error_code);
00264   else
00265     {
00266       x = default_value;
00267       *error_code = 0;
00268     }
00269   return x;
00270 }
```

Here is the call graph for this function:



5.21.2.15 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 132 of file utils.c.

```
00133 {
00134   int i = 0;
00135   xmlChar *buffer;
00136   buffer = xmlGetProp (node, prop);
00137   if (!buffer)
00138     *error_code = 1;
00139   else
00140     {
00141       if (sscanf ((char *) buffer, "%d", &i) != 1)
00142         *error_code = 2;
00143       else
00144         *error_code = 0;
00145       xmlFree (buffer);
00146     }
00147   return i;
00148 }
```

5.21.2.16 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 163 of file utils.c.

```
00164 {
00165   unsigned int i = 0;
00166   xmlChar *buffer;
00167   buffer = xmlGetProp (node, prop);
00168   if (!buffer)
00169     *error_code = 1;
00170   else
00171     {
00172       if (sscanf ((char *) buffer, "%u", &i) != 1)
00173         *error_code = 2;
00174       else
00175         *error_code = 0;
00176       xmlFree (buffer);
00177     }
00178   return i;
00179 }
```

5.21.2.17 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.

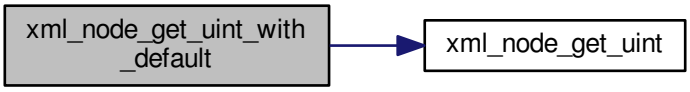
Returns

Unsigned integer number value.

Definition at line 197 of file utils.c.

```
00199 {
00200   unsigned int i;
00201   if (xmlHasProp (node, prop))
00202     i = xml_node_get_uint (node, prop, error_code);
00203   else
00204     {
00205       i = default_value;
00206       *error_code = 0;
00207     }
00208   return i;
00209 }
```

Here is the call graph for this function:



5.21.2.18 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 321 of file utils.c.

```
00322 {
00323   xmlChar buffer[64];
00324   snprintf ((char *) buffer, 64, "%.14lg", value);
00325   xmlSetProp (node, prop, buffer);
00326 }
```

5.21.2.19 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 283 of file utils.c.

```
00284 {
00285   xmlChar buffer[64];
00286   snprintf ((char *) buffer, 64, "%d", value);
00287   xmlSetProp (node, prop, buffer);
00288 }
```

5.21.2.20 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 302 of file utils.c.

```
00303 {
00304   xmlChar buffer[64];
00305   snprintf ((char *) buffer, 64, "%u", value);
00306   xmlSetProp (node, prop, buffer);
00307 }
```

5.22 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 2012-2016, 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
00064 void
00065 show_pending ()
00066 {
00067 #if HAVE_GTK
00068   while (gtk_events_pending ())
00069     gtk_main_iteration ();
00070 #endif
00071 }
00072
00083 void
00084 show_message (char *title, char *msg, int type)
00085 {
00086 #if HAVE_GTK
00087   GtkMessageDialog *dlg;
00088
00089   // Creating the dialog
00090   dlg = (GtkMessageDialog *) gtk_message_dialog_new
```

```
00091     (main_window, GTK_DIALOG_MODAL, type, GTK_BUTTONS_OK, "%s", msg);
00092
00093   // Setting the dialog title
00094   gtk_window_set_title (GTK_WINDOW (dlg), title);
00095
00096   // Showing the dialog and waiting response
00097   gtk_dialog_run (GTK_DIALOG (dlg));
00098
00099   // Closing and freeing memory
00100   gtk_widget_destroy (GTK_WIDGET (dlg));
00101
00102 #else
00103   printf ("%s: %s\n", title, msg);
00104 #endif
00105 }
00106
00113 void
00114 show_error (char *msg)
00115 {
00116   show_message (gettext ("ERROR!"), msg, ERROR_TYPE);
00117 }
00118
00131 int
00132 xml_node_get_int (xmlNode * node, const xmlChar * prop, int *error_code)
00133 {
00134   int i = 0;
00135   xmlChar *buffer;
00136   buffer = xmlGetProp (node, prop);
00137   if (!buffer)
00138     *error_code = 1;
00139   else
00140     {
00141       if (sscanf ((char *) buffer, "%d", &i) != 1)
00142         *error_code = 2;
00143       else
00144         *error_code = 0;
00145       xmlFree (buffer);
00146     }
00147   return i;
00148 }
00149
00162 unsigned int
00163 xml_node_get_uint (xmlNode * node, const xmlChar * prop, int *error_code)
00164 {
00165   unsigned int i = 0;
00166   xmlChar *buffer;
00167   buffer = xmlGetProp (node, prop);
00168   if (!buffer)
00169     *error_code = 1;
00170   else
00171     {
00172       if (sscanf ((char *) buffer, "%u", &i) != 1)
00173         *error_code = 2;
00174       else
00175         *error_code = 0;
00176       xmlFree (buffer);
00177     }
00178   return i;
00179 }
00180
00196 unsigned int
00197 xml_node_get_uint_with_default (xmlNode * node, const xmlChar * prop,
00198                                 unsigned int default_value, int *error_code)
00199 {
00200   unsigned int i;
00201   if (xmlHasProp (node, prop))
00202     i = xml_node_get_uint (node, prop, error_code);
00203   else
00204     {
00205       i = default_value;
00206       *error_code = 0;
00207     }
00208   return i;
00209 }
00210
00223 double
00224 xml_node_get_float (xmlNode * node, const xmlChar * prop, int *error_code)
00225 {
00226   double x = 0.;
00227   xmlChar *buffer;
00228   buffer = xmlGetProp (node, prop);
00229   if (!buffer)
00230     *error_code = 1;
00231   else
00232     {
00233       if (sscanf ((char *) buffer, "%lf", &x) != 1)
00234         *error_code = 2;
```

```
00235       else
00236         *error_code = 0;
00237       xmlFree (buffer);
00238     }
00239   return x;
00240 }
00241
00257 double
00258 xml_node_get_float_with_default (xmlNode * node, const xmlChar * prop,
00259                                  double default_value, int *error_code)
00260 {
00261   double x;
00262   if (xmlHasProp (node, prop))
00263     x = xml_node_get_float (node, prop, error_code);
00264   else
00265     {
00266       x = default_value;
00267       *error_code = 0;
00268     }
00269   return x;
00270 }
00271
00282 void
00283 xml_node_set_int (xmlNode * node, const xmlChar * prop, int value)
00284 {
00285   xmlChar buffer[64];
00286   snprintf ((char *) buffer, 64, "%d", value);
00287   xmlSetProp (node, prop, buffer);
00288 }
00289
00301 void
00302 xml_node_set_uint (xmlNode * node, const xmlChar * prop, unsigned int value)
00303 {
00304   xmlChar buffer[64];
00305   snprintf ((char *) buffer, 64, "%u", value);
00306   xmlSetProp (node, prop, buffer);
00307 }
00308
00320 void
00321 xml_node_set_float (xmlNode * node, const xmlChar * prop, double value)
00322 {
00323   xmlChar buffer[64];
00324   snprintf ((char *) buffer, 64, "%.14lg", value);
00325   xmlSetProp (node, prop, buffer);
00326 }
00327
00340 int
00341 json_object_get_int (JsonObject * object, const char *prop, int *error_code)
00342 {
00343   const char *buffer;
00344   int i = 0;
00345   buffer = json_object_get_string_member (object, prop);
00346   if (!buffer)
00347     *error_code = 1;
00348   else
00349     {
00350       if (sscanf (buffer, "%d", &i) != 1)
00351         *error_code = 2;
00352       else
00353         *error_code = 0;
00354     }
00355   return i;
00356 }
00357
00370 unsigned int
00371 json_object_get_uint (JsonObject * object, const char *prop, int *error_code)
00372 {
00373   const char *buffer;
00374   unsigned int i = 0;
00375   buffer = json_object_get_string_member (object, prop);
00376   if (!buffer)
00377     *error_code = 1;
00378   else
00379     {
00380       if (sscanf (buffer, "%u", &i) != 1)
00381         *error_code = 2;
00382       else
00383         *error_code = 0;
00384     }
00385   return i;
00386 }
00387
00403 unsigned int
00404 json_object_get_uint_with_default (JsonObject * object, const char *prop,
00405                                    unsigned int default_value, int *error_code)
00406 {
00407   unsigned int i;
```

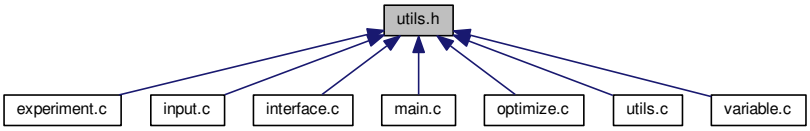
```
00408   if (json_object_get_member (object, prop))
00409     i = json_object_get_uint (object, prop, error_code);
00410   else
00411     {
00412       i = default_value;
00413       *error_code = 0;
00414     }
00415   return i;
00416 }
00417
00430 double
00431 json_object_get_float (JsonObject * object, const char *prop, int *error_code)
00432 {
00433   const char *buffer;
00434   double x = 0.;
00435   buffer = json_object_get_string_member (object, prop);
00436   if (!buffer)
00437     *error_code = 1;
00438   else
00439     {
00440       if (sscanf (buffer, "%lf", &x) != 1)
00441         *error_code = 2;
00442       else
00443         *error_code = 0;
00444     }
00445   return x;
00446 }
00447
00463 double
00464 json_object_get_float_with_default (JsonObject * object, const char *prop
      ,
00465                                     double default_value, int *error_code)
00466 {
00467   double x;
00468   if (json_object_get_member (object, prop))
00469     x = json_object_get_float (object, prop, error_code);
00470   else
00471     {
00472       x = default_value;
00473       *error_code = 0;
00474     }
00475   return x;
00476 }
00477
00489 void
00490 json_object_set_int (JsonObject * object, const char *prop, int value)
00491 {
00492   char buffer[64];
00493   snprintf (buffer, 64, "%d", value);
00494   json_object_set_string_member (object, prop, buffer);
00495 }
00496
00508 void
00509 json_object_set_uint (JsonObject * object, const char *prop, unsigned int value)
00510 {
00511   char buffer[64];
00512   snprintf (buffer, 64, "%u", value);
00513   json_object_set_string_member (object, prop, buffer);
00514 }
00515
00527 void
00528 json_object_set_float (JsonObject * object, const char *prop, double value)
00529 {
00530   char buffer[64];
00531   snprintf (buffer, 64, "%.14lg", value);
00532   json_object_set_string_member (object, prop, buffer);
00533 }
00534
00540 int
00541 cores_number ()
00542 {
00543 #ifdef G_OS_WIN32
00544   SYSTEM_INFO sysinfo;
00545   GetSystemInfo (&sysinfo);
00546   return sysinfo.dwNumberOfProcessors;
00547 #else
00548   return (int) sysconf (_SC_NPROCESSORS_ONLN);
00549 #endif
00550 }
00551
00552 #if HAVE_GTK
00553
00564 unsigned int
00565 gtk_array_get_active (GtkRadioButton * array[], unsigned int n)
00566 {
00567   unsigned int i;
00568   for (i = 0; i < n; ++i)
```

```
00569     if (gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (array[i])))
00570       break;
00571   return i;
00572 }
00573
00574 #endif
```

5.23 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_pending ()

  Function to show events on long computation.
- 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.
- 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.

5.23.1 Detailed Description

Header file to define some useful functions.

Authors

Javier Burguete.

Copyright

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Definition in file utils.h.

5.23.2 Function Documentation

5.23.2.1 cores_number()

```
int cores_number ( )
```

Function to obtain the cores number.

Returns

Cores number.

Definition at line 541 of file utils.c.

```
00542 {
00543 #ifdef G_OS_WIN32
00544   SYSTEM_INFO sysinfo;
00545   GetSystemInfo (&sysinfo);
00546   return sysinfo.dwNumberOfProcessors;
00547 #else
00548   return (int) sysconf (_SC_NPROCESSORS_ONLN);
00549 #endif
00550 }
```

5.23.2.2 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 565 of file utils.c.

```
00566 {
00567   unsigned int i;
00568   for (i = 0; i < n; ++i)
00569     if (gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (array[i])))
00570       break;
00571   return i;
00572 }
```

5.23.2.3 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 431 of file utils.c.

```
00432 {
00433   const char *buffer;
00434   double x = 0.;
00435   buffer = json_object_get_string_member (object, prop);
00436   if (!buffer)
00437     *error_code = 1;
00438   else
00439     {
00440       if (sscanf (buffer, "%lf", &x) != 1)
00441         *error_code = 2;
00442       else
00443         *error_code = 0;
00444     }
00445   return x;
00446 }
```

5.23.2.4 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.

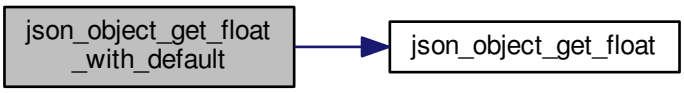
Returns

Floating point number value.

Definition at line 464 of file utils.c.

```
00466 {
00467   double x;
00468   if (json_object_get_member (object, prop))
00469     x = json_object_get_float (object, prop, error_code);
00470   else
00471     {
00472       x = default_value;
00473       *error_code = 0;
00474     }
00475   return x;
00476 }
```

Here is the call graph for this function:



5.23.2.5 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 341 of file utils.c.

```
00342 {
00343   const char *buffer;
00344   int i = 0;
```

```
00345   buffer = json_object_get_string_member (object, prop);
00346   if (!buffer)
00347     *error_code = 1;
00348   else
00349     {
00350       if (sscanf (buffer, "%d", &i) != 1)
00351         *error_code = 2;
00352       else
00353         *error_code = 0;
00354     }
00355   return i;
00356 }
```

5.23.2.6 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 371 of file utils.c.

```
00372 {
00373   const char *buffer;
00374   unsigned int i = 0;
00375   buffer = json_object_get_string_member (object, prop);
00376   if (!buffer)
00377     *error_code = 1;
00378   else
00379     {
00380       if (sscanf (buffer, "%u", &i) != 1)
00381         *error_code = 2;
00382       else
00383         *error_code = 0;
00384     }
00385   return i;
00386 }
```

5.23.2.7 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.

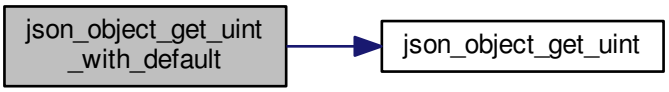
Returns

Unsigned integer number value.

Definition at line 404 of file utils.c.

```
00406 {
00407   unsigned int i;
00408   if (json_object_get_member (object, prop))
00409     i = json_object_get_uint (object, prop, error_code);
00410   else
00411     {
00412       i = default_value;
00413       *error_code = 0;
00414     }
00415   return i;
00416 }
```

Here is the call graph for this function:



5.23.2.8 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 528 of file utils.c.

```
00529 {
00530   char buffer[64];
00531   snprintf (buffer, 64, "%.14lg", value);
00532   json_object_set_string_member (object, prop, buffer);
00533 }
```

5.23.2.9 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 490 of file utils.c.

```
00491 {
00492   char buffer[64];
00493   snprintf (buffer, 64, "%d", value);
00494   json_object_set_string_member (object, prop, buffer);
00495 }
```

5.23.2.10 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 509 of file utils.c.

```
00510 {
00511   char buffer[64];
00512   snprintf (buffer, 64, "%u", value);
00513   json_object_set_string_member (object, prop, buffer);
00514 }
```

5.23.2.11 show_error()

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

Function to show a dialog with an error message.

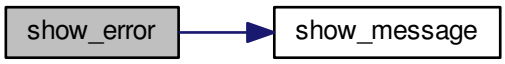
Parameters

msg	Error message.

Definition at line 114 of file utils.c.

```
00115 {
00116   show_message (gettext ("ERROR!"), msg, ERROR_TYPE);
00117 }
```

Here is the call graph for this function:



5.23.2.12 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 84 of file utils.c.

```
00085 {
00086 #if HAVE_GTK
00087   GtkMessageDialog *dlg;
00088
00089   // Creating the dialog
```

```
00090   dlg = (GtkMessageDialog *) gtk_message_dialog_new
00091     (main_window, GTK_DIALOG_MODAL, type, GTK_BUTTONS_OK, "%s", msg);
00092
00093   // Setting the dialog title
00094   gtk_window_set_title (GTK_WINDOW (dlg), title);
00095
00096   // Showing the dialog and waiting response
00097   gtk_dialog_run (GTK_DIALOG (dlg));
00098
00099   // Closing and freeing memory
00100   gtk_widget_destroy (GTK_WIDGET (dlg));
00101
00102 #else
00103   printf ("%s: %s\n", title, msg);
00104 #endif
00105 }
```

5.23.2.13 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 224 of file utils.c.

```
00225 {
00226   double x = 0.;
00227   xmlChar *buffer;
00228   buffer = xmlGetProp (node, prop);
00229   if (!buffer)
00230     *error_code = 1;
00231   else
00232     {
00233       if (sscanf ((char *) buffer, "%lf", &x) != 1)
00234         *error_code = 2;
00235       else
00236         *error_code = 0;
00237       xmlFree (buffer);
00238     }
00239   return x;
00240 }
```

5.23.2.14 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.

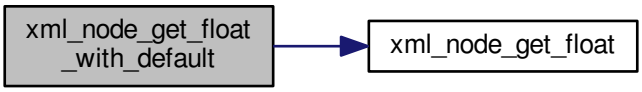
Returns

Floating point number value.

Definition at line 258 of file utils.c.

```
00260 {
00261   double x;
00262   if (xmlHasProp (node, prop))
00263     x = xml_node_get_float (node, prop, error_code);
00264   else
00265     {
00266       x = default_value;
00267       *error_code = 0;
00268     }
00269   return x;
00270 }
```

Here is the call graph for this function:



5.23.2.15 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 132 of file utils.c.

```
00133 {
00134   int i = 0;
00135   xmlChar *buffer;
00136   buffer = xmlGetProp (node, prop);
00137   if (!buffer)
00138     *error_code = 1;
00139   else
00140     {
00141       if (sscanf ((char *) buffer, "%d", &i) != 1)
00142         *error_code = 2;
00143       else
00144         *error_code = 0;
00145       xmlFree (buffer);
00146     }
00147   return i;
00148 }
```

5.23.2.16 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 163 of file utils.c.

```
00164 {
00165   unsigned int i = 0;
00166   xmlChar *buffer;
00167   buffer = xmlGetProp (node, prop);
00168   if (!buffer)
00169     *error_code = 1;
00170   else
00171     {
00172       if (sscanf ((char *) buffer, "%u", &i) != 1)
00173         *error_code = 2;
00174       else
00175         *error_code = 0;
00176       xmlFree (buffer);
00177     }
00178   return i;
00179 }
```

5.23.2.17 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.

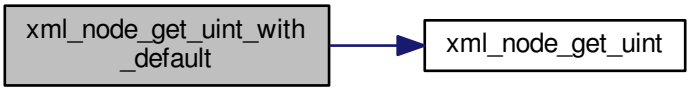
Returns

Unsigned integer number value.

Definition at line 197 of file utils.c.

```
00199 {
00200   unsigned int i;
00201   if (xmlHasProp (node, prop))
00202     i = xml_node_get_uint (node, prop, error_code);
00203   else
00204     {
00205       i = default_value;
00206       *error_code = 0;
00207     }
00208   return i;
00209 }
```

Here is the call graph for this function:



5.23.2.18 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 321 of file utils.c.

```
00322 {
00323   xmlChar buffer[64];
00324   snprintf ((char *) buffer, 64, "%.14lg", value);
00325   xmlSetProp (node, prop, buffer);
00326 }
```

5.23.2.19 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 283 of file utils.c.

```
00284 {
00285   xmlChar buffer[64];
00286   snprintf ((char *) buffer, 64, "%d", value);
00287   xmlSetProp (node, prop, buffer);
00288 }
```

5.23.2.20 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 302 of file utils.c.

```
00303 {
00304   xmlChar buffer[64];
00305   snprintf ((char *) buffer, 64, "%u", value);
00306   xmlSetProp (node, prop, buffer);
00307 }
```

5.24 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 2012-2016, 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 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
00058 // Public functions
00059 void show_pending ();
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,
```

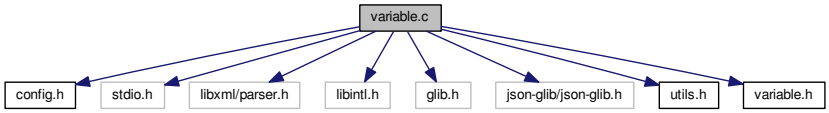
```
00082                                               const char *prop,
00083                                               unsigned int default_value,
00084                                               int *error_code);
00085 double json_object_get_float (JsonObject * object, const char *prop,
00086                                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 unsigned int gtk_array_get_active (GtkRadioButton * array[], unsigned int n);
00099 #endif
00100
00101 #endif
```

5.25 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 **_GNU_SOURCE**
- #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.

5.25.1 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.

5.25.2 Function Documentation

5.25.2.1 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", gettext ("Variable"), message);
00115   else
00116     snprintf (buffer, 64, "%s %s: %s", gettext ("Variable"), variable->name,
00117               message);
00118   error_message = g_strdup (buffer);
00119 }
```

5.25.2.2 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 }
```

5.25.2.3 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 }
```

5.25.2.4 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.

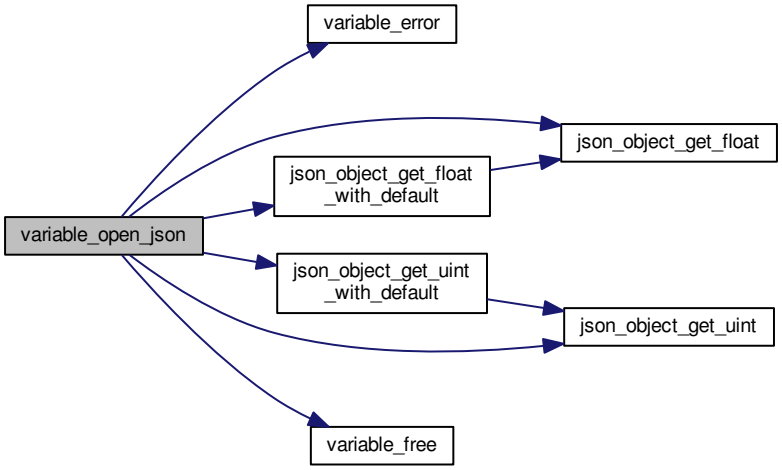
Definition at line 302 of file variable.c.

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

```
00357         = json_object_get_float_with_default (object,
      LABEL_ABSOLUTE_MAXIMUM,
00358                                               G_MAXDOUBLE, &error_code);
00359       if (error_code)
00360         {
00361           variable_error (variable, gettext ("bad absolute maximum"));
00362           goto exit_on_error;
00363         }
00364       if (variable->rangemax > variable->rangemaxabs)
00365         {
00366           variable_error (variable, gettext ("maximum range not allowed"));
00367           goto exit_on_error;
00368         }
00369       if (variable->rangemax < variable->rangemin)
00370         {
00371           variable_error (variable, gettext ("bad range"));
00372           goto exit_on_error;
00373         }
00374     }
00375   else
00376     {
00377       variable_error (variable, gettext ("no maximum range"));
00378       goto exit_on_error;
00379     }
00380   variable->precision
00381     = json_object_get_uint_with_default (object,
      LABEL_PRECISION,
00382                                          DEFAULT_PRECISION, &error_code);
00383   if (error_code || variable->precision >= NPRECISIONS)
00384     {
00385       variable_error (variable, gettext ("bad precision"));
00386       goto exit_on_error;
00387     }
00388   if (algorithm == ALGORITHM_SWEEP)
00389     {
00390       if (json_object_get_member (object, LABEL_NSWEEPS))
00391         {
00392           variable->nsweeps
00393             = json_object_get_uint (object, LABEL_NSWEEPS, &error_code);
00394           if (error_code || !variable->nsweeps)
00395             {
00396               variable_error (variable, gettext ("bad sweeps"));
00397               goto exit_on_error;
00398             }
00399         }
00400       else
00401         {
00402           variable_error (variable, gettext ("no sweeps number"));
00403           goto exit_on_error;
00404         }
00405 #if DEBUG_VARIABLE
00406       fprintf (stderr, "variable_open_json: nsweeps=%u\n", variable->nsweeps);
00407 #endif
00408     }
00409   if (algorithm == ALGORITHM_GENETIC)
00410     {
00411       // Obtaining bits representing each variable
00412       if (json_object_get_member (object, LABEL_NBITS))
00413         {
00414           variable->nbits
00415             = json_object_get_uint (object, LABEL_NBITS, &error_code);
00416           if (error_code || !variable->nbits)
00417             {
00418               variable_error (variable, gettext ("invalid bits number"));
00419               goto exit_on_error;
00420             }
00421         }
00422       else
00423         {
00424           variable_error (variable, gettext ("no bits number"));
00425           goto exit_on_error;
00426         }
00427     }
00428   else if (nsteps)
00429     {
00430       variable->step = json_object_get_float (object,
      LABEL_STEP, &error_code);
00431       if (error_code || variable->step < 0.)
00432         {
00433           variable_error (variable, gettext ("bad step size"));
00434           goto exit_on_error;
00435         }
00436     }
00437
00438 #if DEBUG_VARIABLE
00439   fprintf (stderr, "variable_open_json: end\n");
00440 #endif
```

```
00441   return 1;
00442 exit_on_error:
00443   variable_free (variable, INPUT_TYPE_JSON);
00444 #if DEBUG_VARIABLE
00445   fprintf (stderr, "variable_open_json: end\n");
00446 #endif
00447   return 0;
00448 }
```

Here is the call graph for this function:



5.25.2.5 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

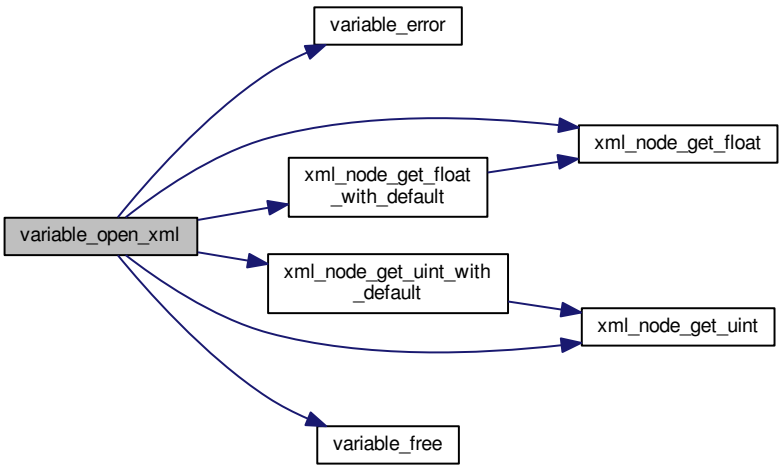
1 on success, 0 on error.

Definition at line 136 of file variable.c.

```
00138 {
00139   int error_code;
00140 
00141 #if DEBUG_VARIABLE
00142   fprintf (stderr, "variable_open_xml: start\n");
00143 #endif
00144 
00145   variable->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
00146   if (!variable->name)
00147     {
00148       variable_error (variable, gettext ("no name"));
00149       goto exit_on_error;
00150     }
00151   if (xmlHasProp (node, (const xmlChar *) LABEL_MINIMUM))
00152     {
00153       variable->rangemin
00154         = xml_node_get_float (node, (const xmlChar *)
      LABEL_MINIMUM,
00155                               &error_code);
00156       if (error_code)
00157         {
00158           variable_error (variable, gettext ("bad minimum"));
00159           goto exit_on_error;
00160         }
00161       variable->rangeminabs = xml_node_get_float_with_default
00162         (node, (const xmlChar *) LABEL_ABSOLUTE_MINIMUM, -G_MAXDOUBLE,
00163          &error_code);
00164       if (error_code)
00165         {
00166           variable_error (variable, gettext ("bad absolute minimum"));
00167           goto exit_on_error;
00168         }
00169       if (variable->rangemin < variable->rangeminabs)
00170         {
00171           variable_error (variable, gettext ("minimum range not allowed"));
00172           goto exit_on_error;
00173         }
00174     }
00175   else
00176     {
00177       variable_error (variable, gettext ("no minimum range"));
00178       goto exit_on_error;
00179     }
00180   if (xmlHasProp (node, (const xmlChar *) LABEL_MAXIMUM))
00181     {
00182       variable->rangemax
00183         = xml_node_get_float (node, (const xmlChar *)
      LABEL_MAXIMUM,
00184                               &error_code);
00185       if (error_code)
00186         {
00187           variable_error (variable, gettext ("bad maximum"));
00188           goto exit_on_error;
00189         }
00190       variable->rangemaxabs = xml_node_get_float_with_default
00191         (node, (const xmlChar *) LABEL_ABSOLUTE_MAXIMUM, G_MAXDOUBLE,
00192          &error_code);
00193       if (error_code)
00194         {
00195           variable_error (variable, gettext ("bad absolute maximum"));
00196           goto exit_on_error;
00197         }
00198       if (variable->rangemax > variable->rangemaxabs)
00199         {
00200           variable_error (variable, gettext ("maximum range not allowed"));
00201           goto exit_on_error;
00202         }
00203       if (variable->rangemax < variable->rangemin)
00204         {
00205           variable_error (variable, gettext ("bad range"));
00206           goto exit_on_error;
00207         }
00208     }
00209   else
00210     {
00211       variable_error (variable, gettext ("no maximum range"));
00212       goto exit_on_error;
00213     }
00214   variable->precision
00215     = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_PRECISION,
00216                                       DEFAULT_PRECISION, &error_code);
00217   if (error_code || variable->precision >= NPRECISIONS)
00218     {
00219       variable_error (variable, gettext ("bad precision"));
00220       goto exit_on_error;
00221     }
```

```
00222   if (algorithm == ALGORITHM_SWEEP)
00223     {
00224       if (xmlHasProp (node, (const xmlChar *) LABEL_NSWEEPS))
00225         {
00226           variable->nsweeps
00227             = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NSWEEPS,
00228                                  &error_code);
00229           if (error_code || !variable->nsweeps)
00230             {
00231               variable_error (variable, gettext ("bad sweeps"));
00232               goto exit_on_error;
00233             }
00234         }
00235       else
00236         {
00237           variable_error (variable, gettext ("no sweeps number"));
00238           goto exit_on_error;
00239         }
00240 #if DEBUG_VARIABLE
00241       fprintf (stderr, "variable_open_xml: nsweeps=%u\n", variable->nsweeps);
00242 #endif
00243     }
00244   if (algorithm == ALGORITHM_GENETIC)
00245     {
00246       // Obtaining bits representing each variable
00247       if (xmlHasProp (node, (const xmlChar *) LABEL_NBITS))
00248         {
00249           variable->nbits
00250             = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NBITS,
00251                                  &error_code);
00252           if (error_code || !variable->nbits)
00253             {
00254               variable_error (variable, gettext ("invalid bits number"));
00255               goto exit_on_error;
00256             }
00257         }
00258       else
00259         {
00260           variable_error (variable, gettext ("no bits number"));
00261           goto exit_on_error;
00262         }
00263     }
00264   else if (nsteps)
00265     {
00266       variable->step
00267         = xml_node_get_float (node, (const xmlChar *)
      LABEL_STEP, &error_code);
00268       if (error_code || variable->step < 0.)
00269         {
00270           variable_error (variable, gettext ("bad step size"));
00271           goto exit_on_error;
00272         }
00273     }
00274
00275 #if DEBUG_VARIABLE
00276   fprintf (stderr, "variable_open_xml: end\n");
00277 #endif
00278   return 1;
00279 exit_on_error:
00280   variable_free (variable, INPUT_TYPE_XML);
00281 #if DEBUG_VARIABLE
00282   fprintf (stderr, "variable_open_xml: end\n");
00283 #endif
00284   return 0;
00285 }
```

Here is the call graph for this function:



5.25.3 Variable Documentation

5.25.3.1 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.

5.25.3.2 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.

5.26 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 2012-2016, 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, 1e-12,
00057   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", gettext ("Variable"), message);
00115   else
00116     snprintf (buffer, 64, "%s %s: %s", gettext ("Variable"), variable->name,
00117               message);
00118   error_message = g_strdup (buffer);
00119 }
00120
00135 int
00136 variable_open_xml (Variable * variable, xmlNode * node, unsigned int algorithm,
00137                    unsigned int nsteps)
00138 {
00139   int error_code;
00140
00141 #if DEBUG_VARIABLE
00142   fprintf (stderr, "variable_open_xml: start\n");
00143 #endif
00144
00145   variable->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
00146   if (!variable->name)
00147     {
00148       variable_error (variable, gettext ("no name"));
00149       goto exit_on_error;
00150     }
00151   if (xmlHasProp (node, (const xmlChar *) LABEL_MINIMUM))
00152     {
00153       variable->rangemin
00154         = xml_node_get_float (node, (const xmlChar *)
      LABEL_MINIMUM,
00155                               &error_code);
00156       if (error_code)
00157         {
00158           variable_error (variable, gettext ("bad minimum"));
00159           goto exit_on_error;
00160         }
00161       variable->rangeminabs = xml_node_get_float_with_default
00162         (node, (const xmlChar *) LABEL_ABSOLUTE_MINIMUM, -G_MAXDOUBLE,
00163          &error_code);
00164       if (error_code)
00165         {
00166           variable_error (variable, gettext ("bad absolute minimum"));
00167           goto exit_on_error;
00168         }
00169       if (variable->rangemin < variable->rangeminabs)
00170         {
00171           variable_error (variable, gettext ("minimum range not allowed"));
00172           goto exit_on_error;
00173         }
00174     }
00175   else
00176     {
00177       variable_error (variable, gettext ("no minimum range"));
00178       goto exit_on_error;
00179     }
00180   if (xmlHasProp (node, (const xmlChar *) LABEL_MAXIMUM))
00181     {
00182       variable->rangemax
00183         = xml_node_get_float (node, (const xmlChar *)
      LABEL_MAXIMUM,
00184                               &error_code);
00185       if (error_code)
00186         {
00187           variable_error (variable, gettext ("bad maximum"));
00188           goto exit_on_error;
00189         }
00190       variable->rangemaxabs = xml_node_get_float_with_default
00191         (node, (const xmlChar *) LABEL_ABSOLUTE_MAXIMUM, G_MAXDOUBLE,
00192          &error_code);
00193       if (error_code)
00194         {
00195           variable_error (variable, gettext ("bad absolute maximum"));
00196           goto exit_on_error;
00197         }
00198       if (variable->rangemax > variable->rangemaxabs)
00199         {
00200           variable_error (variable, gettext ("maximum range not allowed"));
00201           goto exit_on_error;
00202         }
00203       if (variable->rangemax < variable->rangemin)
00204         {
00205           variable_error (variable, gettext ("bad range"));
00206           goto exit_on_error;
00207         }
00208     }
00209   else
00210     {
00211       variable_error (variable, gettext ("no maximum range"));
```

```
00212       goto exit_on_error;
00213     }
00214   variable->precision
00215     = xml_node_get_uint_with_default (node, (const xmlChar *)
    LABEL_PRECISION,
00216                                       DEFAULT_PRECISION, &error_code);
00217   if (error_code || variable->precision >= NPRECISIONS)
00218     {
00219       variable_error (variable, gettext ("bad precision"));
00220       goto exit_on_error;
00221     }
00222   if (algorithm == ALGORITHM_SWEEP)
00223     {
00224       if (xmlHasProp (node, (const xmlChar *) LABEL_NSWEEPS))
00225         {
00226           variable->nsweeps
00227             = xml_node_get_uint (node, (const xmlChar *)
    LABEL_NSWEEPS,
00228                                  &error_code);
00229           if (error_code || !variable->nsweeps)
00230             {
00231               variable_error (variable, gettext ("bad sweeps"));
00232               goto exit_on_error;
00233             }
00234         }
00235       else
00236         {
00237           variable_error (variable, gettext ("no sweeps number"));
00238           goto exit_on_error;
00239         }
00240 #if DEBUG_VARIABLE
00241       fprintf (stderr, "variable_open_xml: nsweeps=%u\n", variable->nsweeps);
00242 #endif
00243     }
00244   if (algorithm == ALGORITHM_GENETIC)
00245     {
00246       // Obtaining bits representing each variable
00247       if (xmlHasProp (node, (const xmlChar *) LABEL_NBITS))
00248         {
00249           variable->nbits
00250             = xml_node_get_uint (node, (const xmlChar *)
    LABEL_NBITS,
00251                                  &error_code);
00252           if (error_code || !variable->nbits)
00253             {
00254               variable_error (variable, gettext ("invalid bits number"));
00255               goto exit_on_error;
00256             }
00257         }
00258       else
00259         {
00260           variable_error (variable, gettext ("no bits number"));
00261           goto exit_on_error;
00262         }
00263     }
00264   else if (nsteps)
00265     {
00266       variable->step
00267         = xml_node_get_float (node, (const xmlChar *)
    LABEL_STEP, &error_code);
00268       if (error_code || variable->step < 0.)
00269         {
00270           variable_error (variable, gettext ("bad step size"));
00271           goto exit_on_error;
00272         }
00273     }
00274
00275 #if DEBUG_VARIABLE
00276   fprintf (stderr, "variable_open_xml: end\n");
00277 #endif
00278   return 1;
00279 exit_on_error:
00280   variable_free (variable, INPUT_TYPE_XML);
00281 #if DEBUG_VARIABLE
00282   fprintf (stderr, "variable_open_xml: end\n");
00283 #endif
00284   return 0;
00285 }
00286
00301 int
00302 variable_open_json (Variable * variable, JsonNode * node,
00303                     unsigned int algorithm, unsigned int nsteps)
00304 {
00305   JsonObject *object;
00306   const char *label;
00307   int error_code;
00308 #if DEBUG_VARIABLE
```

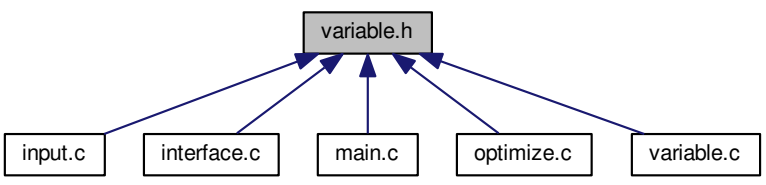
```
00309   fprintf (stderr, "variable_open_json: start\n");
00310 #endif
00311   object = json_node_get_object (node);
00312   label = json_object_get_string_member (object, LABEL_NAME);
00313   if (!label)
00314     {
00315       variable_error (variable, gettext ("no name"));
00316       goto exit_on_error;
00317     }
00318   variable->name = g_strdup (label);
00319   if (json_object_get_member (object, LABEL_MINIMUM))
00320     {
00321       variable->rangemin
00322         = json_object_get_float (object, LABEL_MINIMUM, &error_code);
00323       if (error_code)
00324         {
00325           variable_error (variable, gettext ("bad minimum"));
00326           goto exit_on_error;
00327         }
00328       variable->rangeminabs
00329         = json_object_get_float_with_default (object,
    LABEL_ABSOLUTE_MINIMUM,
00330                                               -G_MAXDOUBLE, &error_code);
00331       if (error_code)
00332         {
00333           variable_error (variable, gettext ("bad absolute minimum"));
00334           goto exit_on_error;
00335         }
00336       if (variable->rangemin < variable->rangeminabs)
00337         {
00338           variable_error (variable, gettext ("minimum range not allowed"));
00339           goto exit_on_error;
00340         }
00341     }
00342   else
00343     {
00344       variable_error (variable, gettext ("no minimum range"));
00345       goto exit_on_error;
00346     }
00347   if (json_object_get_member (object, LABEL_MAXIMUM))
00348     {
00349       variable->rangemax
00350         = json_object_get_float (object, LABEL_MAXIMUM, &error_code);
00351       if (error_code)
00352         {
00353           variable_error (variable, gettext ("bad maximum"));
00354           goto exit_on_error;
00355         }
00356       variable->rangemaxabs
00357         = json_object_get_float_with_default (object,
    LABEL_ABSOLUTE_MAXIMUM,
00358                                               G_MAXDOUBLE, &error_code);
00359       if (error_code)
00360         {
00361           variable_error (variable, gettext ("bad absolute maximum"));
00362           goto exit_on_error;
00363         }
00364       if (variable->rangemax > variable->rangemaxabs)
00365         {
00366           variable_error (variable, gettext ("maximum range not allowed"));
00367           goto exit_on_error;
00368         }
00369       if (variable->rangemax < variable->rangemin)
00370         {
00371           variable_error (variable, gettext ("bad range"));
00372           goto exit_on_error;
00373         }
00374     }
00375   else
00376     {
00377       variable_error (variable, gettext ("no maximum range"));
00378       goto exit_on_error;
00379     }
00380   variable->precision
00381     = json_object_get_uint_with_default (object,
    LABEL_PRECISION,
00382                                          DEFAULT_PRECISION, &error_code);
00383   if (error_code || variable->precision >= NPRECISIONS)
00384     {
00385       variable_error (variable, gettext ("bad precision"));
00386       goto exit_on_error;
00387     }
00388   if (algorithm == ALGORITHM_SWEEP)
00389     {
00390       if (json_object_get_member (object, LABEL_NSWEEPS))
00391         {
00392           variable->nsweeps
```

```
00393             = json_object_get_uint (object, LABEL_NSWEEPS, &error_code);
00394           if (error_code || !variable->nsweeps)
00395             {
00396               variable_error (variable, gettext ("bad sweeps"));
00397               goto exit_on_error;
00398             }
00399         }
00400       else
00401         {
00402           variable_error (variable, gettext ("no sweeps number"));
00403           goto exit_on_error;
00404         }
00405 #if DEBUG_VARIABLE
00406       fprintf (stderr, "variable_open_json: nsweeps=%u\n", variable->nsweeps);
00407 #endif
00408     }
00409   if (algorithm == ALGORITHM_GENETIC)
00410     {
00411       // Obtaining bits representing each variable
00412       if (json_object_get_member (object, LABEL_NBITS))
00413         {
00414           variable->nbits
00415             = json_object_get_uint (object, LABEL_NBITS, &error_code);
00416           if (error_code || !variable->nbits)
00417             {
00418               variable_error (variable, gettext ("invalid bits number"));
00419               goto exit_on_error;
00420             }
00421         }
00422       else
00423         {
00424           variable_error (variable, gettext ("no bits number"));
00425           goto exit_on_error;
00426         }
00427     }
00428   else if (nsteps)
00429     {
00430       variable->step = json_object_get_float (object,
      LABEL_STEP, &error_code);
00431       if (error_code || variable->step < 0.)
00432         {
00433           variable_error (variable, gettext ("bad step size"));
00434           goto exit_on_error;
00435         }
00436     }
00437
00438 #if DEBUG_VARIABLE
00439   fprintf (stderr, "variable_open_json: end\n");
00440 #endif
00441   return 1;
00442 exit_on_error:
00443   variable_free (variable, INPUT_TYPE_JSON);
00444 #if DEBUG_VARIABLE
00445   fprintf (stderr, "variable_open_json: end\n");
00446 #endif
00447   return 0;
00448 }
```

5.27 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.

5.27.1 Detailed Description

Header file to define the variable data.

Authors

Javier Burguete.

Copyright

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Definition in file variable.h.

5.27.2 Enumeration Type Documentation

5.27.2.1 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 };
```

5.27.3 Function Documentation

5.27.3.1 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", gettext ("Variable"), message);
00115   else
00116     snprintf (buffer, 64, "%s %s: %s", gettext ("Variable"), variable->name,
00117               message);
00118   error_message = g_strdup (buffer);
00119 }
```

5.27.3.2 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 }
```

5.27.3.3 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 }
```

5.27.3.4 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

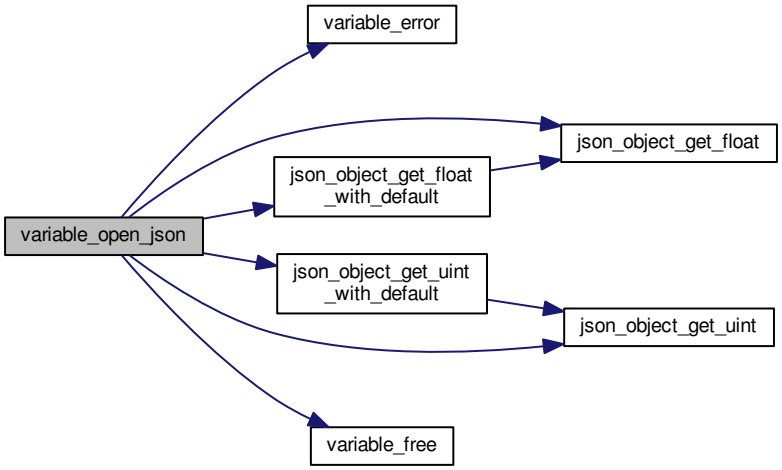
1 on success, 0 on error.

Definition at line 302 of file variable.c.

```
00304 {
00305   JsonObject *object;
00306   const char *label;
00307   int error_code;
00308 #if DEBUG_VARIABLE
00309   fprintf (stderr, "variable_open_json: start\n");
00310 #endif
00311   object = json_node_get_object (node);
00312   label = json_object_get_string_member (object, LABEL_NAME);
00313   if (!label)
00314     {
00315       variable_error (variable, gettext ("no name"));
00316       goto exit_on_error;
00317     }
00318   variable->name = g_strdup (label);
00319   if (json_object_get_member (object, LABEL_MINIMUM))
00320     {
00321       variable->rangemin
00322         = json_object_get_float (object, LABEL_MINIMUM, &error_code);
00323       if (error_code)
00324         {
00325           variable_error (variable, gettext ("bad minimum"));
00326           goto exit_on_error;
00327         }
00328       variable->rangeminabs
00329         = json_object_get_float_with_default (object,
    LABEL_ABSOLUTE_MINIMUM,
00330                                               -G_MAXDOUBLE, &error_code);
00331       if (error_code)
00332         {
00333           variable_error (variable, gettext ("bad absolute minimum"));
00334           goto exit_on_error;
00335         }
00336       if (variable->rangemin < variable->rangeminabs)
00337         {
00338           variable_error (variable, gettext ("minimum range not allowed"));
00339           goto exit_on_error;
00340         }
00341     }
00342   else
00343     {
00344       variable_error (variable, gettext ("no minimum range"));
00345       goto exit_on_error;
00346     }
00347   if (json_object_get_member (object, LABEL_MAXIMUM))
00348     {
00349       variable->rangemax
00350         = json_object_get_float (object, LABEL_MAXIMUM, &error_code);
00351       if (error_code)
00352         {
00353           variable_error (variable, gettext ("bad maximum"));
00354           goto exit_on_error;
00355         }
00356       variable->rangemaxabs
00357         = json_object_get_float_with_default (object,
    LABEL_ABSOLUTE_MAXIMUM,
00358                                               G_MAXDOUBLE, &error_code);
00359       if (error_code)
00360         {
00361           variable_error (variable, gettext ("bad absolute maximum"));
00362           goto exit_on_error;
00363         }
00364       if (variable->rangemax > variable->rangemaxabs)
00365         {
00366           variable_error (variable, gettext ("maximum range not allowed"));
00367           goto exit_on_error;
00368         }
00369       if (variable->rangemax < variable->rangemin)
00370         {
00371           variable_error (variable, gettext ("bad range"));
00372           goto exit_on_error;
00373         }
00374     }
00375   else
00376     {
00377       variable_error (variable, gettext ("no maximum range"));
00378       goto exit_on_error;
00379     }
```

```
00380   variable->precision
00381     = json_object_get_uint_with_default (object,
    LABEL_PRECISION,
00382                                          DEFAULT_PRECISION, &error_code);
00383   if (error_code || variable->precision >= NPRECISIONS)
00384     {
00385       variable_error (variable, gettext ("bad precision"));
00386       goto exit_on_error;
00387     }
00388   if (algorithm == ALGORITHM_SWEEP)
00389     {
00390       if (json_object_get_member (object, LABEL_NSWEEPS))
00391         {
00392           variable->nsweeps
00393             = json_object_get_uint (object, LABEL_NSWEEPS, &error_code);
00394           if (error_code || !variable->nsweeps)
00395             {
00396               variable_error (variable, gettext ("bad sweeps"));
00397               goto exit_on_error;
00398             }
00399         }
00400       else
00401         {
00402           variable_error (variable, gettext ("no sweeps number"));
00403           goto exit_on_error;
00404         }
00405 #if DEBUG_VARIABLE
00406       fprintf (stderr, "variable_open_json: nsweeps=%u\n", variable->nsweeps);
00407 #endif
00408     }
00409   if (algorithm == ALGORITHM_GENETIC)
00410     {
00411       // Obtaining bits representing each variable
00412       if (json_object_get_member (object, LABEL_NBITS))
00413         {
00414           variable->nbits
00415             = json_object_get_uint (object, LABEL_NBITS, &error_code);
00416           if (error_code || !variable->nbits)
00417             {
00418               variable_error (variable, gettext ("invalid bits number"));
00419               goto exit_on_error;
00420             }
00421         }
00422       else
00423         {
00424           variable_error (variable, gettext ("no bits number"));
00425           goto exit_on_error;
00426         }
00427     }
00428   else if (nsteps)
00429     {
00430       variable->step = json_object_get_float (object,
    LABEL_STEP, &error_code);
00431       if (error_code || variable->step < 0.)
00432         {
00433           variable_error (variable, gettext ("bad step size"));
00434           goto exit_on_error;
00435         }
00436     }
00437
00438 #if DEBUG_VARIABLE
00439   fprintf (stderr, "variable_open_json: end\n");
00440 #endif
00441   return 1;
00442 exit_on_error:
00443   variable_free (variable, INPUT_TYPE_JSON);
00444 #if DEBUG_VARIABLE
00445   fprintf (stderr, "variable_open_json: end\n");
00446 #endif
00447   return 0;
00448 }
```

Here is the call graph for this function:



5.27.3.5 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.

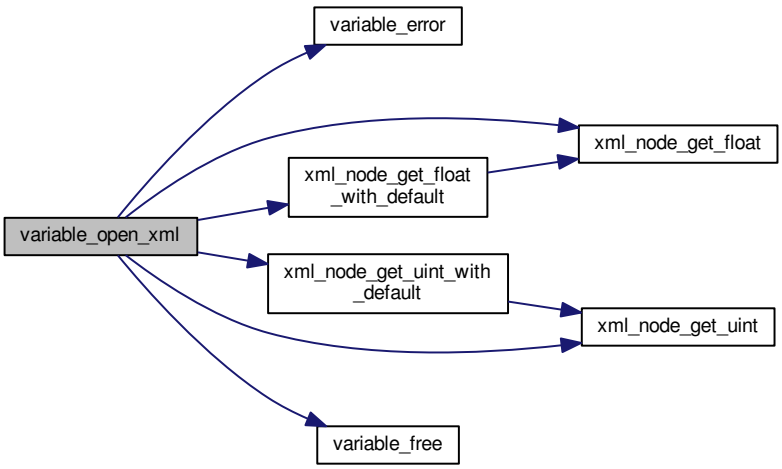
Definition at line 136 of file variable.c.

```
00138 {
00139   int error_code;
00140 
00141 #if DEBUG_VARIABLE
00142   fprintf (stderr, "variable_open_xml: start\n");
00143 #endif
00144 
00145   variable->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
00146   if (!variable->name)
```

```
00147     {
00148       variable_error (variable, gettext ("no name"));
00149       goto exit_on_error;
00150     }
00151   if (xmlHasProp (node, (const xmlChar *) LABEL_MINIMUM))
00152     {
00153       variable->rangemin
00154         = xml_node_get_float (node, (const xmlChar *)
      LABEL_MINIMUM,
00155                               &error_code);
00156       if (error_code)
00157         {
00158           variable_error (variable, gettext ("bad minimum"));
00159           goto exit_on_error;
00160         }
00161       variable->rangeminabs = xml_node_get_float_with_default
00162         (node, (const xmlChar *) LABEL_ABSOLUTE_MINIMUM, -G_MAXDOUBLE,
00163          &error_code);
00164       if (error_code)
00165         {
00166           variable_error (variable, gettext ("bad absolute minimum"));
00167           goto exit_on_error;
00168         }
00169       if (variable->rangemin < variable->rangeminabs)
00170         {
00171           variable_error (variable, gettext ("minimum range not allowed"));
00172           goto exit_on_error;
00173         }
00174     }
00175   else
00176     {
00177       variable_error (variable, gettext ("no minimum range"));
00178       goto exit_on_error;
00179     }
00180   if (xmlHasProp (node, (const xmlChar *) LABEL_MAXIMUM))
00181     {
00182       variable->rangemax
00183         = xml_node_get_float (node, (const xmlChar *)
      LABEL_MAXIMUM,
00184                               &error_code);
00185       if (error_code)
00186         {
00187           variable_error (variable, gettext ("bad maximum"));
00188           goto exit_on_error;
00189         }
00190       variable->rangemaxabs = xml_node_get_float_with_default
00191         (node, (const xmlChar *) LABEL_ABSOLUTE_MAXIMUM, G_MAXDOUBLE,
00192          &error_code);
00193       if (error_code)
00194         {
00195           variable_error (variable, gettext ("bad absolute maximum"));
00196           goto exit_on_error;
00197         }
00198       if (variable->rangemax > variable->rangemaxabs)
00199         {
00200           variable_error (variable, gettext ("maximum range not allowed"));
00201           goto exit_on_error;
00202         }
00203       if (variable->rangemax < variable->rangemin)
00204         {
00205           variable_error (variable, gettext ("bad range"));
00206           goto exit_on_error;
00207         }
00208     }
00209   else
00210     {
00211       variable_error (variable, gettext ("no maximum range"));
00212       goto exit_on_error;
00213     }
00214   variable->precision
00215     = xml_node_get_uint_with_default (node, (const xmlChar *)
      LABEL_PRECISION,
00216                                       DEFAULT_PRECISION, &error_code);
00217   if (error_code || variable->precision >= NPRECISIONS)
00218     {
00219       variable_error (variable, gettext ("bad precision"));
00220       goto exit_on_error;
00221     }
00222   if (algorithm == ALGORITHM_SWEEP)
00223     {
00224       if (xmlHasProp (node, (const xmlChar *) LABEL_NSWEEPS))
00225         {
00226           variable->nsweeps
00227             = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NSWEEPS,
00228                                  &error_code);
00229           if (error_code || !variable->nsweeps)
```

```
00230             {
00231               variable_error (variable, gettext ("bad sweeps"));
00232               goto exit_on_error;
00233             }
00234         }
00235       else
00236         {
00237           variable_error (variable, gettext ("no sweeps number"));
00238           goto exit_on_error;
00239         }
00240 #if DEBUG_VARIABLE
00241       fprintf (stderr, "variable_open_xml: nsweeps=%u\n", variable->nsweeps);
00242 #endif
00243     }
00244   if (algorithm == ALGORITHM_GENETIC)
00245     {
00246       // Obtaining bits representing each variable
00247       if (xmlHasProp (node, (const xmlChar *) LABEL_NBITS))
00248         {
00249           variable->nbits
00250             = xml_node_get_uint (node, (const xmlChar *)
      LABEL_NBITS,
00251                                  &error_code);
00252           if (error_code || !variable->nbits)
00253             {
00254               variable_error (variable, gettext ("invalid bits number"));
00255               goto exit_on_error;
00256             }
00257         }
00258       else
00259         {
00260           variable_error (variable, gettext ("no bits number"));
00261           goto exit_on_error;
00262         }
00263     }
00264   else if (nsteps)
00265     {
00266       variable->step
00267         = xml_node_get_float (node, (const xmlChar *)
      LABEL_STEP, &error_code);
00268       if (error_code || variable->step < 0.)
00269         {
00270           variable_error (variable, gettext ("bad step size"));
00271           goto exit_on_error;
00272         }
00273     }
00274
00275 #if DEBUG_VARIABLE
00276   fprintf (stderr, "variable_open_xml: end\n");
00277 #endif
00278   return 1;
00279 exit_on_error:
00280   variable_free (variable, INPUT_TYPE_XML);
00281 #if DEBUG_VARIABLE
00282   fprintf (stderr, "variable_open_xml: end\n");
00283 #endif
00284   return 0;
00285 }
```

Here is the call graph for this function:



5.28 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 2012-2016, AUTHORS.
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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 #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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