MPCOTool

4.10.2

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Chapter 1

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Chapter 3

Data Structure Documentation

3.1 Experiment Struct Reference

Struct to define the experiment data.

```
#include <experiment.h>
```

Data Fields

- char ∗ name

  File name.
- char ∗ stencil [MAX_NINPUTS]

  Array of template names of input files.
- double weight

  Objective function weight.
- unsigned int ninputs

  Number of input files to the simulator.
- unsigned int template_flags

  Flags of template files.

3.1.1 Detailed Description

Struct to define the experiment data.

Definition at line 45 of file experiment.h.

3.1.2 Field Documentation

3.1.2.1 name

```
char* Experiment::name
```

File name.

Definition at line 47 of file experiment.h.

3.1.2.2 ninputs

```
unsigned int Experiment::ninputs
```

Number of input files to the simulator.

Definition at line 50 of file experiment.h.

3.1.2.3 stencil

```
char* Experiment::stencil[MAX_NINPUTS]
```

Array of template names of input files.

Definition at line 48 of file experiment.h.

3.1.2.4 template_flags

```
unsigned int Experiment::template_flags
```

Flags of template files.

Definition at line 51 of file experiment.h.

3.1.2.5 weight

```
double Experiment::weight
```

Objective function weight.

Definition at line 49 of file experiment.h.

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

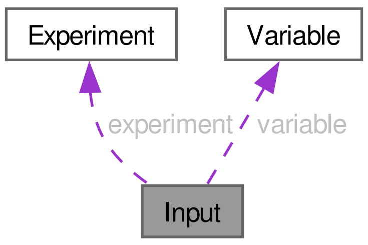
- experiment.h

3.2 Input Struct Reference

Struct to define the optimization input file.

```
#include <input.h>
```

Collaboration diagram for Input:



Data Fields

- Experiment ∗ experiment

  Array or experiments.
- Variable ∗ variable

  Array of variables.
- char ∗ result

  Name of the result file.
- char ∗ variables

  Name of the variables file.
- char ∗ simulator

  Name of the simulator program.
- char ∗ evaluator

  Name of the program to evaluate the objective function.
- char ∗ cleaner

  Name of the cleaner program.
- 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 hill climbing method.
- unsigned int nfinal_steps

  Number of steps to do the hill climbing method at the final pass.
- unsigned int climbing

  Method to estimate the hill climbing.
- unsigned int nestimates

Number of simulations to estimate the hill climbing.
- 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.
- unsigned int template_flags

  Flags of template files.

3.2.1 Detailed Description

Struct to define the optimization input file.

Definition at line 65 of file input.h.

3.2.2 Field Documentation

3.2.2.1 adaptation_ratio

```
double Input::adaptation_ratio
```

Adaptation probability.

Definition at line 80 of file input.h.

3.2.2.2 algorithm

```
unsigned int Input::algorithm
```

Algorithm type.

Definition at line 89 of file input.h.

3.2.2.3 cleaner

```
char* Input::cleaner
```

Name of the cleaner program.

Definition at line 74 of file input.h.

3.2.2.4 climbing

```
unsigned int Input::climbing
```

Method to estimate the hill climbing.

Definition at line 94 of file input.h.

3.2.2.5 directory

```
char* Input::directory
```

Working directory.

Definition at line 75 of file input.h.

3.2.2.6 evaluator

```
char* Input::evaluator
```

Name of the program to evaluate the objective function.

Definition at line 72 of file input.h.

3.2.2.7 experiment

```
Experiment* Input::experiment
```

Array or experiments.

Definition at line 67 of file input.h.

3.2.2.8 mutation_ratio

```
double Input::mutation_ratio
```

Mutation probability.

Definition at line 78 of file input.h.

3.2.2.9 name

```
char* Input::name
```

Input data file name.

Definition at line 76 of file input.h.

3.2.2.10 nbest

```
unsigned int Input::nbest
```

Number of best simulations.

Definition at line 98 of file input.h.

3.2.2.11 nestimates

```
unsigned int Input::nestimates
```

Number of simulations to estimate the hill climbing.

Definition at line 95 of file input.h.

3.2.2.12 nexperiments

```
unsigned int Input::nexperiments
```

Experiments number.

Definition at line 87 of file input.h.

3.2.2.13 nfinal_steps

```
unsigned int Input::nfinal_steps
```

Number of steps to do the hill climbing method at the final pass.

Definition at line 92 of file input.h.

3.2.2.14 niterations

```
unsigned int Input::niterations
```

Number of algorithm iterations.

Definition at line 97 of file input.h.

3.2.2.15 norm

```
unsigned int Input::norm
```

Error norm type.

Definition at line 99 of file input.h.

3.2.2.16 nsimulations

```
unsigned int Input::nsimulations
```

Simulations number per experiment.

Definition at line 88 of file input.h.

3.2.2.17 nsteps

```
unsigned int Input::nsteps
```

Number of steps to do the hill climbing method.

Definition at line 90 of file input.h.

3.2.2.18 nvariables

```
unsigned int Input::nvariables
```

Variables number.

Definition at line 86 of file input.h.

3.2.2.19 p

```
double Input::p
```

Exponent of the P error norm.

Definition at line 82 of file input.h.

3.2.2.20 relaxation

```
double Input::relaxation
```

Relaxation parameter.

Definition at line 81 of file input.h.

3.2.2.21 reproduction_ratio

```
double Input::reproduction_ratio
```

Reproduction probability.

Definition at line 79 of file input.h.

3.2.2.22 result

```
char* Input::result
```

Name of the result file.

Definition at line 69 of file input.h.

3.2.2.23 seed

```
unsigned long int Input::seed
```

Seed of the pseudo-random numbers generator.

Definition at line 84 of file input.h.

3.2.2.24 simulator

```
char* Input::simulator
```

Name of the simulator program.

Definition at line 71 of file input.h.

3.2.2.25 template_flags

```
unsigned int Input::template_flags
```

Flags of template files.

Definition at line 101 of file input.h.

3.2.2.26 threshold

```
double Input::threshold
```

Threshold to finish the optimization.

Definition at line 83 of file input.h.

3.2.2.27 tolerance

```
double Input::tolerance
```

Algorithm tolerance.

Definition at line 77 of file input.h.

3.2.2.28 type

```
unsigned int Input::type
```

Type of input file.

Definition at line 100 of file input.h.

3.2.2.29 variable

```
Variable* Input::variable
```

Array of variables.

Definition at line 68 of file input.h.

3.2.2.30 variables

```
char* Input::variables
```

Name of the variables file.

Definition at line 70 of file input.h.

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

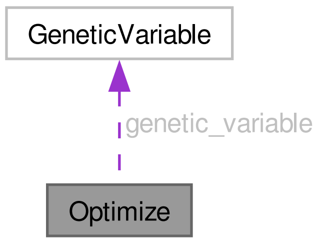
- input.h

3.3 Optimize Struct Reference

Struct to define the optimization ation data.

```
#include <optimize.h>
```

Collaboration diagram for Optimize:



Data Fields

- GMappedFile ∗∗ file [MAX_NINPUTS]

  Matrix of input template files.
- char ∗∗ experiment

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

  Array of variable names.
- gsl_rng ∗ rng

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

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

  Result file.
- FILE ∗ file_variables

  Variables file.
- char ∗ result

  Name of the result file.
- char ∗ variables

  Name of the variables file.
- char ∗ simulator

  Name of the simulator program.
- char ∗ evaluator

  Name of the program to evaluate the objective function.
- char ∗ cleaner

  Name of the cleaner program.
- 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 hill climbing method step sizes.
- double ∗ climbing

  Vector of hill climbing 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_climbing
- 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 hill climbing method.
- unsigned int nfinal_steps

  Number of steps to do the hill climbing method at the final pass.
- unsigned int nestimates

  Number of simulations to estimate the climbing.
- 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_climbing

  Beginning simulation number of the task for the hill climbing method.
- unsigned int nend_climbing

  Ending simulation number of the task for the hill climbing 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.
- unsigned int template_flags

  Flags of template files.
- int mpi_rank

  Number of MPI task.

3.3.1 Detailed Description

Struct to define the optimization ation data.

Definition at line 45 of file optimize.h.

3.3.2 Field Documentation

3.3.2.1 adaptation_ratio

```
double Optimize::adaptation_ratio
```

Adaptation probability.

Definition at line 87 of file optimize.h.

3.3.2.2 algorithm

```
unsigned int Optimize::algorithm
```

Algorithm type.

Definition at line 104 of file optimize.h.

3.3.2.3 calculation_time

```
double Optimize::calculation_time
```

Calculation time.

Definition at line 89 of file optimize.h.

3.3.2.4 cleaner

```
char* Optimize::cleaner
```

Name of the cleaner program.

Definition at line 60 of file optimize.h.

3.3.2.5 climbing

```
double* Optimize::climbing
```

Vector of hill climbing estimation.

Definition at line 69 of file optimize.h.

3.3.2.6 error_best

```
double* Optimize::error_best
```

Array of the best minimum errors.

Definition at line 66 of file optimize.h.

3.3.2.7 error_old

```
double* Optimize::error_old
```

Array of the best minimum errors on the previous step.

Definition at line 72 of file optimize.h.

3.3.2.8 evaluator

```
char* Optimize::evaluator
```

Name of the program to evaluate the objective function.

Definition at line 58 of file optimize.h.

3.3.2.9 experiment

```
char** Optimize::experiment
```

Array of experimental data file names.

Definition at line 48 of file optimize.h.

3.3.2.10 file

```
GMappedFile** Optimize::file[MAX_NINPUTS]
```

Matrix of input template files.

Definition at line 47 of file optimize.h.

3.3.2.11 file_result

```
FILE* Optimize::file_result
```

Result file.

Definition at line 53 of file optimize.h.

3.3.2.12 file_variables

```
FILE* Optimize::file_variables
```

Variables file.

Definition at line 54 of file optimize.h.

3.3.2.13 genetic_variable

```
GeneticVariable* Optimize::genetic_variable
```

Array of variables for the genetic algorithm.

Definition at line 51 of file optimize.h.

3.3.2.14 label

```
char** Optimize::label
```

Array of variable names.

Definition at line 49 of file optimize.h.

3.3.2.15 mpi_rank

```
int Optimize::mpi_rank
```

Number of MPI task.

Definition at line 117 of file optimize.h.

3.3.2.16 mutation_ratio

```
double Optimize::mutation_ratio
```

Mutation probability.

Definition at line 85 of file optimize.h.

3.3.2.17 nbest

```
unsigned int Optimize::nbest
```

Number of best simulations.

Definition at line 112 of file optimize.h.

3.3.2.18 nbits

```
unsigned int* Optimize::nbits
```

Array of bits number of the genetic algorithm.

Definition at line 76 of file optimize.h.

3.3.2.19 nend

```
unsigned int Optimize::nend
```

Ending simulation number of the task.

Definition at line 106 of file optimize.h.

3.3.2.20 nend_climbing

```
unsigned int Optimize::nend_climbing
```

Ending simulation number of the task for the hill climbing method.

Definition at line 109 of file optimize.h.

3.3.2.21 nestimates

```
unsigned int Optimize::nestimates
```

Number of simulations to estimate the climbing.

Definition at line 102 of file optimize.h.

3.3.2.22 nexperiments

```
unsigned int Optimize::nexperiments
```

Experiments number.

Definition at line 95 of file optimize.h.

3.3.2.23 nfinal_steps

```
unsigned int Optimize::nfinal_steps
```

Number of steps to do the hill climbing method at the final pass.

Definition at line 100 of file optimize.h.

3.3.2.24 ninputs

```
unsigned int Optimize::ninputs
```

Number of input files to the simulator.

Definition at line 96 of file optimize.h.

3.3.2.25 niterations

```
unsigned int Optimize::niterations
```

Number of algorithm iterations.

Definition at line 111 of file optimize.h.

3.3.2.26 nsaveds

```
unsigned int Optimize::nsaveds
```

Number of saved simulations.

Definition at line 113 of file optimize.h.

3.3.2.27 nsimulations

```
unsigned int Optimize::nsimulations
```

Simulations number per experiment.

Definition at line 97 of file optimize.h.

3.3.2.28 nstart

```
unsigned int Optimize::nstart
```

Beginning simulation number of the task.

Definition at line 105 of file optimize.h.

3.3.2.29 nstart_climbing

```
unsigned int Optimize::nstart_climbing
```

Beginning simulation number of the task for the hill climbing method.

Definition at line 107 of file optimize.h.

3.3.2.30 nsteps

```
unsigned int Optimize::nsteps
```

Number of steps for the hill climbing method.

Definition at line 98 of file optimize.h.

3.3.2.31 nsweeps

```
unsigned int* Optimize::nsweeps
```

Array of sweeps of the sweep algorithm.

Definition at line 75 of file optimize.h.

3.3.2.32 nvariables

```
unsigned int Optimize::nvariables
```

Variables number.

Definition at line 94 of file optimize.h.

3.3.2.33 p

```
double Optimize::p
```

Exponent of the P error norm.

Definition at line 90 of file optimize.h.

3.3.2.34 precision

```
unsigned int* Optimize::precision
```

Array of variable precisions.

Definition at line 74 of file optimize.h.

3.3.2.35 rangemax

```
double* Optimize::rangemax
```

Array of maximum variable values.

Definition at line 63 of file optimize.h.

3.3.2.36 rangemaxabs

```
double* Optimize::rangemaxabs
```

Array of absolute maximum variable values.

Definition at line 65 of file optimize.h.

3.3.2.37 rangemin

```
double* Optimize::rangemin
```

Array of minimum variable values.

Definition at line 62 of file optimize.h.

3.3.2.38 rangeminabs

```
double* Optimize::rangeminabs
```

Array of absolute minimum variable values.

Definition at line 64 of file optimize.h.

3.3.2.39 relaxation

```
double Optimize::relaxation
```

Relaxation parameter.

Definition at line 88 of file optimize.h.

3.3.2.40 reproduction_ratio

```
double Optimize::reproduction_ratio
```

Reproduction probability.

Definition at line 86 of file optimize.h.

3.3.2.41 result

```
char* Optimize::result
```

Name of the result file.

Definition at line 55 of file optimize.h.

3.3.2.42 rng

```
gsl_rng* Optimize::rng
```

GSL random number generator.

Definition at line 50 of file optimize.h.

3.3.2.43 seed

```
unsigned long int Optimize::seed
```

Seed of the pseudo-random numbers generator.

Definition at line 92 of file optimize.h.

3.3.2.44 simulation_best

```
unsigned int* Optimize::simulation_best
```

Array of best simulation numbers.

Definition at line 83 of file optimize.h.

3.3.2.45 simulator

```
char* Optimize::simulator
```

Name of the simulator program.

Definition at line 57 of file optimize.h.

3.3.2.46 step

```
double* Optimize::step
```

Array of hill climbing method step sizes.

Definition at line 68 of file optimize.h.

3.3.2.47 stop

```
unsigned int Optimize::stop
```

To stop the simulations.

Definition at line 114 of file optimize.h.

3.3.2.48 template_flags

```
unsigned int Optimize::template_flags
```

Flags of template files.

Definition at line 115 of file optimize.h.

3.3.2.49 thread

```
unsigned int* Optimize::thread
```

Array of simulation numbers to calculate on the thread.

Definition at line 78 of file optimize.h.

3.3.2.50 thread_climbing

```
unsigned int* Optimize::thread_climbing
```

Array of simulation numbers to calculate on the thread for the hill climbing method.

Definition at line 80 of file optimize.h.

3.3.2.51 threshold

```
double Optimize::threshold
```

Threshold to finish the optimization.

Definition at line 91 of file optimize.h.

3.3.2.52 tolerance

```
double Optimize::tolerance
```

Algorithm tolerance.

Definition at line 84 of file optimize.h.

3.3.2.53 value

```
double* Optimize::value
```

Array of variable values.

Definition at line 61 of file optimize.h.

3.3.2.54 value_old

```
double* Optimize::value_old
```

Array of the best variable values on the previous step.

Definition at line 70 of file optimize.h.

3.3.2.55 variables

```
char* Optimize::variables
```

Name of the variables file.

Definition at line 56 of file optimize.h.

3.3.2.56 weight

```
double* Optimize::weight
```

Array of the experiment weights.

Definition at line 67 of file optimize.h.

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

- optimize.h

3.4 Options Struct Reference

Struct to define the options dialog.

```
#include <interface.h>
```

Data Fields

- GtkDialog ∗ dialog

  Main GtkDialog.
- GtkGrid ∗ grid

  Main GtkGrid.
- GtkLabel ∗ label_seed

  Pseudo-random numbers generator seed GtkLabel.
- GtkSpinButton ∗ spin_seed

  Pseudo-random numbers generator seed GtkSpinButton.
- GtkLabel ∗ label_threads

  Threads number GtkLabel.
- GtkSpinButton ∗ spin_threads

  Threads number GtkSpinButton.
- GtkLabel ∗ label_climbing

  Climbing threads number GtkLabel.
- GtkSpinButton ∗ spin_climbing

  Climbing threads number GtkSpinButton.

3.4.1 Detailed Description

Struct to define the options dialog.

Definition at line 48 of file interface.h.

3.4.2 Field Documentation

3.4.2.1 dialog

```
GtkDialog* Options::dialog
```

Main GtkDialog.

Definition at line 50 of file interface.h.

3.4.2.2 grid

```
GtkGrid* Options::grid
```

Main GtkGrid.

Definition at line 51 of file interface.h.

3.4.2.3 label_climbing

```
GtkLabel* Options::label_climbing
```

Climbing threads number GtkLabel.

Definition at line 58 of file interface.h.

3.4.2.4 label_seed

`GtkLabel* Options::label_seed`

Pseudo-random numbers generator seed GtkLabel.

Definition at line 52 of file interface.h.

3.4.2.5 label_threads

`GtkLabel* Options::label_threads`

Threads number GtkLabel.

Definition at line 56 of file interface.h.

3.4.2.6 spin_climbing

`GtkSpinButton* Options::spin_climbing`

Climbing threads number GtkSpinButton.

Definition at line 59 of file interface.h.

3.4.2.7 spin_seed

`GtkSpinButton* Options::spin_seed`

Pseudo-random numbers generator seed GtkSpinButton.

Definition at line 54 of file interface.h.

3.4.2.8 spin_threads

`GtkSpinButton* Options::spin_threads`

Threads number GtkSpinButton.

Definition at line 57 of file interface.h.

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

- interface.h

3.5 ParallelData Struct Reference

Struct to pass to the GThreads parallelized function.

`#include <optimize.h>`

Data Fields

- unsigned int thread
  Thread number.

3.5.1 Detailed Description

Struct to pass to the GThreads parallelized function.

Definition at line 125 of file optimize.h.

3.5.2 Field Documentation

3.5.2.1 thread

```
unsigned int ParallelData::thread
```

Thread number.

Definition at line 127 of file optimize.h.

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

- optimize.h

3.6 Running Struct Reference

Struct to define the running dialog.

```
#include <interface.h>
```

Data Fields

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

3.6.1 Detailed Description

Struct to define the running dialog.

Definition at line 66 of file interface.h.

3.6.2 Field Documentation

3.6.2.1 dialog

```
GtkDialog* Running::dialog
```

Main GtkDialog.

Definition at line 68 of file interface.h.

3.6.2.2 grid

```
GtkGrid* Running::grid
```

Grid GtkGrid.

Definition at line 71 of file interface.h.

3.6.2.3 label

```
GtkLabel* Running::label
```

Label GtkLabel.

Definition at line 69 of file interface.h.

3.6.2.4 spinner

```
GtkSpinner* Running::spinner
```

Animation GtkSpinner.

Definition at line 70 of file interface.h.

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

- interface.h

3.7 Variable Struct Reference

Struct to define the variable data.

```
#include <variable.h>
```

Data Fields

- char ∗ name

  Variable name.
- double rangemin

  Minimum variable value.
- double rangemax

  Maximum variable value.
- double rangeminabs

  Absolute minimum variable value.
- double rangemaxabs

  Absolute maximum variable value.
- double step

  Hill climbing method step size.
- unsigned int precision

  Variable precision.
- unsigned int nsweeps

  Sweeps of the sweep algorithm.
- unsigned int nbits

  Bits number of the genetic algorithm.

3.7.1 Detailed Description

Struct to define the variable data.

Definition at line 54 of file variable.h.

3.7.2 Field Documentation

3.7.2.1 name

```
char* Variable::name
```

Variable name.

Definition at line 56 of file variable.h.

3.7.2.2 nbits

```
unsigned int Variable::nbits
```

Bits number of the genetic algorithm.

Definition at line 64 of file variable.h.

3.7.2.3 nsweeps

```
unsigned int Variable::nsweeps
```

Sweeps of the sweep algorithm.

Definition at line 63 of file variable.h.

3.7.2.4 precision

```
unsigned int Variable::precision
```

Variable precision.

Definition at line 62 of file variable.h.

3.7.2.5 rangemax

```
double Variable::rangemax
```

Maximum variable value.

Definition at line 58 of file variable.h.

3.7.2.6 rangemaxabs

```
double Variable::rangemaxabs
```

Absolute maximum variable value.

Definition at line 60 of file variable.h.

3.7.2.7 rangemin

```
double Variable::rangemin
```

Minimum variable value.

Definition at line 57 of file variable.h.

3.7.2.8 rangeminabs

```
double Variable::rangeminabs
```

Absolute minimum variable value.

Definition at line 59 of file variable.h.

3.7.2.9 step

```
double Variable::step
```

Hill climbing method step size.

Definition at line 61 of file variable.h.

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

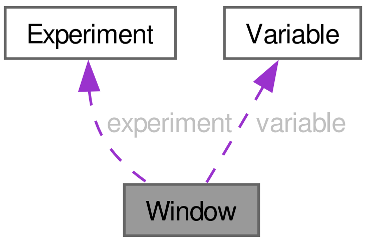
- variable.h

3.8 Window Struct Reference

Struct to define the main window.

```
#include <interface.h>
```

Collaboration diagram for Window:



Data Fields

- GtkWindow ∗ window

  Main GtkWindow.
- GtkGrid ∗ grid

  Main GtkGrid.
- GtkBox ∗ box_buttons

  GtkBox to store the main buttons.
- GtkButton ∗ button_open

  Open GtkButton.
- GtkButton ∗ button_save

  Save GtkButton.
- GtkButton ∗ button_run

  Run GtkButton.
- GtkButton ∗ button_options

  Options GtkButton.

- GtkButton ∗ button_help

  Help GtkButton.
- GtkButton ∗ button_about

  Help GtkButton.
- GtkButton ∗ button_exit

  Exit GtkButton.
- GtkGrid ∗ grid_files

  Files GtkGrid.
- GtkLabel ∗ label_simulator

  Simulator program GtkLabel.
- GtkButton ∗ button_simulator

  Simulator program GtkButton.
- GtkCheckButton ∗ check_evaluator

  Evaluator program GtkCheckButton.
- GtkButton ∗ button_evaluator

  Evaluator program GtkButton.
- GtkCheckButton ∗ check_cleaner

  Cleaner program GtkCheckButton.
- GtkButton ∗ button_cleaner

  Cleaner program GtkButton.
- 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 GtkRadioButtons 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 GtkRadioButtons 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_climbing

  GtkCheckButton to check running the hill climbing method.
- GtkGrid ∗ grid_climbing

  GtkGrid to pack the hill climbing method widgets.
- GtkRadioButton ∗ button_climbing [NCLIMBINGS]

  Array of GtkRadioButtons array to set the hill climbing method.
- GtkLabel ∗ label_steps

  GtkLabel to set the steps number.
- GtkSpinButton ∗ spin_steps

  GtkSpinButton to set the steps number.
- GtkLabel ∗ label_final_steps

  GtkLabel to set the final steps number.
- GtkSpinButton ∗ spin_final_steps

  GtkSpinButton to set the final 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.
- GtkButton ∗ button_experiment

  GtkButton 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.
- GtkButton ∗ button_template [MAX_NINPUTS]

  Array of GtkButtons to set the input templates.
- GdkPixbuf ∗ logo

  Logo GdkPixbuf.
- Experiment ∗ experiment

  Array of experiments data.
- Variable ∗ variable

  Array of variables data.
- char ∗ application_directory

  Application directory.
- gulong id_experiment

  Identifier of the combo_experiment signal.
- gulong id_experiment_name

  Identifier of the button_experiment signal.
- gulong id_variable

  Identifier of the combo_variable signal.
- gulong id_variable_label

  Identifier of the entry_variable signal.

- gulong id_template [MAX_NINPUTS]

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

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

  Number of experiments.
- unsigned int nvariables

  Number of variables.

3.8.1 Detailed Description

Struct to define the main window.

Definition at line 78 of file interface.h.

3.8.2 Field Documentation

3.8.2.1 application_directory

```
char* Window::application_directory
```

Application directory.

Definition at line 220 of file interface.h.

3.8.2.2 box_buttons

```
GtkBox* Window::box_buttons
```

GtkBox to store the main buttons.

Definition at line 82 of file interface.h.

3.8.2.3 button_about

```
GtkButton* Window::button_about
```

Help GtkButton.

Definition at line 88 of file interface.h.

3.8.2.4 button_add_experiment

```
GtkButton* Window::button_add_experiment
```

GtkButton to add a experiment.

Definition at line 206 of file interface.h.

3.8.2.5 button_add_variable

`GtkButton* Window::button_add_variable`

GtkButton to add a variable.

Definition at line 178 of file interface.h.

3.8.2.6 button_algorithm

`GtkRadioButton* Window::button_algorithm[NALGORITHMS]`

Array of GtkRadioButtons to set the algorithm.

Definition at line 117 of file interface.h.

3.8.2.7 button_cleaner

`GtkButton* Window::button_cleaner`

Cleaner program GtkButton.

Definition at line 96 of file interface.h.

3.8.2.8 button_climbing

`GtkRadioButton* Window::button_climbing[NCLIMBINGS]`

Array of GtkRadioButtons array to set the hill climbing method.

Definition at line 152 of file interface.h.

3.8.2.9 button_evaluator

`GtkButton* Window::button_evaluator`

Evaluator program GtkButton.

Definition at line 94 of file interface.h.

3.8.2.10 button_exit

`GtkButton* Window::button_exit`

Exit GtkButton.

Definition at line 89 of file interface.h.

3.8.2.11 button_experiment

```
GtkButton* Window::button_experiment
```

GtkButton to set the experimental data file.

Definition at line 209 of file interface.h.

3.8.2.12 button_help

```
GtkButton* Window::button_help
```

Help GtkButton.

Definition at line 87 of file interface.h.

3.8.2.13 button_norm

```
GtkRadioButton* Window::button_norm[NNORMS]
```

Array of GtkRadioButtons to set the error norm.

Definition at line 104 of file interface.h.

3.8.2.14 button_open

```
GtkButton* Window::button_open
```

Open GtkButton.

Definition at line 83 of file interface.h.

3.8.2.15 button_options

```
GtkButton* Window::button_options
```

Options GtkButton.

Definition at line 86 of file interface.h.

3.8.2.16 button_remove_experiment

```
GtkButton* Window::button_remove_experiment
```

GtkButton to remove a experiment.

Definition at line 207 of file interface.h.

3.8.2.17 button_remove_variable

```
GtkButton* Window::button_remove_variable
```

GtkButton to remove a variable.

Definition at line 179 of file interface.h.

3.8.2.18 button_run

```
GtkButton* Window::button_run
```

Run GtkButton.

Definition at line 85 of file interface.h.

3.8.2.19 button_save

```
GtkButton* Window::button_save
```

Save GtkButton.

Definition at line 84 of file interface.h.

3.8.2.20 button_simulator

```
GtkButton* Window::button_simulator
```

Simulator program GtkButton.

Definition at line 92 of file interface.h.

3.8.2.21 button_template

```
GtkButton* Window::button_template[MAX_NINPUTS]
```

Array of GtkButtons to set the input templates.

Definition at line 215 of file interface.h.

3.8.2.22 check_cleaner

```
GtkCheckButton* Window::check_cleaner
```

Cleaner program GtkCheckButton.

Definition at line 95 of file interface.h.

3.8.2.23 check_climbing

```
GtkCheckButton* Window::check_climbing
```

GtkCheckButton to check running the hill climbing method.

Definition at line 147 of file interface.h.

3.8.2.24 check_evaluator

```
GtkCheckButton* Window::check_evaluator
```

Evaluator program GtkCheckButton.

Definition at line 93 of file interface.h.

3.8.2.25 check_maxabs

```
GtkCheckButton* Window::check_maxabs
```

Absolute maximum GtkCheckButton.

Definition at line 191 of file interface.h.

3.8.2.26 check_minabs

```
GtkCheckButton* Window::check_minabs
```

Absolute minimum GtkCheckButton.

Definition at line 188 of file interface.h.

3.8.2.27 check_template

```
GtkCheckButton* Window::check_template[MAX_NINPUTS]
```

Array of GtkCheckButtons to set the input templates.

Definition at line 213 of file interface.h.

3.8.2.28 combo_experiment

```
GtkComboBoxText* Window::combo_experiment
```

Experiment GtkComboBoxEntry.

Definition at line 205 of file interface.h.

3.8.2.29 combo_variable

`GtkComboBoxText* Window::combo_variable`

GtkComboBoxEntry to select a variable.

Definition at line 176 of file interface.h.

3.8.2.30 entry_result

`GtkEntry* Window::entry_result`

Result file GtkEntry.

Definition at line 98 of file interface.h.

3.8.2.31 entry_variable

`GtkEntry* Window::entry_variable`

GtkEntry to set the variable name.

Definition at line 181 of file interface.h.

3.8.2.32 entry_variables

`GtkEntry* Window::entry_variables`

Variables file GtkEntry.

Definition at line 100 of file interface.h.

3.8.2.33 experiment

`Experiment* Window::experiment`

Array of experiments data.

Definition at line 218 of file interface.h.

3.8.2.34 frame_algorithm

`GtkFrame* Window::frame_algorithm`

GtkFrame to set the algorithm.

Definition at line 114 of file interface.h.

3.8.2.35 frame_experiment

```
GtkFrame* Window::frame_experiment
```

Experiment GtkFrame.

Definition at line 203 of file interface.h.

3.8.2.36 frame_norm

```
GtkFrame* Window::frame_norm
```

GtkFrame to set the error norm.

Definition at line 101 of file interface.h.

3.8.2.37 frame_variable

```
GtkFrame* Window::frame_variable
```

Variable GtkFrame.

Definition at line 174 of file interface.h.

3.8.2.38 grid

```
GtkGrid* Window::grid
```

Main GtkGrid.

Definition at line 81 of file interface.h.

3.8.2.39 grid_algorithm

```
GtkGrid* Window::grid_algorithm
```

GtkGrid to set the algorithm.

Definition at line 115 of file interface.h.

3.8.2.40 grid_climbing

```
GtkGrid* Window::grid_climbing
```

GtkGrid to pack the hill climbing method widgets.

Definition at line 149 of file interface.h.

3.8.2.41 grid_experiment

```
GtkGrid* Window::grid_experiment
```

Experiment GtkGrid.

Definition at line 204 of file interface.h.

3.8.2.42 grid_files

```
GtkGrid* Window::grid_files
```

Files GtkGrid.

Definition at line 90 of file interface.h.

3.8.2.43 grid_norm

```
GtkGrid* Window::grid_norm
```

GtkGrid to set the error norm.

Definition at line 102 of file interface.h.

3.8.2.44 grid_variable

```
GtkGrid* Window::grid_variable
```

Variable GtkGrid.

Definition at line 175 of file interface.h.

3.8.2.45 id_experiment

```
gulong Window::id_experiment
```

Identifier of the combo_experiment signal.

Definition at line 221 of file interface.h.

3.8.2.46 id_experiment_name

```
gulong Window::id_experiment_name
```

Identifier of the button_experiment signal.

Definition at line 222 of file interface.h.

3.8.2.47 id_input

```
gulong Window::id_input[MAX_NINPUTS]
```

Array of identifiers of the button_template signal.

Definition at line 227 of file interface.h.

3.8.2.48 id_template

```
gulong Window::id_template[MAX_NINPUTS]
```

Array of identifiers of the check_template signal.

Definition at line 225 of file interface.h.

3.8.2.49 id_variable

```
gulong Window::id_variable
```

Identifier of the combo_variable signal.

Definition at line 223 of file interface.h.

3.8.2.50 id_variable_label

```
gulong Window::id_variable_label
```

Identifier of the entry_variable signal.

Definition at line 224 of file interface.h.

3.8.2.51 label_adaptation

```
GtkLabel* Window::label_adaptation
```

GtkLabel to set the adaptation ratio.

Definition at line 144 of file interface.h.

3.8.2.52 label_bests

```
GtkLabel* Window::label_bests
```

GtkLabel to set the best number.

Definition at line 131 of file interface.h.

3.8.2.53 label_bits

```
GtkLabel* Window::label_bits
```

Bits number GtkLabel.

Definition at line 198 of file interface.h.

3.8.2.54 label_estimates

```
GtkLabel* Window::label_estimates
```

GtkLabel to set the estimates number.

Definition at line 163 of file interface.h.

3.8.2.55 label_experiment

```
GtkLabel* Window::label_experiment
```

Experiment GtkLabel.

Definition at line 208 of file interface.h.

3.8.2.56 label_final_steps

```
GtkLabel* Window::label_final_steps
```

GtkLabel to set the final steps number.

Definition at line 160 of file interface.h.

3.8.2.57 label_generations

```
GtkLabel* Window::label_generations
```

GtkLabel to set the generations number.

Definition at line 136 of file interface.h.

3.8.2.58 label_iterations

```
GtkLabel* Window::label_iterations
```

GtkLabel to set the iterations number.

Definition at line 126 of file interface.h.

3.8.2.59 label_max

```
GtkLabel* Window::label_max
```

Maximum GtkLabel.

Definition at line 185 of file interface.h.

3.8.2.60 label_min

```
GtkLabel* Window::label_min
```

Minimum GtkLabel.

Definition at line 182 of file interface.h.

3.8.2.61 label_mutation

```
GtkLabel* Window::label_mutation
```

GtkLabel to set the mutation ratio.

Definition at line 139 of file interface.h.

3.8.2.62 label_p

```
GtkLabel* Window::label_p
```

GtkLabel to set the p parameter.

Definition at line 110 of file interface.h.

3.8.2.63 label_population

```
GtkLabel* Window::label_population
```

GtkLabel to set the population number.

Definition at line 133 of file interface.h.

3.8.2.64 label_precision

```
GtkLabel* Window::label_precision
```

Precision GtkLabel.

Definition at line 194 of file interface.h.

3.8.2.65 label_relaxation

```
GtkLabel* Window::label_relaxation
```

GtkLabel to set the relaxation parameter.

Definition at line 166 of file interface.h.

3.8.2.66 label_reproduction

```
GtkLabel* Window::label_reproduction
```

GtkLabel to set the reproduction ratio.

Definition at line 141 of file interface.h.

3.8.2.67 label_result

```
GtkLabel* Window::label_result
```

Result file GtkLabel.

Definition at line 97 of file interface.h.

3.8.2.68 label_simulations

```
GtkLabel* Window::label_simulations
```

GtkLabel to set the simulations number.

Definition at line 123 of file interface.h.

3.8.2.69 label_simulator

```
GtkLabel* Window::label_simulator
```

Simulator program GtkLabel.

Definition at line 91 of file interface.h.

3.8.2.70 label_step

```
GtkLabel* Window::label_step
```

GtkLabel to set the step.

Definition at line 200 of file interface.h.

3.8.2.71 label_steps

```
GtkLabel* Window::label_steps
```

GtkLabel to set the steps number.

Definition at line 158 of file interface.h.

3.8.2.72 label_sweeps

```
GtkLabel* Window::label_sweeps
```

Sweeps number GtkLabel.

Definition at line 196 of file interface.h.

3.8.2.73 label_threshold

```
GtkLabel* Window::label_threshold
```

GtkLabel to set the threshold.

Definition at line 170 of file interface.h.

3.8.2.74 label_tolerance

```
GtkLabel* Window::label_tolerance
```

GtkLabel to set the tolerance.

Definition at line 129 of file interface.h.

3.8.2.75 label_variable

```
GtkLabel* Window::label_variable
```

Variable GtkLabel.

Definition at line 180 of file interface.h.

3.8.2.76 label_variables

```
GtkLabel* Window::label_variables
```

Variables file GtkLabel.

Definition at line 99 of file interface.h.

3.8.2.77 label_weight

```
GtkLabel* Window::label_weight
```

Weight GtkLabel.

Definition at line 211 of file interface.h.

3.8.2.78 logo

```
GdkPixbuf* Window::logo
```

Logo GdkPixbuf.

Definition at line 217 of file interface.h.

3.8.2.79 nexperiments

```
unsigned int Window::nexperiments
```

Number of experiments.

Definition at line 229 of file interface.h.

3.8.2.80 nvariables

```
unsigned int Window::nvariables
```

Number of variables.

Definition at line 230 of file interface.h.

3.8.2.81 scrolled_max

```
GtkScrolledWindow* Window::scrolled_max
```

Maximum GtkScrolledWindow.

Definition at line 187 of file interface.h.

3.8.2.82 scrolled_maxabs

```
GtkScrolledWindow* Window::scrolled_maxabs
```

Absolute maximum GtkScrolledWindow.

Definition at line 193 of file interface.h.

3.8.2.83 scrolled_min

```
GtkScrolledWindow* Window::scrolled_min
```

Minimum GtkScrolledWindow.

Definition at line 184 of file interface.h.

3.8.2.84 scrolled_minabs

```
GtkScrolledWindow* Window::scrolled_minabs
```

Absolute minimum GtkScrolledWindow.

Definition at line 190 of file interface.h.

3.8.2.85 scrolled_p

```
GtkScrolledWindow* Window::scrolled_p
```

GtkScrolledWindow to set the p parameter.

Definition at line 112 of file interface.h.

3.8.2.86 scrolled_step

```
GtkScrolledWindow* Window::scrolled_step
```

step GtkScrolledWindow.

Definition at line 202 of file interface.h.

3.8.2.87 scrolled_threshold

```
GtkScrolledWindow* Window::scrolled_threshold
```

GtkScrolledWindow to set the threshold.

Definition at line 172 of file interface.h.

3.8.2.88 spin_adaptation

```
GtkSpinButton* Window::spin_adaptation
```

GtkSpinButton to set the adaptation ratio.

Definition at line 145 of file interface.h.

3.8.2.89 spin_bests

```
GtkSpinButton* Window::spin_bests
```

GtkSpinButton to set the best number.

Definition at line 132 of file interface.h.

3.8.2.90 spin_bits

```
GtkSpinButton* Window::spin_bits
```

Bits number GtkSpinButton.

Definition at line 199 of file interface.h.

3.8.2.91 spin_estimates

```
GtkSpinButton* Window::spin_estimates
```

GtkSpinButton to set the estimates number.

Definition at line 164 of file interface.h.

3.8.2.92 spin_final_steps

```
GtkSpinButton* Window::spin_final_steps
```

GtkSpinButton to set the final steps number.

Definition at line 161 of file interface.h.

3.8.2.93 spin_generations

```
GtkSpinButton* Window::spin_generations
```

GtkSpinButton to set the generations number.

Definition at line 137 of file interface.h.

3.8.2.94 spin_iterations

```
GtkSpinButton* Window::spin_iterations
```

GtkSpinButton to set the iterations number.

Definition at line 127 of file interface.h.

3.8.2.95 spin_max

```
GtkSpinButton* Window::spin_max
```

Maximum GtkSpinButton.

Definition at line 186 of file interface.h.

3.8.2.96 spin_maxabs

```
GtkSpinButton* Window::spin_maxabs
```

Absolute maximum GtkSpinButton.

Definition at line 192 of file interface.h.

3.8.2.97 spin_min

```
GtkSpinButton* Window::spin_min
```

Minimum GtkSpinButton.

Definition at line 183 of file interface.h.

3.8.2.98 spin_minabs

```
GtkSpinButton* Window::spin_minabs
```

Absolute minimum GtkSpinButton.

Definition at line 189 of file interface.h.

3.8.2.99 spin_mutation

```
GtkSpinButton* Window::spin_mutation
```

GtkSpinButton to set the mutation ratio.

Definition at line 140 of file interface.h.

3.8.2.100 spin_p

```
GtkSpinButton* Window::spin_p
```

GtkSpinButton to set the p parameter.

Definition at line 111 of file interface.h.

3.8.2.101 spin_population

```
GtkSpinButton* Window::spin_population
```

GtkSpinButton to set the population number.

Definition at line 134 of file interface.h.

3.8.2.102 spin_precision

```
GtkSpinButton* Window::spin_precision
```

Precision digits GtkSpinButton.

Definition at line 195 of file interface.h.

3.8.2.103 spin_relaxation

```
GtkSpinButton* Window::spin_relaxation
```

GtkSpinButton to set the relaxation parameter.

Definition at line 168 of file interface.h.

3.8.2.104 spin_reproduction

```
GtkSpinButton* Window::spin_reproduction
```

GtkSpinButton to set the reproduction ratio.

Definition at line 142 of file interface.h.

3.8.2.105 spin_simulations

```
GtkSpinButton* Window::spin_simulations
```

GtkSpinButton to set the simulations number.

Definition at line 124 of file interface.h.

3.8.2.106 spin_step

```
GtkSpinButton* Window::spin_step
```

GtkSpinButton to set the step.

Definition at line 201 of file interface.h.

3.8.2.107 spin_steps

`GtkSpinButton* Window::spin_steps`

GtkSpinButton to set the steps number.

Definition at line 159 of file interface.h.

3.8.2.108 spin_sweeps

`GtkSpinButton* Window::spin_sweeps`

Sweeps number GtkSpinButton.

Definition at line 197 of file interface.h.

3.8.2.109 spin_threshold

`GtkSpinButton* Window::spin_threshold`

GtkSpinButton to set the threshold.

Definition at line 171 of file interface.h.

3.8.2.110 spin_tolerance

`GtkSpinButton* Window::spin_tolerance`

GtkSpinButton to set the tolerance.

Definition at line 130 of file interface.h.

3.8.2.111 spin_weight

`GtkSpinButton* Window::spin_weight`

Weight GtkSpinButton.

Definition at line 212 of file interface.h.

3.8.2.112 variable

`Variable* Window::variable`

Array of variables data.

Definition at line 219 of file interface.h.

3.8.2.113 window

`GtkWindow* Window::window`

Main GtkWindow.

Definition at line 80 of file interface.h.

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

- interface.h

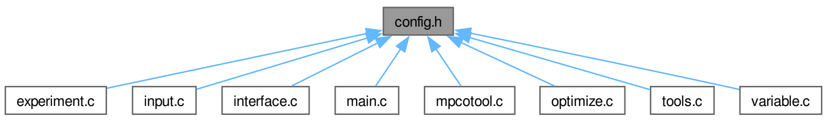
Chapter 4

File Documentation

4.1 config.h File Reference

Configuration header file.

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



Macros

- #define MAX_NINPUTS 8

  Maximum number of input files in the simulator program.
- #define NALGORITHMS 4

  Number of stochastic algorithms.
- #define NCLIMBINGS 2

  Number of hill climbing 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_CLEANER "cleaner"

  cleaner label.
- #define LABEL_CLIMBING "climbing"

  climbing label.
- #define LABEL_COORDINATES "coordinates"

  coordinates 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_INPUT1 "input1"

  input1 label.
- #define LABEL_INPUT2 "input2"

  input2 label.
- #define LABEL_INPUT3 "input3"

  input3 label.
- #define LABEL_INPUT4 "input4"

  input4 label.
- #define LABEL_INPUT5 "input5"

  input5 label.
- #define LABEL_INPUT6 "input6"

  input6 label.
- #define LABEL_INPUT7 "input7"

  input7 label.
- #define LABEL_INPUT8 "input8"

  input8 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_NFINAL_STEPS "nfinal_steps"

  nfinal_steps 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_OPTIMIZE "optimize"

  optimize label.
- #define LABEL_ORTHOGONAL "orthogonal"

  orthogonal label.
- #define LABEL_P "p"

  p label.
- #define LABEL_PRECISION "precision"

  precision label.
- #define LABEL_RANDOM "random"

  random label.
- #define LABEL_RELAXATION "relaxation"

  relaxation label.
- #define LABEL_REPRODUCTION "reproduction"

  reproduction label.
- #define LABEL_RESULT_FILE "result_file"

  result_file label.
- #define LABEL_SIMULATOR "simulator"

  simulator label.
- #define LABEL_SEED "seed"

  seed label.
- #define LABEL_STEP "step"

  step label.
- #define LABEL_SWEEP "sweep"

  sweep label.
- #define LABEL_TAXICAB "taxicab"

  taxicab label.
- #define LABEL_TEMPLATE1 "template1"

  template1 label.

- #define LABEL_TEMPLATE2 "template2"

  template2 label.
- #define LABEL_TEMPLATE3 "template3"

  template3 label.
- #define LABEL_TEMPLATE4 "template4"

  template4 label.
- #define LABEL_TEMPLATE5 "template5"

  template5 label.
- #define LABEL_TEMPLATE6 "template6"

  template6 label.
- #define LABEL_TEMPLATE7 "template7"

  template7 label.
- #define LABEL_TEMPLATE8 "template8"

  template8 label.
- #define LABEL_THRESHOLD "threshold"

  threshold label.
- #define LABEL_TOLERANCE "tolerance"

  tolerance label.
- #define LABEL_VARIABLE "variable"

  variable label.
- #define LABEL_VARIABLES "variables"

  variables label.
- #define LABEL_VARIABLES_FILE "variables_file"

  variables label.
- #define LABEL_WEIGHT "weight"

  weight label.

Enumerations

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

  Enum to define the input file types.

4.1.1 Detailed Description

Configuration header file.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file config.h.

4.1.2 Macro Definition Documentation

4.1.2.1 DEFAULT_PRECISION

```
#define DEFAULT_PRECISION (NPRECISIONS - 1)
```

Default precision digits.

Definition at line 55 of file config.h.

4.1.2.2 DEFAULT_RANDOM_SEED

```
#define DEFAULT_RANDOM_SEED 7007
```

Default pseudo-random numbers seed.

Definition at line 56 of file config.h.

4.1.2.3 DEFAULT_RELAXATION

```
#define DEFAULT_RELAXATION 1.
```

Default relaxation parameter.

Definition at line 57 of file config.h.

4.1.2.4 LABEL_ABSOLUTE_MAXIMUM

```
#define LABEL_ABSOLUTE_MAXIMUM "absolute_maximum"
```

absolute maximum label.

Definition at line 69 of file config.h.

4.1.2.5 LABEL_ABSOLUTE_MINIMUM

```
#define LABEL_ABSOLUTE_MINIMUM "absolute_minimum"
```

absolute minimum label.

Definition at line 67 of file config.h.

4.1.2.6 LABEL_ADAPTATION

```
#define LABEL_ADAPTATION "adaptation"
```

adaption label.

Definition at line 70 of file config.h.

4.1.2.7 LABEL_ALGORITHM

```
#define LABEL_ALGORITHM "algorithm"
```

algoritm label.

Definition at line 71 of file config.h.

4.1.2.8 LABEL_CLEANER

```
#define LABEL_CLEANER "cleaner"
```

cleaner label.

Definition at line 72 of file config.h.

4.1.2.9 LABEL_CLIMBING

```
#define LABEL_CLIMBING "climbing"
```

climbing label.

Definition at line 73 of file config.h.

4.1.2.10 LABEL_COORDINATES

```
#define LABEL_COORDINATES "coordinates"
```

coordinates label.

Definition at line 74 of file config.h.

4.1.2.11 LABEL_EUCLIDIAN

```
#define LABEL_EUCLIDIAN "euclidian"
```

euclidian label.

Definition at line 75 of file config.h.

4.1.2.12 LABEL_EVALUATOR

```
#define LABEL_EVALUATOR "evaluator"
```

evaluator label.

Definition at line 76 of file config.h.

4.1.2.13 LABEL_EXPERIMENT

```
#define LABEL_EXPERIMENT "experiment"
```

experiment label.

Definition at line 77 of file config.h.

4.1.2.14 LABEL_EXPERIMENTS

```
#define LABEL_EXPERIMENTS "experiments"
```

experiment label.

Definition at line 78 of file config.h.

4.1.2.15 LABEL_GENETIC

```
#define LABEL_GENETIC "genetic"
```

genetic label.

Definition at line 79 of file config.h.

4.1.2.16 LABEL_INPUT1

```
#define LABEL_INPUT1 "input1"
```

input1 label.

Definition at line 80 of file config.h.

4.1.2.17 LABEL_INPUT2

```
#define LABEL_INPUT2 "input2"
```

input2 label.

Definition at line 81 of file config.h.

4.1.2.18 LABEL_INPUT3

```
#define LABEL_INPUT3 "input3"
```

input3 label.

Definition at line 82 of file config.h.

4.1.2.19 LABEL_INPUT4

```
#define LABEL_INPUT4 "input4"
```

input4 label.

Definition at line 83 of file config.h.

4.1.2.20 LABEL_INPUT5

```
#define LABEL_INPUT5 "input5"
```

input5 label.

Definition at line 84 of file config.h.

4.1.2.21 LABEL_INPUT6

```
#define LABEL_INPUT6 "input6"
```

input6 label.

Definition at line 85 of file config.h.

4.1.2.22 LABEL_INPUT7

```
#define LABEL_INPUT7 "input7"
```

input7 label.

Definition at line 86 of file config.h.

4.1.2.23 LABEL_INPUT8

```
#define LABEL_INPUT8 "input8"
```

input8 label.

Definition at line 87 of file config.h.

4.1.2.24 LABEL_MAXIMUM

```
#define LABEL_MAXIMUM "maximum"
```

maximum label.

Definition at line 89 of file config.h.

4.1.2.25 LABEL_MINIMUM

```
#define LABEL_MINIMUM "minimum"
```

minimum label.

Definition at line 88 of file config.h.

4.1.2.26 LABEL_MONTE_CARLO

```
#define LABEL_MONTE_CARLO "Monte-Carlo"
```

Monte-Carlo label.

Definition at line 90 of file config.h.

4.1.2.27 LABEL_MUTATION

```
#define LABEL_MUTATION "mutation"
```

mutation label.

Definition at line 91 of file config.h.

4.1.2.28 LABEL_NAME

```
#define LABEL_NAME "name"
```

name label.

Definition at line 92 of file config.h.

4.1.2.29 LABEL_NBEST

```
#define LABEL_NBEST "nbest"
```

nbest label.

Definition at line 93 of file config.h.

4.1.2.30 LABEL_NBITS

```
#define LABEL_NBITS "nbits"
```

nbits label.

Definition at line 94 of file config.h.

4.1.2.31 LABEL_NESTIMATES

```
#define LABEL_NESTIMATES "nestimates"
```

nestimates label.

Definition at line 95 of file config.h.

4.1.2.32 LABEL_NFINAL_STEPS

```
#define LABEL_NFINAL_STEPS "nfinal_steps"
```

nfinal_steps label.

Definition at line 96 of file config.h.

4.1.2.33 LABEL_NGENERATIONS

```
#define LABEL_NGENERATIONS "ngenerations"
```

ngenerations label.

Definition at line 97 of file config.h.

4.1.2.34 LABEL_NITERATIONS

```
#define LABEL_NITERATIONS "niterations"
```

niterations label.

Definition at line 98 of file config.h.

4.1.2.35 LABEL_NORM

```
#define LABEL_NORM "norm"
```

norm label.

Definition at line 99 of file config.h.

4.1.2.36 LABEL_NPOPULATION

```
#define LABEL_NPOPULATION "npopulation"
```

npopulation label.

Definition at line 100 of file config.h.

4.1.2.37 LABEL_NSIMULATIONS

```
#define LABEL_NSIMULATIONS "nsimulations"
```

nsimulations label.

Definition at line 101 of file config.h.

4.1.2.38 LABEL_NSTEPS

```
#define LABEL_NSTEPS "nsteps"
```

nsteps label.

Definition at line 102 of file config.h.

4.1.2.39 LABEL_NSWEEPS

```
#define LABEL_NSWEEPS "nsweeps"
```

nsweeps label.

Definition at line 103 of file config.h.

4.1.2.40 LABEL_OPTIMIZE

```
#define LABEL_OPTIMIZE "optimize"
```

optimize label.

Definition at line 104 of file config.h.

4.1.2.41 LABEL_ORTHOGONAL

```
#define LABEL_ORTHOGONAL "orthogonal"
```

orthogonal label.

Definition at line 105 of file config.h.

4.1.2.42 LABEL_P

```
#define LABEL_P "p"
```

p label.

Definition at line 106 of file config.h.

4.1.2.43 LABEL_PRECISION

```
#define LABEL_PRECISION "precision"
```

precision label.

Definition at line 107 of file config.h.

4.1.2.44 LABEL_RANDOM

```
#define LABEL_RANDOM "random"
```

random label.

Definition at line 108 of file config.h.

4.1.2.45 LABEL_RELAXATION

```
#define LABEL_RELAXATION "relaxation"
```

relaxation label.

Definition at line 109 of file config.h.

4.1.2.46 LABEL_REPRODUCTION

```
#define LABEL_REPRODUCTION "reproduction"
```

reproduction label.

Definition at line 110 of file config.h.

4.1.2.47 LABEL_RESULT_FILE

```
#define LABEL_RESULT_FILE "result_file"
```

result_file label.

Definition at line 111 of file config.h.

4.1.2.48 LABEL_SEED

```
#define LABEL_SEED "seed"
```

seed label.

Definition at line 113 of file config.h.

4.1.2.49 LABEL_SIMULATOR

```
#define LABEL_SIMULATOR "simulator"
```

simulator label.

Definition at line 112 of file config.h.

4.1.2.50 LABEL_STEP

```
#define LABEL_STEP "step"
```

step label.

Definition at line 114 of file config.h.

4.1.2.51 LABEL_SWEEP

```
#define LABEL_SWEEP "sweep"
```

sweep label.

Definition at line 115 of file config.h.

4.1.2.52 LABEL_TAXICAB

```
#define LABEL_TAXICAB "taxicab"
```

taxicab label.

Definition at line 116 of file config.h.

4.1.2.53 LABEL_TEMPLATE1

```
#define LABEL_TEMPLATE1 "template1"
```

template1 label.

Definition at line 117 of file config.h.

4.1.2.54 LABEL_TEMPLATE2

```
#define LABEL_TEMPLATE2 "template2"
```

template2 label.

Definition at line 118 of file config.h.

4.1.2.55 LABEL_TEMPLATE3

```
#define LABEL_TEMPLATE3 "template3"
```

template3 label.

Definition at line 119 of file config.h.

4.1.2.56 LABEL_TEMPLATE4

```
#define LABEL_TEMPLATE4 "template4"
```

template4 label.

Definition at line 120 of file config.h.

4.1.2.57 LABEL_TEMPLATE5

```
#define LABEL_TEMPLATE5 "template5"
```

template5 label.

Definition at line 121 of file config.h.

4.1.2.58 LABEL_TEMPLATE6

```
#define LABEL_TEMPLATE6 "template6"
```

template6 label.

Definition at line 122 of file config.h.

4.1.2.59 LABEL_TEMPLATE7

```
#define LABEL_TEMPLATE7 "template7"
```

template7 label.

Definition at line 123 of file config.h.

4.1.2.60 LABEL_TEMPLATE8

```
#define LABEL_TEMPLATE8 "template8"
```

template8 label.

Definition at line 124 of file config.h.

4.1.2.61 LABEL_THRESHOLD

```
#define LABEL_THRESHOLD "threshold"
```

threshold label.

Definition at line 125 of file config.h.

4.1.2.62 LABEL_TOLERANCE

```
#define LABEL_TOLERANCE "tolerance"
```

tolerance label.

Definition at line 126 of file config.h.

4.1.2.63 LABEL_VARIABLE

```
#define LABEL_VARIABLE "variable"
```

variable label.

Definition at line 127 of file config.h.

4.1.2.64 LABEL_VARIABLES

```
#define LABEL_VARIABLES "variables"
```

variables label.

Definition at line 128 of file config.h.

4.1.2.65 LABEL_VARIABLES_FILE

```
#define LABEL_VARIABLES_FILE "variables_file"
```

variables label.

Definition at line 129 of file config.h.

4.1.2.66 LABEL_WEIGHT

```
#define LABEL_WEIGHT "weight"
```

weight label.

Definition at line 130 of file config.h.

4.1.2.67 LOCALE_DIR

```
#define LOCALE_DIR "locales"
```

Locales directory.

Definition at line 61 of file config.h.

4.1.2.68 MAX_NINPUTS

```
#define MAX_NINPUTS 8
```

Maximum number of input files in the simulator program.

Definition at line 47 of file config.h.

4.1.2.69 NALGORITHMS

```
#define NALGORITHMS 4
```

Number of stochastic algorithms.

Definition at line 48 of file config.h.

4.1.2.70 NCLIMBINGS

```
#define NCLIMBINGS 2
```

Number of hill climbing estimate methods.

Definition at line 49 of file config.h.

4.1.2.71 NNORMS

```
#define NNORMS 4
```

Number of error norms.

Definition at line 50 of file config.h.

4.1.2.72 NPRECISIONS

```
#define NPRECISIONS 15
```

Number of precisions.

Definition at line 51 of file config.h.

4.1.2.73 PROGRAM_INTERFACE

```
#define PROGRAM_INTERFACE "mpcotool"
```

Name of the interface program.

Definition at line 62 of file config.h.

4.1.3 Enumeration Type Documentation

4.1.3.1 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 135 of file config.h.

```
00136 {
00137   INPUT_TYPE_XML = 0,
00138   INPUT_TYPE_JSON = 1
00139 };
```

4.2 config.h

Go to the documentation of this file.

```
00001 /* config.h.  Generated from config.h.in by configure.  */
00002 /*
00003 MPCOTool:
00004 The Multi-Purposes Calibration and Optimization Tool. A software to perform
00005 calibrations or optimizations of empirical parameters.
00006 
00007 AUTHORS: Javier Burguete and Borja Latorre.
00008 
00009 Copyright 2012-2018, AUTHORS.
00010 
00011 Redistribution and use in source and binary forms, with or without modification,
00012 are permitted provided that the following conditions are met:
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00014   1. Redistributions of source code must retain the above copyright notice,
00015     this list of conditions and the following disclaimer.
00016 
00017   2. Redistributions in binary form must reproduce the above copyright notice,
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00019     documentation and/or other materials provided with the distribution.
00020 
00021 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00022 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00023 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00024 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00025 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00026 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00027 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00028 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00029 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00030 OF SUCH DAMAGE.
00031 */
00032 
00039 #ifndef CONFIG__H
00040 #define CONFIG__H 1
00041 
00042 /* #undef HAVE_MPI */
00043 
00044 // Array sizes
00045 
00046 #define MAX_NINPUTS 8
00048 #define NALGORITHMS 4
00049 #define NCLIMBINGS 2
00050 #define NNORMS 4
00051 #define NPRECISIONS 15
00052 
00053 // Default choices
00054 
00055 #define DEFAULT_PRECISION (NPRECISIONS - 1)
00056 #define DEFAULT_RANDOM_SEED 7007
00057 #define DEFAULT_RELAXATION 1.
00058 
00059 // Interface labels
00060 
00061 #define LOCALE_DIR "locales"
00062 #define PROGRAM_INTERFACE "mpcotool"
00063 
00064 // Labels
00065 
00066 #define LABEL_ABSOLUTE_MINIMUM "absolute_minimum"
00068 #define LABEL_ABSOLUTE_MAXIMUM "absolute_maximum"
00070 #define LABEL_ADAPTATION "adaptation"
00071 #define LABEL_ALGORITHM "algorithm"
```

```
#define LABEL_CLEANER  "cleaner"
#define LABEL_CLIMBING "climbing"
#define LABEL_COORDINATES "coordinates"
#define LABEL_EUCLIDIAN "euclidian"
#define LABEL_EVALUATOR "evaluator"
#define LABEL_EXPERIMENT "experiment"
#define LABEL_EXPERIMENTS "experiments"
#define LABEL_GENETIC "genetic"
#define LABEL_INPUT1 "input1"
#define LABEL_INPUT2 "input2"
#define LABEL_INPUT3 "input3"
#define LABEL_INPUT4 "input4"
#define LABEL_INPUT5 "input5"
#define LABEL_INPUT6 "input6"
#define LABEL_INPUT7 "input7"
#define LABEL_INPUT8 "input8"
#define LABEL_MINIMUM "minimum"
#define LABEL_MAXIMUM "maximum"
#define LABEL_MONTE_CARLO "Monte-Carlo"
#define LABEL_MUTATION "mutation"
#define LABEL_NAME "name"
#define LABEL_NBEST "nbest"
#define LABEL_NBITS "nbits"
#define LABEL_NESTIMATES "nestimates"
#define LABEL_NFINAL_STEPS "nfinal_steps"
#define LABEL_NGENERATIONS "ngenerations"
#define LABEL_NITERATIONS "niterations"
#define LABEL_NORM "norm"
#define LABEL_NPOPULATION "npopulation"
#define LABEL_NSIMULATIONS "nsimulations"
#define LABEL_NSTEPS "nsteps"
#define LABEL_NSWEEPS "nsweeps"
#define LABEL_OPTIMIZE "optimize"
#define LABEL_ORTHOGONAL "orthogonal"
#define LABEL_P "p"
#define LABEL_PRECISION "precision"
#define LABEL_RANDOM "random"
#define LABEL_RELAXATION "relaxation"
#define LABEL_REPRODUCTION "reproduction"
#define LABEL_RESULT_FILE "result_file"
#define LABEL_SIMULATOR "simulator"
#define LABEL_SEED "seed"
#define LABEL_STEP "step"
#define LABEL_SWEEP "sweep"
#define LABEL_TAXICAB "taxicab"
#define LABEL_TEMPLATE1 "template1"
#define LABEL_TEMPLATE2 "template2"
#define LABEL_TEMPLATE3 "template3"
#define LABEL_TEMPLATE4 "template4"
#define LABEL_TEMPLATE5 "template5"
#define LABEL_TEMPLATE6 "template6"
#define LABEL_TEMPLATE7 "template7"
#define LABEL_TEMPLATE8 "template8"
#define LABEL_THRESHOLD "threshold"
#define LABEL_TOLERANCE "tolerance"
#define LABEL_VARIABLE "variable"
#define LABEL_VARIABLES "variables"
#define LABEL_VARIABLES_FILE "variables_file"
#define LABEL_WEIGHT "weight"

// Enumerations

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

#endif
```

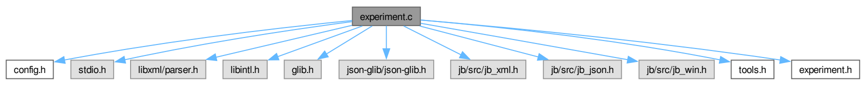
4.3 experiment.c File Reference

Source file to define the experiment data.

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

```
#include <glib.h>
#include <json-glib/json-glib.h>
#include "jb/src/jb_xml.h"
#include "jb/src/jb_json.h"
#include "jb/src/jb_win.h"
#include "tools.h"
#include "experiment.h"
```

Include dependency graph for experiment.c:



Macros

- #define DEBUG_EXPERIMENT 0

  Macro to debug experiment functions.

Functions

- static void experiment_new (Experiment ∗experiment)
- void experiment_free (Experiment ∗experiment, unsigned int type)
- void experiment_error (Experiment ∗experiment, char ∗message)
- int experiment_open_xml (Experiment ∗experiment, xmlNode ∗node, unsigned int ninputs)
- int experiment_open_json (Experiment ∗experiment, JsonNode ∗node, unsigned int ninputs)

Variables

- const char ∗ stencil [MAX_NINPUTS]

  Array of strings with stencil labels.
- const char ∗ stencilbin [MAX_NINPUTS]

  Array of strings with binary stencil labels.

4.3.1 Detailed Description

Source file to define the experiment data.

Authors

Javier Burguete and Borja Latorre.

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Definition in file experiment.c.

4.3.2 Macro Definition Documentation

4.3.2.1 DEBUG_EXPERIMENT

```
#define DEBUG_EXPERIMENT 0
```

Macro to debug experiment functions.

Definition at line 51 of file experiment.c.

4.3.3 Function Documentation

4.3.3.1 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 117 of file experiment.c.

```
{
  if (!experiment->name)
    error_message = g_strconcat (_("Experiment"), ": ", message, NULL);
  else
    error_message = g_strconcat (_("Experiment"), " ", experiment->name, ": ",
                                 message, NULL);
}
```

4.3.3.2 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.

```
{
  unsigned int i;
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_free: start\n");
#endif
00095   if (type == INPUT_TYPE_XML)
00096     {
00097       for (i = 0; i < experiment->ninputs; ++i)
00098         xmlFree (experiment->stencil[i]);
00099       xmlFree (experiment->name);
00100     }
00101   else
00102     {
00103       for (i = 0; i < experiment->ninputs; ++i)
00104         g_free (experiment->stencil[i]);
00105       g_free (experiment->name);
00106     }
00107   experiment->ninputs = experiment->template_flags = 0;
00108 #if DEBUG_EXPERIMENT
00109   fprintf (stderr, "experiment_free: end\n");
00110 #endif
00111 }
```

4.3.3.3 experiment_new()

```
static void experiment_new (
            Experiment * experiment )  [static]
```

Function to create a new Experiment struct.

Parameters

experiment	Experiment struct.

Definition at line 69 of file experiment.c.

```
00070 {
00071   unsigned int i;
00072 #if DEBUG_EXPERIMENT
00073   fprintf (stderr, "experiment_new: start\n");
00074 #endif
00075   experiment->name = NULL;
00076   experiment->ninputs = experiment->template_flags = 0;
00077   for (i = 0; i < MAX_NINPUTS; ++i)
00078     experiment->stencil[i] = NULL;
00079 #if DEBUG_EXPERIMENT
00080   fprintf (stderr, "input_new: end\n");
00081 #endif
00082 }
```

4.3.3.4 experiment_open_json()

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

Function to open the Experiment struct on a XML node.

Returns

1 on success, 0 on error.

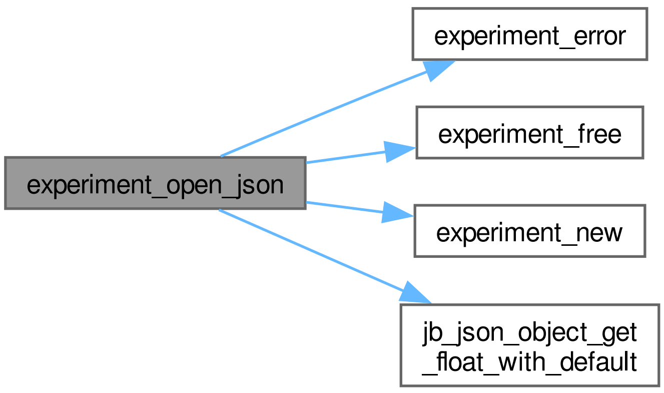
Parameters

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

Definition at line 270 of file experiment.c.

```
{
  char buffer[64];
  JsonObject *object;
  const char *name;
  int error_code;
  unsigned int i;
  unsigned int flags = 1;

#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: start\n");
#endif

  // Resetting experiment data
  experiment_new (experiment);

  // Getting JSON object
  object = json_node_get_object (node);

  // Reading the experimental data
  name = json_object_get_string_member (object, LABEL_NAME);
  if (!name)
    {
      experiment_error (experiment, _("no data file name"));
      goto exit_on_error;
    }
  experiment->name = g_strdup (name);
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: name=%s\n", experiment->name);
#endif
  experiment->weight
    = jb_json_object_get_float_with_default (object, LABEL_WEIGHT, &error_code,
                                             1.);
  if (!error_code)
    {
      experiment_error (experiment, _("bad weight"));
      goto exit_on_error;
    }
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: weight=%lg\n", experiment->weight);
#endif
  name = json_object_get_string_member (object, stencil[0]);
  if (name)
    {
#if DEBUG_EXPERIMENT
      fprintf (stderr, "experiment_open_json: experiment=%s template1=%s\n",
               name, stencil[0]);
#endif
      ++experiment->ninputs;
      experiment->template_flags |= flags;
    }
  else
    {
      name = json_object_get_string_member (object, stencilbin[0]);
      if (name)
        {
#if DEBUG_EXPERIMENT
          fprintf (stderr, "experiment_open_json: experiment=%s template1=%s\n",
                   name, stencilbin[0]);
#endif
          ++experiment->ninputs;
        }
      else
        {
          experiment_error (experiment, _("no template"));
          goto exit_on_error;
        }
    }
  experiment->stencil[0] = g_strdup (name);
  for (i = 1; i < MAX_NINPUTS; ++i)
    {
#if DEBUG_EXPERIMENT
      fprintf (stderr, "experiment_open_json: stencil%u\n", i + 1);
#endif
      flags <<= 1;
      if (json_object_get_member (object, stencil[i]))
        {
          if (ninputs && ninputs <= i)
            {
              experiment_error (experiment, _("bad templates number"));
              goto exit_on_error;
            }
          name = json_object_get_string_member (object, stencil[i]);
#if DEBUG_EXPERIMENT
          fprintf (stderr,
                   "experiment_open_json: experiment=%s stencil%u=%s\n",
                   experiment->nexperiments, name, stencil[i]);
#endif
          experiment->stencil[i] = g_strdup (name);
          ++experiment->ninputs;
          experiment->template_flags |= flags;
        }
      else if (json_object_get_member (object, stencilbin[i]))
        {
          if (ninputs && ninputs <= i)
            {
              experiment_error (experiment, _("bad templates number"));
              goto exit_on_error;
            }
          name = json_object_get_string_member (object, stencilbin[i]);
#if DEBUG_EXPERIMENT
          fprintf (stderr,
                   "experiment_open_json: experiment=%s stencil%u=%s\n",
                   experiment->nexperiments, name, stencilbin[i]);
#endif
          experiment->stencil[i] = g_strdup (name);
          ++experiment->ninputs;
        }
      else if (ninputs && ninputs > i)
        {
          snprintf (buffer, 64, "%s%u", _("no template"), i + 1);
          experiment_error (experiment, buffer);
          goto exit_on_error;
        }
      else
        break;
    }

#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: end\n");
#endif
  return 1;

exit_on_error:
  experiment_free (experiment, INPUT_TYPE_JSON);
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: end\n");
#endif
  return 0;
}
```

Here is the call graph for this function:



4.3.3.5 experiment_open_xml()

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

Function to open the Experiment struct on a XML node.

Returns

1 on success, 0 on error.

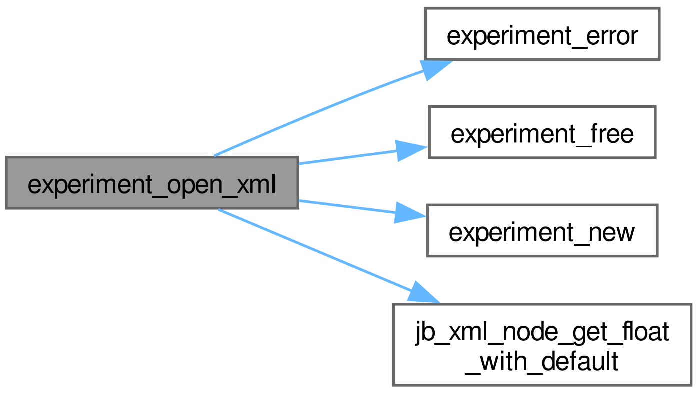
Parameters

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

Definition at line 133 of file experiment.c.

```
{
  char buffer[64];
  int error_code;
  unsigned int i;
  unsigned int flags = 1;

#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: start\n");
#endif

  // Resetting experiment data
  experiment_new (experiment);

  // Reading the experimental data
  experiment->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
  if (!experiment->name)
    {
      experiment_error (experiment, _("no data file name"));
      goto exit_on_error;
    }
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: name=%s\n", experiment->name);
#endif
  experiment->weight
    = jb_xml_node_get_float_with_default (node, (const xmlChar *) LABEL_WEIGHT,
                                          &error_code, 1.);
  if (!error_code)
    {
      experiment_error (experiment, _("bad weight"));
      goto exit_on_error;
    }
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: weight=%lg\n", experiment->weight);
#endif
  experiment->stencil[0]
    = (char *) xmlGetProp (node, (const xmlChar *) stencil[0]);
  if (experiment->stencil[0])
    {
#if DEBUG_EXPERIMENT
      fprintf (stderr, "experiment_open_xml: experiment=%s stencil1=%s\n",
               experiment->name, stencil[0]);
#endif
      ++experiment->ninputs;
      experiment->template_flags |= flags;
    }
  else
    {
      experiment->stencil[0]
        = (char *) xmlGetProp (node, (const xmlChar *) stencilbin[0]);
      if (experiment->stencil[0])
        {
#if DEBUG_EXPERIMENT
          fprintf (stderr, "experiment_open_xml: experiment=%s stencil1=%s\n",
                   experiment->name, stencilbin[0]);
#endif
          ++experiment->ninputs;
        }
      else
        {
          experiment_error (experiment, _("no template"));
          goto exit_on_error;
        }
    }
  for (i = 1; i < MAX_NINPUTS; ++i)
    {
#if DEBUG_EXPERIMENT
      fprintf (stderr, "experiment_open_xml: stencil%u\n", i + 1);
#endif
      flags «= 1;
      if (xmlHasProp (node, (const xmlChar *) stencil[i]))
        {
          if (ninputs && ninputs <= i)
            {
              experiment_error (experiment, _("bad templates number"));
              goto exit_on_error;
            }
          experiment->stencil[i]
            = (char *) xmlGetProp (node, (const xmlChar *) stencil[i]);
#if DEBUG_EXPERIMENT
          fprintf (stderr,
                   "experiment_open_xml: experiment=%s stencil%u=%s\n",
                   experiment->nexperiments, experiment->name,
                   experiment->stencil[i]);
#endif
          ++experiment->ninputs;
          experiment->template_flags |= flags;
        }
      else if (xmlHasProp (node, (const xmlChar *) stencilbin[i]))
        {
          if (ninputs && ninputs <= i)
            {
              experiment_error (experiment, _("bad templates number"));
              goto exit_on_error;
            }
          experiment->stencil[i]
            = (char *) xmlGetProp (node, (const xmlChar *) stencilbin[i]);
#if DEBUG_EXPERIMENT
          fprintf (stderr,
                   "experiment_open_xml: experiment=%s stencil%u=%s\n",
                   experiment->nexperiments, experiment->name,
                   experiment->stencil[i]);
#endif
          ++experiment->ninputs;
        }
      else if (ninputs && ninputs > i)
        {
          snprintf (buffer, 64, "%s%u", _("no template"), i + 1);
          experiment_error (experiment, buffer);
          goto exit_on_error;
        }
      else
        break;
    }

#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: end\n");
#endif
  return 1;

exit_on_error:
  experiment_free (experiment, INPUT_TYPE_XML);
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: end\n");
#endif
  return 0;
}
```

Here is the call graph for this function:



4.3.4 Variable Documentation

4.3.4.1 stencil

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

Initial value:

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

Array of strings with stencil labels.

Definition at line 54 of file experiment.c.

```
00054                                     {
00055   LABEL_TEMPLATE1, LABEL_TEMPLATE2, LABEL_TEMPLATE3, LABEL_TEMPLATE4,
00056   LABEL_TEMPLATE5, LABEL_TEMPLATE6, LABEL_TEMPLATE7, LABEL_TEMPLATE8
00057 };
```

4.3.4.2 stencilbin

```
const char* stencilbin[MAX_NINPUTS]
```

Initial value:

```
= {
  LABEL_INPUT1, LABEL_INPUT2, LABEL_INPUT3, LABEL_INPUT4,
  LABEL_INPUT5, LABEL_INPUT6, LABEL_INPUT7, LABEL_INPUT8
}
```

Array of strings with binary stencil labels.

Definition at line 60 of file experiment.c.

```
00060                                        {
00061   LABEL_INPUT1, LABEL_INPUT2, LABEL_INPUT3, LABEL_INPUT4,
00062   LABEL_INPUT5, LABEL_INPUT6, LABEL_INPUT7, LABEL_INPUT8
00063 };
```

4.4 experiment.c

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#define _GNU_SOURCE
#include "config.h"
#include <stdio.h>
#include <libxml/parser.h>
#include <libintl.h>
#include <glib.h>
#include <json-glib/json-glib.h>
#include "jb/src/jb_xml.h"
#include "jb/src/jb_json.h"
#include "jb/src/jb_win.h"
#include "tools.h"
#include "experiment.h"

#define DEBUG_EXPERIMENT 0

const char *stencil[MAX_NINPUTS] = {
  LABEL_TEMPLATE1, LABEL_TEMPLATE2, LABEL_TEMPLATE3, LABEL_TEMPLATE4,
  LABEL_TEMPLATE5, LABEL_TEMPLATE6, LABEL_TEMPLATE7, LABEL_TEMPLATE8
};

const char *stencilbin[MAX_NINPUTS] = {
  LABEL_INPUT1, LABEL_INPUT2, LABEL_INPUT3, LABEL_INPUT4,
  LABEL_INPUT5, LABEL_INPUT6, LABEL_INPUT7, LABEL_INPUT8
};

static void
experiment_new (Experiment * experiment)
{
  unsigned int i;
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_new: start\n");
#endif
  experiment->name = NULL;
  experiment->ninputs = experiment->template_flags = 0;
  for (i = 0; i < MAX_NINPUTS; ++i)
    experiment->stencil[i] = NULL;
#if DEBUG_EXPERIMENT
  fprintf (stderr, "input_new: end\n");
#endif
}

void
experiment_free (Experiment * experiment,
                 unsigned int type)
{
  unsigned int i;
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_free: start\n");
#endif
  if (type == INPUT_TYPE_XML)
    {
      for (i = 0; i < experiment->ninputs; ++i)
        xmlFree (experiment->stencil[i]);
      xmlFree (experiment->name);
    }
  else
    {
      for (i = 0; i < experiment->ninputs; ++i)
        g_free (experiment->stencil[i]);
      g_free (experiment->name);
    }
  experiment->ninputs = experiment->template_flags = 0;
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_free: end\n");
#endif
}

void
experiment_error (Experiment * experiment,
                  char *message)
{
  if (!experiment->name)
    error_message = g_strconcat (_("Experiment"), ": ", message, NULL);
  else
    error_message = g_strconcat (_("Experiment"), " ", experiment->name, ": ",
                                 message, NULL);
}

int
experiment_open_xml (Experiment * experiment,
                     xmlNode * node,
                     unsigned int ninputs)
{
  char buffer[64];
  int error_code;
  unsigned int i;
  unsigned int flags = 1;

#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: start\n");
#endif

  // Resetting experiment data
  experiment_new (experiment);

  // Reading the experimental data
  experiment->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
  if (!experiment->name)
    {
      experiment_error (experiment, _("no data file name"));
      goto exit_on_error;
    }
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: name=%s\n", experiment->name);
#endif
  experiment->weight
    = jb_xml_node_get_float_with_default (node, (const xmlChar *) LABEL_WEIGHT,
                                          &error_code, 1.);
  if (!error_code)
    {
      experiment_error (experiment, _("bad weight"));
      goto exit_on_error;
    }
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: weight=%lg\n", experiment->weight);
#endif
  experiment->stencil[0]
    = (char *) xmlGetProp (node, (const xmlChar *) stencil[0]);
  if (experiment->stencil[0])
    {
#if DEBUG_EXPERIMENT
      fprintf (stderr, "experiment_open_xml: experiment=%s stencil1=%s\n",
               experiment->name, stencil[0]);
#endif
      ++experiment->ninputs;
      experiment->template_flags |= flags;
    }
  else
    {
      experiment->stencil[0]
        = (char *) xmlGetProp (node, (const xmlChar *) stencilbin[0]);
      if (experiment->stencil[0])
        {
#if DEBUG_EXPERIMENT
          fprintf (stderr, "experiment_open_xml: experiment=%s stencil1=%s\n",
                   experiment->name, stencilbin[0]);
#endif
          ++experiment->ninputs;
```
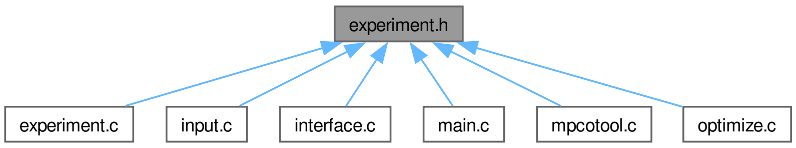

```c
        }
      else
        {
          experiment_error (experiment, _("no template"));
          goto exit_on_error;
        }
    }
  for (i = 1; i < MAX_NINPUTS; ++i)
    {
#if DEBUG_EXPERIMENT
      fprintf (stderr, "experiment_open_xml: stencil%u\n", i + 1);
#endif
      flags «= 1;
      if (xmlHasProp (node, (const xmlChar *) stencil[i]))
        {
          if (ninputs && ninputs <= i)
            {
              experiment_error (experiment, _("bad templates number"));
              goto exit_on_error;
            }
          experiment->stencil[i]
            = (char *) xmlGetProp (node, (const xmlChar *) stencil[i]);
#if DEBUG_EXPERIMENT
          fprintf (stderr,
                   "experiment_open_xml: experiment=%s stencil%u=%s\n",
                   experiment->nexperiments, experiment->name,
                   experiment->stencil[i]);
#endif
          ++experiment->ninputs;
          experiment->template_flags |= flags;
        }
      else if (xmlHasProp (node, (const xmlChar *) stencilbin[i]))
        {
          if (ninputs && ninputs <= i)
            {
              experiment_error (experiment, _("bad templates number"));
              goto exit_on_error;
            }
          experiment->stencil[i]
            = (char *) xmlGetProp (node, (const xmlChar *) stencilbin[i]);
#if DEBUG_EXPERIMENT
          fprintf (stderr,
                   "experiment_open_xml: experiment=%s stencil%u=%s\n",
                   experiment->nexperiments, experiment->name,
                   experiment->stencil[i]);
#endif
          ++experiment->ninputs;
        }
      else if (ninputs && ninputs > i)
        {
          snprintf (buffer, 64, "%s%u", _("no template"), i + 1);
          experiment_error (experiment, buffer);
          goto exit_on_error;
        }
      else
        break;
    }

#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: end\n");
#endif
  return 1;

exit_on_error:
  experiment_free (experiment, INPUT_TYPE_XML);
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: end\n");
#endif
  return 0;
}

int
experiment_open_json (Experiment * experiment,
                      JsonNode * node,
                      unsigned int ninputs)
{
  char buffer[64];
  JsonObject *object;
  const char *name;
  int error_code;
  unsigned int i;
  unsigned int flags = 1;

#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: start\n");
#endif

```

```
  // Resetting experiment data
  experiment_new (experiment);

  // Getting JSON object
  object = json_node_get_object (node);

  // Reading the experimental data
  name = json_object_get_string_member (object, LABEL_NAME);
  if (!name)
    {
      experiment_error (experiment, _("no data file name"));
      goto exit_on_error;
    }
  experiment->name = g_strdup (name);
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: name=%s\n", experiment->name);
#endif
  experiment->weight
    = jb_json_object_get_float_with_default (object, LABEL_WEIGHT, &error_code,
                                             1.);
  if (!error_code)
    {
      experiment_error (experiment, _("bad weight"));
      goto exit_on_error;
    }
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: weight=%lg\n", experiment->weight);
#endif
  name = json_object_get_string_member (object, stencil[0]);
  if (name)
    {
#if DEBUG_EXPERIMENT
      fprintf (stderr, "experiment_open_json: experiment=%s template1=%s\n",
               name, stencil[0]);
#endif
      ++experiment->ninputs;
      experiment->template_flags |= flags;
    }
  else
    {
      name = json_object_get_string_member (object, stencilbin[0]);
      if (name)
        {
#if DEBUG_EXPERIMENT
          fprintf (stderr, "experiment_open_json: experiment=%s template1=%s\n",
                   name, stencilbin[0]);
#endif
          ++experiment->ninputs;
        }
      else
        {
          experiment_error (experiment, _("no template"));
          goto exit_on_error;
        }
    }
  experiment->stencil[0] = g_strdup (name);
  for (i = 1; i < MAX_NINPUTS; ++i)
    {
#if DEBUG_EXPERIMENT
      fprintf (stderr, "experiment_open_json: stencil%u\n", i + 1);
#endif
      flags «= 1;
      if (json_object_get_member (object, stencil[i]))
        {
          if (ninputs && ninputs <= i)
            {
              experiment_error (experiment, _("bad templates number"));
              goto exit_on_error;
            }
          name = json_object_get_string_member (object, stencil[i]);
#if DEBUG_EXPERIMENT
          fprintf (stderr,
                   "experiment_open_json: experiment=%s stencil%u=%s\n",
                   experiment->nexperiments, name, stencil[i]);
#endif
          experiment->stencil[i] = g_strdup (name);
          ++experiment->ninputs;
          experiment->template_flags |= flags;
        }
      else if (json_object_get_member (object, stencilbin[i]))
        {
          if (ninputs && ninputs <= i)
            {
              experiment_error (experiment, _("bad templates number"));
              goto exit_on_error;
            }
          name = json_object_get_string_member (object, stencilbin[i]);
#if DEBUG_EXPERIMENT
          fprintf (stderr,
                   "experiment_open_json: experiment=%s stencil%u=%s\n",
                   experiment->nexperiments, name, stencilbin[i]);
#endif
          experiment->stencil[i] = g_strdup (name);
          ++experiment->ninputs;
        }
      else if (ninputs && ninputs > i)
        {
          snprintf (buffer, 64, "%s%u", _("no template"), i + 1);
          experiment_error (experiment, buffer);
          goto exit_on_error;
        }
      else
        break;
    }

#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: end\n");
#endif
  return 1;

exit_on_error:
  experiment_free (experiment, INPUT_TYPE_JSON);
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: end\n");
#endif
  return 0;
}
```

4.5 experiment.h File Reference

Header file to define the experiment data.

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



Data Structures

- struct Experiment

  Struct to define the experiment data.

Functions

- void experiment_free (Experiment ∗experiment, unsigned int type)
- void experiment_error (Experiment ∗experiment, char ∗message)
- int experiment_open_xml (Experiment ∗experiment, xmlNode ∗node, unsigned int ninputs)
- int experiment_open_json (Experiment ∗experiment, JsonNode ∗node, unsigned int ninputs)

Variables

- const char ∗ stencil [MAX_NINPUTS]

  Array of strings with stencil labels.
- const char ∗ stencilbin [MAX_NINPUTS]

  Array of strings with binary stencil labels.

4.5.1 Detailed Description

Header file to define the experiment data.

Authors

Javier Burguete.

Copyright

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Definition in file experiment.h.

4.5.2 Function Documentation

4.5.2.1 experiment_error()

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

Function to print a message error opening an Experiment struct.

Parameters

experiment	Experiment struct.
message	Error message.

Definition at line 117 of file experiment.c.

```
00119 {
00120   if (!experiment->name)
00121     error_message = g_strconcat (_("Experiment"), ": ", message, NULL);
00122   else
00123     error_message = g_strconcat (_("Experiment"), " ", experiment->name, ": ",
00124                                  message, NULL);
00125 }
```

4.5.2.2 experiment_free()

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

Function to free the memory of an Experiment struct.

Parameters

experiment	Experiment struct.
type	Type of input file.

Definition at line 88 of file experiment.c.

```
{
  unsigned int i;
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_free: start\n");
#endif
  if (type == INPUT_TYPE_XML)
    {
      for (i = 0; i < experiment->ninputs; ++i)
        xmlFree (experiment->stencil[i]);
      xmlFree (experiment->name);
    }
  else
    {
      for (i = 0; i < experiment->ninputs; ++i)
        g_free (experiment->stencil[i]);
      g_free (experiment->name);
    }
  experiment->ninputs = experiment->template_flags = 0;
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_free: end\n");
#endif
}
```

4.5.2.3 experiment_open_json()

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

Function to open the Experiment struct on a XML node.

Returns

1 on success, 0 on error.

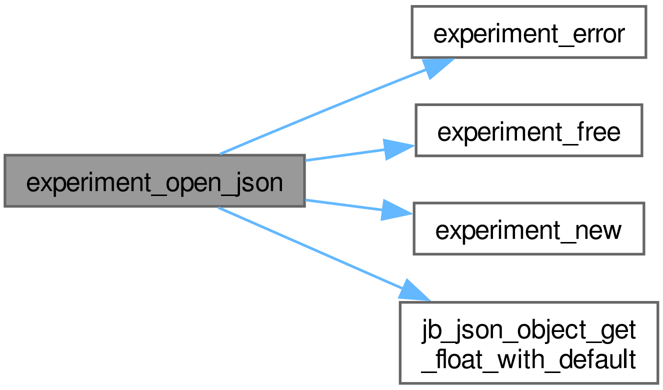
Parameters

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

Definition at line 270 of file experiment.c.

```
{
  char buffer[64];
  JsonObject *object;
  const char *name;
  int error_code;
  unsigned int i;
  unsigned int flags = 1;

#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: start\n");
#endif

  // Resetting experiment data
  experiment_new (experiment);

  // Getting JSON object
  object = json_node_get_object (node);

  // Reading the experimental data
  name = json_object_get_string_member (object, LABEL_NAME);
  if (!name)
    {
      experiment_error (experiment, _("no data file name"));
      goto exit_on_error;
    }
  experiment->name = g_strdup (name);
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: name=%s\n", experiment->name);
#endif
  experiment->weight
    = jb_json_object_get_float_with_default (object, LABEL_WEIGHT, &error_code,
                                             1.);
  if (!error_code)
    {
      experiment_error (experiment, _("bad weight"));
      goto exit_on_error;
    }
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: weight=%lg\n", experiment->weight);
#endif
  name = json_object_get_string_member (object, stencil[0]);
  if (name)
    {
#if DEBUG_EXPERIMENT
      fprintf (stderr, "experiment_open_json: experiment=%s template1=%s\n",
               name, stencil[0]);
#endif
      ++experiment->ninputs;
      experiment->template_flags |= flags;
    }
  else
    {
      name = json_object_get_string_member (object, stencilbin[0]);
      if (name)
        {
#if DEBUG_EXPERIMENT
          fprintf (stderr, "experiment_open_json: experiment=%s template1=%s\n",
                   name, stencilbin[0]);
#endif
          ++experiment->ninputs;
        }
      else
        {
          experiment_error (experiment, _("no template"));
          goto exit_on_error;
        }
    }
  experiment->stencil[0] = g_strdup (name);
  for (i = 1; i < MAX_NINPUTS; ++i)
    {
#if DEBUG_EXPERIMENT
      fprintf (stderr, "experiment_open_json: stencil%u\n", i + 1);
#endif
      flags «= 1;
      if (json_object_get_member (object, stencil[i]))
        {
          if (ninputs && ninputs <= i)
            {
              experiment_error (experiment, _("bad templates number"));
              goto exit_on_error;
            }
          name = json_object_get_string_member (object, stencil[i]);
#if DEBUG_EXPERIMENT
          fprintf (stderr,
                   "experiment_open_json: experiment=%s stencil%u=%s\n",
                   experiment->nexperiments, name, stencil[i]);
#endif
          experiment->stencil[i] = g_strdup (name);
          ++experiment->ninputs;
          experiment->template_flags |= flags;
        }
      else if (json_object_get_member (object, stencilbin[i]))
        {
          if (ninputs && ninputs <= i)
            {
              experiment_error (experiment, _("bad templates number"));
              goto exit_on_error;
            }
          name = json_object_get_string_member (object, stencilbin[i]);
#if DEBUG_EXPERIMENT
          fprintf (stderr,
                   "experiment_open_json: experiment=%s stencil%u=%s\n",
                   experiment->nexperiments, name, stencilbin[i]);
#endif
          experiment->stencil[i] = g_strdup (name);
          ++experiment->ninputs;
        }
      else if (ninputs && ninputs > i)
        {
          snprintf (buffer, 64, "%s%u", _("no template"), i + 1);
          experiment_error (experiment, buffer);
          goto exit_on_error;
        }
      else
        break;
    }

#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: end\n");
#endif
  return 1;

exit_on_error:
  experiment_free (experiment, INPUT_TYPE_JSON);
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_json: end\n");
#endif
  return 0;
}
```

Here is the call graph for this function:



4.5.2.4 experiment_open_xml()

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

Function to open the Experiment struct on a XML node.

Returns

1 on success, 0 on error.

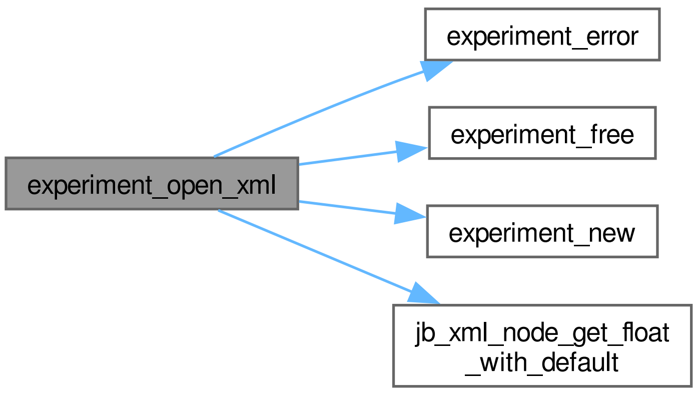
Parameters

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

Definition at line 133 of file experiment.c.

```
{
  char buffer[64];
  int error_code;
  unsigned int i;
  unsigned int flags = 1;

#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: start\n");
#endif

  // Resetting experiment data
  experiment_new (experiment);

  // Reading the experimental data
  experiment->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
  if (!experiment->name)
    {
      experiment_error (experiment, _("no data file name"));
      goto exit_on_error;
    }
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: name=%s\n", experiment->name);
#endif
  experiment->weight
    = jb_xml_node_get_float_with_default (node, (const xmlChar *) LABEL_WEIGHT,
                                          &error_code, 1.);
  if (!error_code)
    {
      experiment_error (experiment, _("bad weight"));
      goto exit_on_error;
    }
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: weight=%lg\n", experiment->weight);
#endif
  experiment->stencil[0]
    = (char *) xmlGetProp (node, (const xmlChar *) stencil[0]);
  if (experiment->stencil[0])
    {
#if DEBUG_EXPERIMENT
      fprintf (stderr, "experiment_open_xml: experiment=%s stencil1=%s\n",
               experiment->name, stencil[0]);
#endif
      ++experiment->ninputs;
      experiment->template_flags |= flags;
    }
  else
    {
      experiment->stencil[0]
        = (char *) xmlGetProp (node, (const xmlChar *) stencilbin[0]);
      if (experiment->stencil[0])
        {
#if DEBUG_EXPERIMENT
          fprintf (stderr, "experiment_open_xml: experiment=%s stencil1=%s\n",
                   experiment->name, stencilbin[0]);
#endif
          ++experiment->ninputs;
        }
      else
        {
          experiment_error (experiment, _("no template"));
          goto exit_on_error;
        }
    }
  for (i = 1; i < MAX_NINPUTS; ++i)
    {
#if DEBUG_EXPERIMENT
      fprintf (stderr, "experiment_open_xml: stencil%u\n", i + 1);
#endif
      flags <<= 1;
      if (xmlHasProp (node, (const xmlChar *) stencil[i]))
        {
          if (ninputs && ninputs <= i)
            {
              experiment_error (experiment, _("bad templates number"));
              goto exit_on_error;
            }
          experiment->stencil[i]
            = (char *) xmlGetProp (node, (const xmlChar *) stencil[i]);
#if DEBUG_EXPERIMENT
          fprintf (stderr,
                   "experiment_open_xml: experiment=%s stencil%u=%s\n",
                   experiment->nexperiments, experiment->name,
                   experiment->stencil[i]);
#endif
          ++experiment->ninputs;
          experiment->template_flags |= flags;
        }
      else if (xmlHasProp (node, (const xmlChar *) stencilbin[i]))
        {
          if (ninputs && ninputs <= i)
            {
              experiment_error (experiment, _("bad templates number"));
              goto exit_on_error;
            }
          experiment->stencil[i]
            = (char *) xmlGetProp (node, (const xmlChar *) stencilbin[i]);
#if DEBUG_EXPERIMENT
          fprintf (stderr,
                   "experiment_open_xml: experiment=%s stencil%u=%s\n",
                   experiment->nexperiments, experiment->name,
                   experiment->stencil[i]);
#endif
          ++experiment->ninputs;
        }
      else if (ninputs && ninputs > i)
        {
          snprintf (buffer, 64, "%s%u", _("no template"), i + 1);
          experiment_error (experiment, buffer);
          goto exit_on_error;
        }
      else
        break;
    }

#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: end\n");
#endif
  return 1;

exit_on_error:
  experiment_free (experiment, INPUT_TYPE_XML);
#if DEBUG_EXPERIMENT
  fprintf (stderr, "experiment_open_xml: end\n");
#endif
  return 0;
}
```

Here is the call graph for this function:



4.5.3 Variable Documentation

4.5.3.1 stencil

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

Array of strings with stencil labels.

Definition at line 54 of file experiment.c.

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

4.5.3.2 stencilbin

```
const char* stencilbin[MAX_NINPUTS]  [extern]
```

Array of strings with binary stencil labels.

Definition at line 60 of file experiment.c.

```
                                {
  LABEL_INPUT1, LABEL_INPUT2, LABEL_INPUT3, LABEL_INPUT4,
  LABEL_INPUT5, LABEL_INPUT6, LABEL_INPUT7, LABEL_INPUT8
};
```

4.6 experiment.h

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#ifndef EXPERIMENT__H
#define EXPERIMENT__H 1

typedef struct
{
  char *name;
  char *stencil[MAX_NINPUTS];
  double weight;
  unsigned int ninputs;
  unsigned int template_flags;
} Experiment;

extern const char *stencil[MAX_NINPUTS];
extern const char *stencilbin[MAX_NINPUTS];

// Public functions
void experiment_free (Experiment * experiment, unsigned int type);
void experiment_error (Experiment * experiment, char *message);
int experiment_open_xml (Experiment * experiment, xmlNode * node,
                         unsigned int ninputs);
int experiment_open_json (Experiment * experiment, JsonNode * node,
                          unsigned int ninputs);

#endif
```
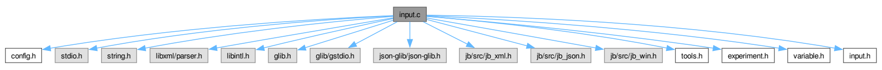

4.7 input.c File Reference

Source file to define the input functions.

```
#include "config.h"
#include <stdio.h>
#include <string.h>
#include <libxml/parser.h>
#include <libintl.h>
#include <glib.h>
#include <glib/gstdio.h>
#include <json-glib/json-glib.h>
#include "jb/src/jb_xml.h"
#include "jb/src/jb_json.h"
#include "jb/src/jb_win.h"
#include "tools.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"
```

Include dependency graph for input.c:



Macros

- #define DEBUG_INPUT 0

  Macro to debug input functions.

Functions

- void input_new ()
- void input_free ()
- static void input_error (char ∗message)
- static int input_open_xml (xmlDoc ∗doc)
- static int input_open_json (JsonParser ∗parser)
- int input_open (char ∗filename)

Variables

- Input input [1]

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

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

    Name of the variables file.

4.7.1 Detailed Description

Source file to define the input functions.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file input.c.

4.7.2 Macro Definition Documentation

4.7.2.1 DEBUG_INPUT

```
#define DEBUG_INPUT 0
```

Macro to debug input functions.

Definition at line 55 of file input.c.

4.7.3 Function Documentation

4.7.3.1 input_error()

```
static void input_error (
             char * message )  [static]
```

Function to print an error message opening an Input struct.

Parameters

message	Error message.

Definition at line 127 of file input.c.

```
{
  error_message = g_strconcat (_("Input"), ": ", message, "\n", NULL);
}
```

4.7.3.2 input_free()

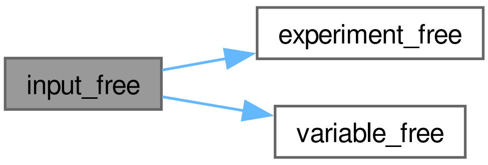
```
void input_free ( )
```

Function to free the memory of the input file data.

Definition at line 86 of file input.c.

```
{
  unsigned int i;
#if DEBUG_INPUT
  fprintf (stderr, "input_free: start\n");
#endif
  g_free (input->name);
  g_free (input->directory);
  for (i = 0; i < input->nexperiments; ++i)
    experiment_free (input->experiment + i, input->type);
  for (i = 0; i < input->nvariables; ++i)
    variable_free (input->variable + i, input->type);
  g_free (input->experiment);
  g_free (input->variable);
  if (input->type == INPUT_TYPE_XML)
    {
      xmlFree (input->cleaner);
      xmlFree (input->evaluator);
      xmlFree (input->simulator);
      xmlFree (input->result);
      xmlFree (input->variables);
    }
  else
    {
      g_free (input->cleaner);
      g_free (input->evaluator);
      g_free (input->simulator);
      g_free (input->result);
      g_free (input->variables);
    }
  input->nexperiments = input->nvariables = input->nsteps
    = input->nfinal_steps = 0;
#if DEBUG_INPUT
  fprintf (stderr, "input_free: end\n");
#endif
}
```

Here is the call graph for this function:



4.7.3.3 input_new()

```
void input_new ( )
```

Function to create a new Input struct.

Definition at line 66 of file input.c.

```
{
#if DEBUG_INPUT
  fprintf (stderr, "input_new: start\n");
#endif
  input->nvariables = input->nexperiments = input->nsteps = input->nfinal_steps
    = 0;
  input->simulator = input->evaluator = input->cleaner = input->directory
    = input->name = NULL;
  input->experiment = NULL;
  input->variable = NULL;
#if DEBUG_INPUT
  fprintf (stderr, "input_new: end\n");
#endif
}
```

4.7.3.4 input_open()

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

Function to open the input file.

Returns

1_on_success, 0_on_error.

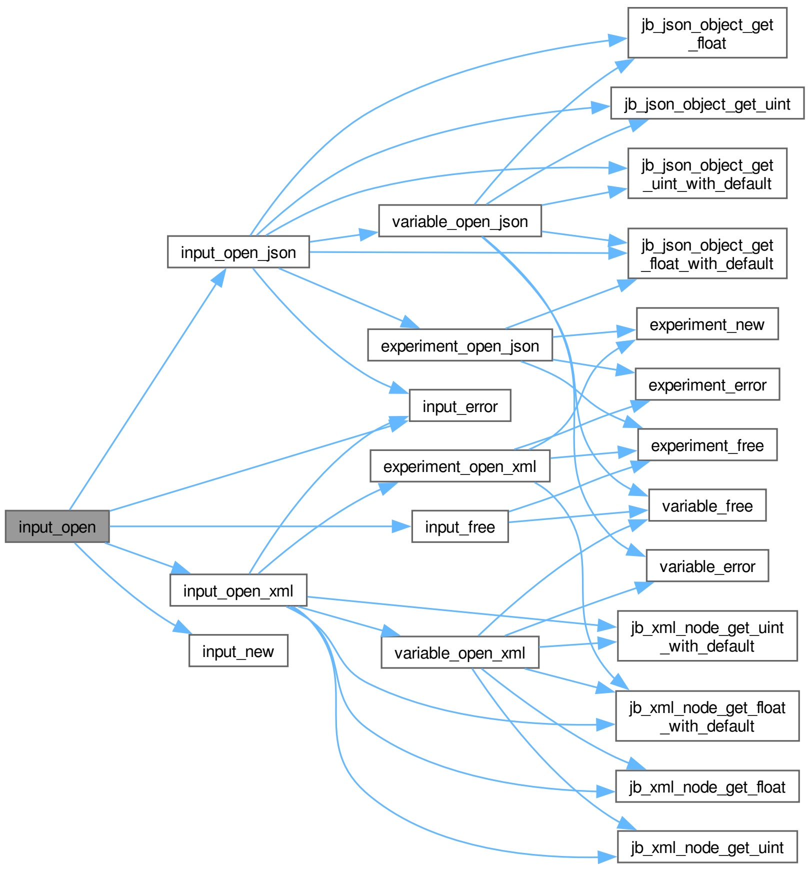
Parameters

filename	Input data file name.

Definition at line 1021 of file input.c.

```
{
  xmlDoc *doc;
  JsonParser *parser;

#if DEBUG_INPUT
  fprintf (stderr, "input_open: start\n");
#endif

  // Resetting input data
  input_new ();

  // Opening input file
#if DEBUG_INPUT
  fprintf (stderr, "input_open: opening the input file %s\n", filename);
  fprintf (stderr, "input_open: trying XML format\n");
#endif
  doc = xmlParseFile (filename);
  if (!doc)
    {
#if DEBUG_INPUT
      fprintf (stderr, "input_open: trying JSON format\n");
#endif
      parser = json_parser_new ();
      if (!json_parser_load_from_file (parser, filename, NULL))
        {
          input_error (_("Unable to parse the input file"));
          goto exit_on_error;
        }
      if (!input_open_json (parser))
        goto exit_on_error;
    }
  else if (!input_open_xml (doc))
    goto exit_on_error;

  // Getting the working directory
  input->directory = g_path_get_dirname (filename);
  input->name = g_path_get_basename (filename);

#if DEBUG_INPUT
  fprintf (stderr, "input_open: end\n");
#endif
  return 1;

exit_on_error:
  jb_show_error (error_message);
  g_free (error_message);
  input_free ();
#if DEBUG_INPUT
  fprintf (stderr, "input_open: end\n");
#endif
  return 0;
}
```

Here is the call graph for this function:



4.7.3.5 input_open_json()

```
static int input_open_json (
            JsonParser * parser )  [inline], [static]
```

Function to open the input file in JSON format.

Returns

1_on_success, 0_on_error.

Parameters

parser	JsonParser struct.

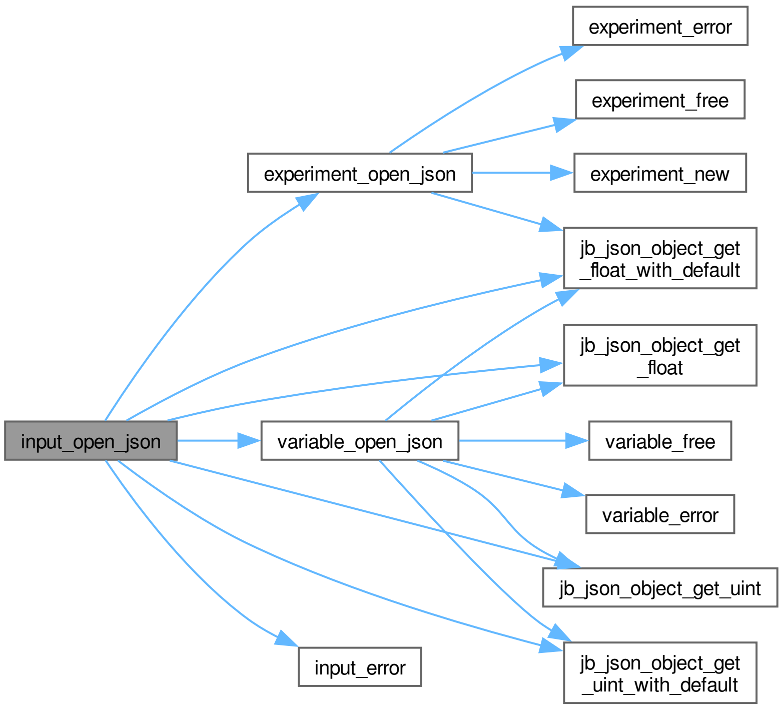
Definition at line 603 of file input.c.

```
{
  Experiment *experiment;
  JsonNode *node, *child;
  JsonObject *object;
  JsonArray *array;
  const char *buffer;
  int error_code;
  unsigned int i, n;

#if DEBUG_INPUT
  fprintf (stderr, "input_open_json: start\n");
#endif

  // Resetting input data
  input->type = INPUT_TYPE_JSON;

  // Getting the root node
#if DEBUG_INPUT
  fprintf (stderr, "input_open_json: getting the root node\n");
#endif
  node = json_parser_get_root (parser);
  object = json_node_get_object (node);

  // Getting result and variables file names
  if (!input->result)
    {
      buffer = json_object_get_string_member (object, LABEL_RESULT_FILE);
      if (!buffer)
        buffer = result_name;
      input->result = g_strdup (buffer);
    }
  else
    input->result = g_strdup (result_name);
  if (!input->variables)
    {
      buffer = json_object_get_string_member (object, LABEL_VARIABLES_FILE);
      if (!buffer)
        buffer = variables_name;
      input->variables = g_strdup (buffer);
    }
  else
    input->variables = g_strdup (variables_name);

  // Opening simulator program name
  buffer = json_object_get_string_member (object, LABEL_SIMULATOR);
  if (!buffer)
    {
      input_error (_("Bad simulator program"));
      goto exit_on_error;
    }
  input->simulator = g_strdup (buffer);

  // Opening evaluator program name
  buffer = json_object_get_string_member (object, LABEL_EVALUATOR);
  if (buffer)
    input->evaluator = g_strdup (buffer);

  // Opening cleaner program name
  buffer = json_object_get_string_member (object, LABEL_CLEANER);
  if (buffer)
    input->cleaner = g_strdup (buffer);

  // Obtaining pseudo-random numbers generator seed
  input->seed
    = jb_json_object_get_uint_with_default (object, LABEL_SEED,
                                            &error_code, DEFAULT_RANDOM_SEED);
  if (!error_code)
    {
      input_error (_("Bad pseudo-random numbers generator seed"));
      goto exit_on_error;
    }

```

```
// Opening algorithm
buffer = json_object_get_string_member (object, LABEL_ALGORITHM);
if (!strcmp (buffer, LABEL_MONTE_CARLO))
  {
    input->algorithm = ALGORITHM_MONTE_CARLO;

    // Obtaining simulations number
    input->nsimulations
      = jb_json_object_get_uint (object, LABEL_NSIMULATIONS, &error_code);
    if (!error_code)
      {
        input_error (_("Bad simulations number"));
        goto exit_on_error;
      }
  }
else if (!strcmp (buffer, LABEL_SWEEP))
  input->algorithm = ALGORITHM_SWEEP;
else if (!strcmp (buffer, LABEL_ORTHOGONAL))
  input->algorithm = ALGORITHM_ORTHOGONAL;
else if (!strcmp (buffer, LABEL_GENETIC))
  {
    input->algorithm = ALGORITHM_GENETIC;

    // Obtaining population
    if (json_object_get_member (object, LABEL_NPOPULATION))
      {
        input->nsimulations
          = jb_json_object_get_uint (object, LABEL_NPOPULATION, &error_code);
        if (!error_code || input->nsimulations < 3)
          {
            input_error (_("Invalid population number"));
            goto exit_on_error;
          }
      }
    else
      {
        input_error (_("No population number"));
        goto exit_on_error;
      }

    // Obtaining generations
    if (json_object_get_member (object, LABEL_NGENERATIONS))
      {
        input->niterations
          = jb_json_object_get_uint_with_default (object, LABEL_NGENERATIONS,
                                                  &error_code, 1);
        if (!error_code || !input->niterations)
          {
            input_error (_("Invalid generations number"));
            goto exit_on_error;
          }
      }
    else
      {
        input_error (_("No generations number"));
        goto exit_on_error;
      }

    // Obtaining mutation probability
    if (json_object_get_member (object, LABEL_MUTATION))
      {
        input->mutation_ratio
          = jb_json_object_get_float (object, LABEL_MUTATION, &error_code);
        if (!error_code || input->mutation_ratio < 0.
            || input->mutation_ratio >= 1.)
          {
            input_error (_("Invalid mutation probability"));
            goto exit_on_error;
          }
      }
    else
      {
        input_error (_("No mutation probability"));
        goto exit_on_error;
      }

    // Obtaining reproduction probability
    if (json_object_get_member (object, LABEL_REPRODUCTION))
      {
        input->reproduction_ratio
          = jb_json_object_get_float (object, LABEL_REPRODUCTION,
                                      &error_code);
        if (!error_code || input->reproduction_ratio < 0.
            || input->reproduction_ratio >= 1.0)
          {
            input_error (_("Invalid reproduction probability"));
            goto exit_on_error;
          }
      }
    else
      {
        input_error (_("No reproduction probability"));
        goto exit_on_error;
      }

    // Obtaining adaptation probability
    if (json_object_get_member (object, LABEL_ADAPTATION))
      {
        input->adaptation_ratio
          = jb_json_object_get_float (object, LABEL_ADAPTATION, &error_code);
        if (!error_code || input->adaptation_ratio < 0.
            || input->adaptation_ratio >= 1.)
          {
            input_error (_("Invalid adaptation probability"));
            goto exit_on_error;
          }
      }
    else
      {
        input_error (_("No adaptation probability"));
        goto exit_on_error;
      }

    // Checking survivals
    i = input->mutation_ratio * input->nsimulations;
    i += input->reproduction_ratio * input->nsimulations;
    i += input->adaptation_ratio * input->nsimulations;
    if (i > input->nsimulations - 2)
      {
        input_error
          (_("No enough survival entities to reproduce the population"));
        goto exit_on_error;
      }
  }
else
  {
    input_error (_("Unknown algorithm"));
    goto exit_on_error;
  }

if (input->algorithm == ALGORITHM_MONTE_CARLO
    || input->algorithm == ALGORITHM_SWEEP
    || input->algorithm == ALGORITHM_ORTHOGONAL)
  {

    // Obtaining iterations number
    input->niterations
      = jb_json_object_get_uint (object, LABEL_NITERATIONS, &error_code);
    if (!error_code || !input->niterations)
      {
        input_error (_("Bad iterations number"));
        goto exit_on_error;
      }

    // Obtaining best number
    input->nbest
      = jb_json_object_get_uint_with_default (object, LABEL_NBEST,
                                              &error_code, 1);
    if (!error_code || !input->nbest)
      {
        input_error (_("Invalid best number"));
        goto exit_on_error;
      }

    // Obtaining tolerance
    input->tolerance
      = jb_json_object_get_float_with_default (object, LABEL_TOLERANCE,
                                               &error_code, 0.);
    if (!error_code || input->tolerance < 0.)
      {
        input_error (_("Invalid tolerance"));
        goto exit_on_error;
      }

    // Getting hill climbing method parameters
    if (json_object_get_member (object, LABEL_NSTEPS))
      {
        input->nsteps
          = jb_json_object_get_uint (object, LABEL_NSTEPS, &error_code);
        if (!error_code)
          {
            input_error (_("Invalid steps number"));
            goto exit_on_error;
          }
        if (json_object_has_member (object, LABEL_NFINAL_STEPS))
          {
            input->nfinal_steps
              = jb_json_object_get_uint (object, LABEL_NFINAL_STEPS,
                                         &error_code);
            if (!error_code)
              {
                input_error (_("Invalid final steps number"));
                goto exit_on_error;
              }
          }
        else
          input->nfinal_steps = input->nsteps;
        buffer = json_object_get_string_member (object, LABEL_CLIMBING);
        if (!strcmp (buffer, LABEL_COORDINATES))
          input->climbing = CLIMBING_METHOD_COORDINATES;
        else if (!strcmp (buffer, LABEL_RANDOM))
          {
            input->climbing = CLIMBING_METHOD_RANDOM;
            input->nestimates
              = jb_json_object_get_uint (object, LABEL_NESTIMATES,
                                         &error_code);
            if (!error_code || !input->nestimates)
              {
                input_error (_("Invalid estimates number"));
                goto exit_on_error;
              }
          }
        else
          {
            input_error (_("Unknown method to estimate the hill climbing"));
            goto exit_on_error;
          }
        input->relaxation
          = jb_json_object_get_float_with_default (object, LABEL_RELAXATION,
                                                   &error_code,
                                                   DEFAULT_RELAXATION);
        if (!error_code || input->relaxation < 0. || input->relaxation > 2.)
          {
            input_error (_("Invalid relaxation parameter"));
            goto exit_on_error;
          }
      }
    else
      input->nsteps = input->nfinal_steps = 0;
  }
// Obtaining the threshold
input->threshold
  = jb_json_object_get_float_with_default (object, LABEL_THRESHOLD,
                                           &error_code, 0.);

if (!error_code)
  {
    input_error (_("Invalid threshold"));
    goto exit_on_error;
  }

// Reading the experimental data
array = json_object_get_array_member (object, LABEL_EXPERIMENTS);
n = json_array_get_length (array);
input->experiment = experiment = (Experiment *)
  g_malloc (n * sizeof (Experiment));
for (i = 0; i < n; ++i)
  {
#if DEBUG_INPUT
    fprintf (stderr, "input_open_json: nexperiments=%u\n",
             input->nexperiments);
#endif
    child = json_array_get_element (array, i);
    if (!input->nexperiments)
      {
        if (!experiment_open_json (experiment, child, 0))
          goto exit_on_error;
      }
    else
      {
        if (!experiment_open_json (experiment + input->nexperiments,
                                   child, experiment->ninputs))
          goto exit_on_error;
        if (experiment[experiment->ninputs].template_flags
            != experiment->template_flags)
          {
            input_error ("bad template inputs");
            goto exit_on_error;
          }
      }
    ++input->nexperiments;
```

```
#if DEBUG_INPUT
      fprintf (stderr, "input_open_json: nexperiments=%u\n",
               input->nexperiments);
#endif
    }
  if (!input->nexperiments)
    {
      input_error (_("No optimization experiments"));
      goto exit_on_error;
    }
  input->template_flags = experiment->template_flags;

  // Reading the variables data
  array = json_object_get_array_member (object, LABEL_VARIABLES);
  n = json_array_get_length (array);
  input->variable = (Variable *) g_malloc (n * sizeof (Variable));
  for (i = 0; i < n; ++i)
    {
#if DEBUG_INPUT
      fprintf (stderr, "input_open_json: nvariables=%u\n", input->nvariables);
#endif
      child = json_array_get_element (array, i);
      if (!variable_open_json (input->variable + input->nvariables, child,
                               input->algorithm, input->nsteps))
        goto exit_on_error;
      ++input->nvariables;
    }
  if (!input->nvariables)
    {
      input_error (_("No optimization variables"));
      goto exit_on_error;
    }

  // Obtaining the error norm
  if (json_object_get_member (object, LABEL_NORM))
    {
      buffer = json_object_get_string_member (object, LABEL_NORM);
      if (!strcmp (buffer, LABEL_EUCLIDIAN))
        input->norm = ERROR_NORM_EUCLIDIAN;
      else if (!strcmp (buffer, LABEL_MAXIMUM))
        input->norm = ERROR_NORM_MAXIMUM;
      else if (!strcmp (buffer, LABEL_P))
        {
          input->norm = ERROR_NORM_P;
          input->p = jb_json_object_get_float (object, LABEL_P, &error_code);
          if (!error_code)
            {
              input_error (_("Bad P parameter"));
              goto exit_on_error;
            }
        }
      else if (!strcmp (buffer, LABEL_TAXICAB))
        input->norm = ERROR_NORM_TAXICAB;
      else
        {
          input_error (_("Unknown error norm"));
          goto exit_on_error;
        }
    }
  else
    input->norm = ERROR_NORM_EUCLIDIAN;

  // Closing the JSON document
  g_object_unref (parser);

#if DEBUG_INPUT
  fprintf (stderr, "input_open_json: end\n");
#endif
  return 1;

exit_on_error:
  g_object_unref (parser);
#if DEBUG_INPUT
  fprintf (stderr, "input_open_json: end\n");
#endif
  return 0;
}
```

Here is the call graph for this function:



4.7.3.6 input_open_xml()

```
static int input_open_xml (
             xmlDoc * doc )  [inline], [static]
```

Function to open the input file in XML format.

Returns

1_on_success, 0_on_error.

Parameters

doc	xmlDoc struct.

Definition at line 138 of file input.c.

```
{
  char buffer2[64];
  Experiment *experiment;
  xmlNode *node, *child;
  xmlChar *buffer;
  int error_code;
  unsigned int i, nsteps;

#if DEBUG_INPUT
  fprintf (stderr, "input_open_xml: start\n");
```

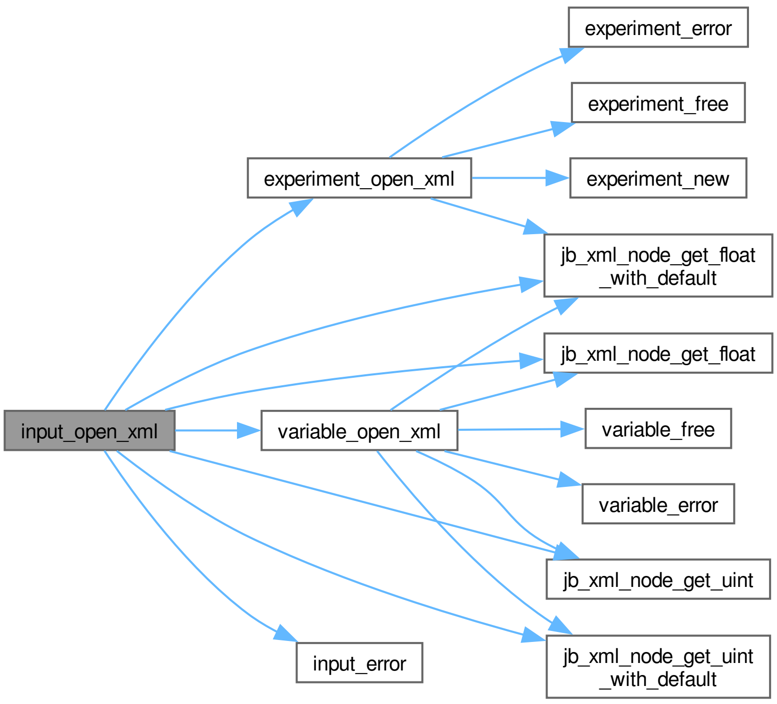
```
#endif

  // Resetting input data
  buffer = NULL;
  input->type = INPUT_TYPE_XML;

  // Getting the root node
#if DEBUG_INPUT
  fprintf (stderr, "input_open_xml: getting the root node\n");
#endif
  node = xmlDocGetRootElement (doc);
  if (xmlStrcmp (node->name, (const xmlChar *) LABEL_OPTIMIZE))
    {
      input_error (_("Bad root XML node"));
      goto exit_on_error;
    }

  // Getting result and variables file names
  if (!input->result)
    {
      input->result =
        (char *) xmlGetProp (node, (const xmlChar *) LABEL_RESULT_FILE);
      if (!input->result)
        input->result = (char *) xmlStrdup ((const xmlChar *) result_name);
    }
#if DEBUG_INPUT
  fprintf (stderr, "input_open_xml: result file=%s\n", input->result);
#endif
  if (!input->variables)
    {
      input->variables =
        (char *) xmlGetProp (node, (const xmlChar *) LABEL_VARIABLES_FILE);
      if (!input->variables)
        input->variables =
          (char *) xmlStrdup ((const xmlChar *) variables_name);
    }
#if DEBUG_INPUT
  fprintf (stderr, "input_open_xml: variables file=%s\n", input->variables);
#endif

  // Opening simulator program name
  input->simulator =
    (char *) xmlGetProp (node, (const xmlChar *) LABEL_SIMULATOR);
  if (!input->simulator)
    {
      input_error (_("Bad simulator program"));
      goto exit_on_error;
    }

  // Opening evaluator program name
  input->evaluator =
    (char *) xmlGetProp (node, (const xmlChar *) LABEL_EVALUATOR);

  // Opening cleaner program name
  input->cleaner = (char *) xmlGetProp (node, (const xmlChar *) LABEL_CLEANER);

  // Obtaining pseudo-random numbers generator seed
  input->seed
    = jb_xml_node_get_uint_with_default (node, (const xmlChar *) LABEL_SEED,
                                         &error_code, DEFAULT_RANDOM_SEED);
  if (!error_code)
    {
      input_error (_("Bad pseudo-random numbers generator seed"));
      goto exit_on_error;
    }

  // Opening algorithm
  buffer = xmlGetProp (node, (const xmlChar *) LABEL_ALGORITHM);
  if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MONTE_CARLO))
    {
      input->algorithm = ALGORITHM_MONTE_CARLO;

      // Obtaining simulations number
      input->nsimulations
        = jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NSIMULATIONS,
                                &error_code);
      if (!error_code)
        {
          input_error (_("Bad simulations number"));
          goto exit_on_error;
        }
    }
  else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_SWEEP))
    input->algorithm = ALGORITHM_SWEEP;
  else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_ORTHOGONAL))
    input->algorithm = ALGORITHM_ORTHOGONAL;
  else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_GENETIC))
```

```
    {
      input->algorithm = ALGORITHM_GENETIC;

      // Obtaining population
      if (xmlHasProp (node, (const xmlChar *) LABEL_NPOPULATION))
        {
          input->nsimulations
            = jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NPOPULATION,
                                    &error_code);
          if (!error_code || input->nsimulations < 3)
            {
              input_error (_("Invalid population number"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No population number"));
          goto exit_on_error;
        }

      // Obtaining generations
      if (xmlHasProp (node, (const xmlChar *) LABEL_NGENERATIONS))
        {
          input->niterations
            = jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NGENERATIONS,
                                    &error_code);
          if (!error_code || !input->niterations)
            {
              input_error (_("Invalid generations number"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No generations number"));
          goto exit_on_error;
        }

      // Obtaining mutation probability
      if (xmlHasProp (node, (const xmlChar *) LABEL_MUTATION))
        {
          input->mutation_ratio
            = jb_xml_node_get_float (node, (const xmlChar *) LABEL_MUTATION,
                                     &error_code);
          if (!error_code || input->mutation_ratio < 0.
              || input->mutation_ratio >= 1.)
            {
              input_error (_("Invalid mutation probability"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No mutation probability"));
          goto exit_on_error;
        }

      // Obtaining reproduction probability
      if (xmlHasProp (node, (const xmlChar *) LABEL_REPRODUCTION))
        {
          input->reproduction_ratio
            = jb_xml_node_get_float (node, (const xmlChar *) LABEL_REPRODUCTION,
                                     &error_code);
          if (!error_code || input->reproduction_ratio < 0.
              || input->reproduction_ratio >= 1.0)
            {
              input_error (_("Invalid reproduction probability"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No reproduction probability"));
          goto exit_on_error;
        }

      // Obtaining adaptation probability
      if (xmlHasProp (node, (const xmlChar *) LABEL_ADAPTATION))
        {
          input->adaptation_ratio
            = jb_xml_node_get_float (node, (const xmlChar *) LABEL_ADAPTATION,
                                     &error_code);
          if (!error_code || input->adaptation_ratio < 0.
              || input->adaptation_ratio >= 1.)
            {
              input_error (_("Invalid adaptation probability"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No adaptation probability"));
          goto exit_on_error;
        }

      // Checking survivals
      i = input->mutation_ratio * input->nsimulations;
      i += input->reproduction_ratio * input->nsimulations;
      i += input->adaptation_ratio * input->nsimulations;
      if (i > input->nsimulations - 2)
        {
          input_error
            (_("No enough survival entities to reproduce the population"));
          goto exit_on_error;
        }
    }
  else
    {
      input_error (_("Unknown algorithm"));
      goto exit_on_error;
    }
  xmlFree (buffer);
  buffer = NULL;

  if (input->algorithm == ALGORITHM_MONTE_CARLO
      || input->algorithm == ALGORITHM_SWEEP
      || input->algorithm == ALGORITHM_ORTHOGONAL)
    {

      // Obtaining iterations number
      input->niterations = jb_xml_node_get_uint_with_default
        (node, (const xmlChar *) LABEL_NITERATIONS, &error_code, 1);
      if (!error_code || !input->niterations)
        {
          input_error (_("Bad iterations number"));
          goto exit_on_error;
        }

      // Obtaining best number
      input->nbest
        = jb_xml_node_get_uint_with_default (node,
                                             (const xmlChar *) LABEL_NBEST,
                                             &error_code, 1);
      if (!error_code || !input->nbest)
        {
          input_error (_("Invalid best number"));
          goto exit_on_error;
        }

      // Obtaining tolerance
      input->tolerance
        = jb_xml_node_get_float_with_default (node,
                                              (const xmlChar *) LABEL_TOLERANCE,
                                              &error_code, 0.);
      if (!error_code || input->tolerance < 0.)
        {
          input_error (_("Invalid tolerance"));
          goto exit_on_error;
        }

      // Getting hill climbing method parameters
      if (xmlHasProp (node, (const xmlChar *) LABEL_NSTEPS))
        {
          input->nsteps =
            jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NSTEPS,
                                  &error_code);
          if (!error_code)
            {
              input_error (_("Invalid steps number"));
              goto exit_on_error;
            }
        }
      else
        input->nsteps = 0;
      if (xmlHasProp (node, (const xmlChar *) LABEL_NFINAL_STEPS))
        {
          input->nfinal_steps =
            jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NFINAL_STEPS,
                                  &error_code);
          if (!error_code)
            {
              input_error (_("Invalid final steps number"));
              goto exit_on_error;
            }
        }
      else
        input->nfinal_steps = input->nsteps;
      nsteps = JBM_MAX (input->nsteps, input->nfinal_steps);
#if DEBUG_INPUT
      fprintf (stderr, "input_open_xml: nsteps=%u\n", nsteps);
#endif
      if (nsteps)
        {
          buffer = xmlGetProp (node, (const xmlChar *) LABEL_CLIMBING);
          if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_COORDINATES))
            input->climbing = CLIMBING_METHOD_COORDINATES;
          else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_RANDOM))
            {
              input->climbing = CLIMBING_METHOD_RANDOM;
              input->nestimates
                = jb_xml_node_get_uint (node,
                                        (const xmlChar *) LABEL_NESTIMATES,
                                        &error_code);
              if (!error_code || !input->nestimates)
                {
                  input_error (_("Invalid estimates number"));
                  goto exit_on_error;
                }
            }
          else
            {
              input_error (_("Unknown method to estimate the hill climbing"));
              goto exit_on_error;
            }
          xmlFree (buffer);
          buffer = NULL;
          input->relaxation
            = jb_xml_node_get_float_with_default (node,
                                                  (const xmlChar *)
                                                  LABEL_RELAXATION,
                                                  &error_code,
                                                  DEFAULT_RELAXATION);
          if (!error_code || input->relaxation < 0. || input->relaxation > 2.)
            {
              input_error (_("Invalid relaxation parameter"));
              goto exit_on_error;
            }
        }
    }
  // Obtaining the threshold
  input->threshold =
    jb_xml_node_get_float_with_default (node, (const xmlChar *) LABEL_THRESHOLD,
                                        &error_code, 0.);
  if (!error_code)
    {
      input_error (_("Invalid threshold"));
      goto exit_on_error;
    }

  // Reading the experimental data
  for (child = node->children; child; child = child->next)
    {
      if (xmlStrcmp (child->name, (const xmlChar *) LABEL_EXPERIMENT))
        break;
#if DEBUG_INPUT
      fprintf (stderr, "input_open_xml: nexperiments=%u\n",
               input->nexperiments);
#endif
      input->experiment = experiment = (Experiment *)
        g_realloc (input->experiment,
                   (1 + input->nexperiments) * sizeof (Experiment));
      if (!input->nexperiments)
        {
          if (!experiment_open_xml (experiment, child, 0))
            goto exit_on_error;
        }
      else
        {
          if (!experiment_open_xml (experiment + input->nexperiments,
                                    child, experiment->ninputs))
            goto exit_on_error;
          if (experiment[experiment->ninputs].template_flags
              != experiment->template_flags)
            {
              input_error ("bad template inputs");
              goto exit_on_error;
            }
        }
      ++input->nexperiments;
#if DEBUG_INPUT
```

```
      fprintf (stderr, "input_open_xml: nexperiments=%u\n",
               input->nexperiments);
#endif
    }
  if (!input->nexperiments)
    {
      input_error (_("No optimization experiments"));
      goto exit_on_error;
    }
  input->template_flags = experiment->template_flags;
  buffer = NULL;

  // Reading the variables data
  if (input->algorithm == ALGORITHM_SWEEP
      || input->algorithm == ALGORITHM_ORTHOGONAL)
    input->nsimulations = 1;
  for (; child; child = child->next)
    {
#if DEBUG_INPUT
      fprintf (stderr, "input_open_xml: nvariables=%u\n", input->nvariables);
#endif
      if (xmlStrcmp (child->name, (const xmlChar *) LABEL_VARIABLE))
        {
          snprintf (buffer2, 64, "%s %u: %s",
                    _("Variable"), input->nvariables + 1, _("bad XML node"));
          input_error (buffer2);
          goto exit_on_error;
        }
      input->variable = (Variable *)
        g_realloc (input->variable,
                   (1 + input->nvariables) * sizeof (Variable));
      if (!variable_open_xml (input->variable + input->nvariables, child,
                              input->algorithm, input->nsteps))
        goto exit_on_error;
      if (input->algorithm == ALGORITHM_SWEEP
          || input->algorithm == ALGORITHM_ORTHOGONAL)
        input->nsimulations *= input->variable[input->nvariables].nsweeps;
      ++input->nvariables;
    }
  if (!input->nvariables)
    {
      input_error (_("No optimization variables"));
      goto exit_on_error;
    }
  if (input->nbest > input->nsimulations)
    {
      input_error (_("Best number higher than simulations number"));
      goto exit_on_error;
    }
  buffer = NULL;

  // Obtaining the error norm
  if (xmlHasProp (node, (const xmlChar *) LABEL_NORM))
    {
      buffer = xmlGetProp (node, (const xmlChar *) LABEL_NORM);
      if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_EUCLIDIAN))
        input->norm = ERROR_NORM_EUCLIDIAN;
      else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MAXIMUM))
        input->norm = ERROR_NORM_MAXIMUM;
      else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_P))
        {
          input->norm = ERROR_NORM_P;
          input->p
            = jb_xml_node_get_float (node, (const xmlChar *) LABEL_P,
                                     &error_code);
          if (!error_code)
            {
              input_error (_("Bad P parameter"));
              goto exit_on_error;
            }
        }
      else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_TAXICAB))
        input->norm = ERROR_NORM_TAXICAB;
      else
        {
          input_error (_("Unknown error norm"));
          goto exit_on_error;
        }
      xmlFree (buffer);
    }
  else
    input->norm = ERROR_NORM_EUCLIDIAN;

  // Closing the XML document
  xmlFreeDoc (doc);

#if DEBUG_INPUT
```

```
  fprintf (stderr, "input_open_xml: end\n");
#endif
  return 1;

exit_on_error:
  xmlFree (buffer);
  xmlFreeDoc (doc);
#if DEBUG_INPUT
  fprintf (stderr, "input_open_xml: end\n");
#endif
  return 0;
}
```

Here is the call graph for this function:



4.7.4 Variable Documentation

4.7.4.1 input

```
Input input[1]
```

Global Input struct to set the input data.

Definition at line 57 of file input.c.

4.7.4.2 result_name

```
const char* result_name = "result"
```

Name of the result file.

Definition at line 59 of file input.c.

4.7.4.3 variables_name

```
const char* variables_name = "variables"
```

Name of the variables file.

Definition at line 60 of file input.c.

4.8 input.c

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#define _GNU_SOURCE
#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 "jb/src/jb_xml.h"
#include "jb/src/jb_json.h"
#include "jb/src/jb_win.h"
#include "tools.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"

#define DEBUG_INPUT 0

Input input[1];

const char *result_name = "result";
const char *variables_name = "variables";

void
input_new ()
{
#if DEBUG_INPUT
  fprintf (stderr, "input_new: start\n");
#endif
  input->nvariables = input->nexperiments = input->nsteps = input->nfinal_steps
    = 0;
  input->simulator = input->evaluator = input->cleaner = input->directory
    = input->name = NULL;
  input->experiment = NULL;
  input->variable = NULL;
#if DEBUG_INPUT
  fprintf (stderr, "input_new: end\n");
#endif
}

void
input_free ()
{
  unsigned int i;
#if DEBUG_INPUT
  fprintf (stderr, "input_free: start\n");
#endif
  g_free (input->name);
  g_free (input->directory);
  for (i = 0; i < input->nexperiments; ++i)
    experiment_free (input->experiment + i, input->type);
  for (i = 0; i < input->nvariables; ++i)
    variable_free (input->variable + i, input->type);
  g_free (input->experiment);
  g_free (input->variable);
  if (input->type == INPUT_TYPE_XML)
    {
      xmlFree (input->cleaner);
      xmlFree (input->evaluator);
      xmlFree (input->simulator);
      xmlFree (input->result);
      xmlFree (input->variables);
    }
  else
    {
      g_free (input->cleaner);
      g_free (input->evaluator);
      g_free (input->simulator);
      g_free (input->result);
      g_free (input->variables);
    }
  input->nexperiments = input->nvariables = input->nsteps
    = input->nfinal_steps = 0;
#if DEBUG_INPUT
  fprintf (stderr, "input_free: end\n");
#endif
}

static void
input_error (char *message)
{
  error_message = g_strconcat (_("Input"), ": ", message, "\n", NULL);
}

static inline int
input_open_xml (xmlDoc * doc)
{
  char buffer2[64];
  Experiment *experiment;
  xmlNode *node, *child;
  xmlChar *buffer;
  int error_code;
  unsigned int i, nsteps;

#if DEBUG_INPUT
  fprintf (stderr, "input_open_xml: start\n");
#endif

  // Resetting input data
  buffer = NULL;
  input->type = INPUT_TYPE_XML;

  // Getting the root node
#if DEBUG_INPUT
  fprintf (stderr, "input_open_xml: getting the root node\n");
#endif
  node = xmlDocGetRootElement (doc);
  if (xmlStrcmp (node->name, (const xmlChar *) LABEL_OPTIMIZE))
    {
      input_error (_("Bad root XML node"));
      goto exit_on_error;
    }

  // Getting result and variables file names
  if (!input->result)
    {
      input->result =
        (char *) xmlGetProp (node, (const xmlChar *) LABEL_RESULT_FILE);
      if (!input->result)
        input->result = (char *) xmlStrdup ((const xmlChar *) result_name);
    }
```

```c
#if DEBUG_INPUT
  fprintf (stderr, "input_open_xml: result file=%s\n", input->result);
#endif
  if (!input->variables)
    {
      input->variables =
        (char *) xmlGetProp (node, (const xmlChar *) LABEL_VARIABLES_FILE);
      if (!input->variables)
        input->variables =
          (char *) xmlStrdup ((const xmlChar *) variables_name);
    }
#if DEBUG_INPUT
  fprintf (stderr, "input_open_xml: variables file=%s\n", input->variables);
#endif

  // Opening simulator program name
  input->simulator =
    (char *) xmlGetProp (node, (const xmlChar *) LABEL_SIMULATOR);
  if (!input->simulator)
    {
      input_error (_("Bad simulator program"));
      goto exit_on_error;
    }

  // Opening evaluator program name
  input->evaluator =
    (char *) xmlGetProp (node, (const xmlChar *) LABEL_EVALUATOR);

  // Opening cleaner program name
  input->cleaner = (char *) xmlGetProp (node, (const xmlChar *) LABEL_CLEANER);

  // Obtaining pseudo-random numbers generator seed
  input->seed
    = jb_xml_node_get_uint_with_default (node, (const xmlChar *) LABEL_SEED,
                                         &error_code, DEFAULT_RANDOM_SEED);
  if (!error_code)
    {
      input_error (_("Bad pseudo-random numbers generator seed"));
      goto exit_on_error;
    }

  // Opening algorithm
  buffer = xmlGetProp (node, (const xmlChar *) LABEL_ALGORITHM);
  if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MONTE_CARLO))
    {
      input->algorithm = ALGORITHM_MONTE_CARLO;

      // Obtaining simulations number
      input->nsimulations
        = jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NSIMULATIONS,
                                &error_code);
      if (!error_code)
        {
          input_error (_("Bad simulations number"));
          goto exit_on_error;
        }
    }
  else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_SWEEP))
    input->algorithm = ALGORITHM_SWEEP;
  else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_ORTHOGONAL))
    input->algorithm = ALGORITHM_ORTHOGONAL;
  else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_GENETIC))
    {
      input->algorithm = ALGORITHM_GENETIC;

      // Obtaining population
      if (xmlHasProp (node, (const xmlChar *) LABEL_NPOPULATION))
        {
          input->nsimulations
            = jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NPOPULATION,
                                    &error_code);
          if (!error_code || input->nsimulations < 3)
            {
              input_error (_("Invalid population number"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No population number"));
          goto exit_on_error;
        }

      // Obtaining generations
      if (xmlHasProp (node, (const xmlChar *) LABEL_NGENERATIONS))
        {
          input->niterations
```

```
            = jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NGENERATIONS,
                                    &error_code);
          if (!error_code || !input->niterations)
            {
              input_error (_("Invalid generations number"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No generations number"));
          goto exit_on_error;
        }

      // Obtaining mutation probability
      if (xmlHasProp (node, (const xmlChar *) LABEL_MUTATION))
        {
          input->mutation_ratio
            = jb_xml_node_get_float (node, (const xmlChar *) LABEL_MUTATION,
                                     &error_code);
          if (!error_code || input->mutation_ratio < 0.
              || input->mutation_ratio >= 1.)
            {
              input_error (_("Invalid mutation probability"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No mutation probability"));
          goto exit_on_error;
        }

      // Obtaining reproduction probability
      if (xmlHasProp (node, (const xmlChar *) LABEL_REPRODUCTION))
        {
          input->reproduction_ratio
            = jb_xml_node_get_float (node, (const xmlChar *) LABEL_REPRODUCTION,
                                     &error_code);
          if (!error_code || input->reproduction_ratio < 0.
              || input->reproduction_ratio >= 1.0)
            {
              input_error (_("Invalid reproduction probability"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No reproduction probability"));
          goto exit_on_error;
        }

      // Obtaining adaptation probability
      if (xmlHasProp (node, (const xmlChar *) LABEL_ADAPTATION))
        {
          input->adaptation_ratio
            = jb_xml_node_get_float (node, (const xmlChar *) LABEL_ADAPTATION,
                                     &error_code);
          if (!error_code || input->adaptation_ratio < 0.
              || input->adaptation_ratio >= 1.)
            {
              input_error (_("Invalid adaptation probability"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No adaptation probability"));
          goto exit_on_error;
        }

      // Checking survivals
      i = input->mutation_ratio * input->nsimulations;
      i += input->reproduction_ratio * input->nsimulations;
      i += input->adaptation_ratio * input->nsimulations;
      if (i > input->nsimulations - 2)
        {
          input_error
            (_("No enough survival entities to reproduce the population"));
          goto exit_on_error;
        }
    }
  else
    {
      input_error (_("Unknown algorithm"));
      goto exit_on_error;
    }
  xmlFree (buffer);
  buffer = NULL;

  if (input->algorithm == ALGORITHM_MONTE_CARLO
      || input->algorithm == ALGORITHM_SWEEP
      || input->algorithm == ALGORITHM_ORTHOGONAL)
    {

      // Obtaining iterations number
      input->niterations = jb_xml_node_get_uint_with_default
        (node, (const xmlChar *) LABEL_NITERATIONS, &error_code, 1);
      if (!error_code || !input->niterations)
        {
          input_error (_("Bad iterations number"));
          goto exit_on_error;
        }

      // Obtaining best number
      input->nbest
        = jb_xml_node_get_uint_with_default (node,
                                             (const xmlChar *) LABEL_NBEST,
                                             &error_code, 1);
      if (!error_code || !input->nbest)
        {
          input_error (_("Invalid best number"));
          goto exit_on_error;
        }

      // Obtaining tolerance
      input->tolerance
        = jb_xml_node_get_float_with_default (node,
                                              (const xmlChar *) LABEL_TOLERANCE,
                                              &error_code, 0.);
      if (!error_code || input->tolerance < 0.)
        {
          input_error (_("Invalid tolerance"));
          goto exit_on_error;
        }

      // Getting hill climbing method parameters
      if (xmlHasProp (node, (const xmlChar *) LABEL_NSTEPS))
        {
          input->nsteps =
            jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NSTEPS,
                                  &error_code);
          if (!error_code)
            {
              input_error (_("Invalid steps number"));
              goto exit_on_error;
            }
        }
      else
        input->nsteps = 0;
      if (xmlHasProp (node, (const xmlChar *) LABEL_NFINAL_STEPS))
        {
          input->nfinal_steps =
            jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NFINAL_STEPS,
                                  &error_code);
          if (!error_code)
            {
              input_error (_("Invalid final steps number"));
              goto exit_on_error;
            }
        }
      else
        input->nfinal_steps = input->nsteps;
      nsteps = JBM_MAX (input->nsteps, input->nfinal_steps);
#if DEBUG_INPUT
      fprintf (stderr, "input_open_xml: nsteps=%u\n", nsteps);
#endif
      if (nsteps)
        {
          buffer = xmlGetProp (node, (const xmlChar *) LABEL_CLIMBING);
          if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_COORDINATES))
            input->climbing = CLIMBING_METHOD_COORDINATES;
          else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_RANDOM))
            {
              input->climbing = CLIMBING_METHOD_RANDOM;
              input->nestimates
                = jb_xml_node_get_uint (node,
                                        (const xmlChar *) LABEL_NESTIMATES,
                                        &error_code);
              if (!error_code || !input->nestimates)
                {
                  input_error (_("Invalid estimates number"));
                  goto exit_on_error;
                }
            }
          else
            {
              input_error (_("Unknown method to estimate the hill climbing"));
              goto exit_on_error;
            }
          xmlFree (buffer);
          buffer = NULL;
          input->relaxation
            = jb_xml_node_get_float_with_default (node,
                                                  (const xmlChar *)
                                                  LABEL_RELAXATION,
                                                  &error_code,
                                                  DEFAULT_RELAXATION);
          if (!error_code || input->relaxation < 0. || input->relaxation > 2.)
            {
              input_error (_("Invalid relaxation parameter"));
              goto exit_on_error;
            }
        }
    }
  // Obtaining the threshold
  input->threshold =
    jb_xml_node_get_float_with_default (node, (const xmlChar *) LABEL_THRESHOLD,
                                        &error_code, 0.);
  if (!error_code)
    {
      input_error (_("Invalid threshold"));
      goto exit_on_error;
    }

  // Reading the experimental data
  for (child = node->children; child; child = child->next)
    {
      if (xmlStrcmp (child->name, (const xmlChar *) LABEL_EXPERIMENT))
        break;
#if DEBUG_INPUT
      fprintf (stderr, "input_open_xml: nexperiments=%u\n",
               input->nexperiments);
#endif
      input->experiment = experiment = (Experiment *)
        g_realloc (input->experiment,
                   (1 + input->nexperiments) * sizeof (Experiment));
      if (!input->nexperiments)
        {
          if (!experiment_open_xml (experiment, child, 0))
            goto exit_on_error;
        }
      else
        {
          if (!experiment_open_xml (experiment + input->nexperiments,
                                    child, experiment->ninputs))
            goto exit_on_error;
          if (experiment[experiment->ninputs].template_flags
              != experiment->template_flags)
            {
              input_error ("bad template inputs");
              goto exit_on_error;
            }
        }
      ++input->nexperiments;
#if DEBUG_INPUT
      fprintf (stderr, "input_open_xml: nexperiments=%u\n",
               input->nexperiments);
#endif
    }
  if (!input->nexperiments)
    {
      input_error (_("No optimization experiments"));
      goto exit_on_error;
    }
  input->template_flags = experiment->template_flags;
  buffer = NULL;

  // Reading the variables data
  if (input->algorithm == ALGORITHM_SWEEP
      || input->algorithm == ALGORITHM_ORTHOGONAL)
    input->nsimulations = 1;
  for (; child; child = child->next)
    {
#if DEBUG_INPUT
      fprintf (stderr, "input_open_xml: nvariables=%u\n", input->nvariables);
#endif
      if (xmlStrcmp (child->name, (const xmlChar *) LABEL_VARIABLE))
        {
          snprintf (buffer2, 64, "%s %u: %s",
                    _("Variable"), input->nvariables + 1, _("bad XML node"));
          input_error (buffer2);
          goto exit_on_error;
        }
      input->variable = (Variable *)
        g_realloc (input->variable,
                   (1 + input->nvariables) * sizeof (Variable));
      if (!variable_open_xml (input->variable + input->nvariables, child,
                              input->algorithm, input->nsteps))
        goto exit_on_error;
      if (input->algorithm == ALGORITHM_SWEEP
          || input->algorithm == ALGORITHM_ORTHOGONAL)
        input->nsimulations *= input->variable[input->nvariables].nsweeps;
      ++input->nvariables;
    }
  if (!input->nvariables)
    {
      input_error (_("No optimization variables"));
      goto exit_on_error;
    }
  if (input->nbest > input->nsimulations)
    {
      input_error (_("Best number higher than simulations number"));
      goto exit_on_error;
    }
  buffer = NULL;

  // Obtaining the error norm
  if (xmlHasProp (node, (const xmlChar *) LABEL_NORM))
    {
      buffer = xmlGetProp (node, (const xmlChar *) LABEL_NORM);
      if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_EUCLIDIAN))
        input->norm = ERROR_NORM_EUCLIDIAN;
      else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_MAXIMUM))
        input->norm = ERROR_NORM_MAXIMUM;
      else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_P))
        {
          input->norm = ERROR_NORM_P;
          input->p
            = jb_xml_node_get_float (node, (const xmlChar *) LABEL_P,
                                     &error_code);
          if (!error_code)
            {
              input_error (_("Bad P parameter"));
              goto exit_on_error;
            }
        }
      else if (!xmlStrcmp (buffer, (const xmlChar *) LABEL_TAXICAB))
        input->norm = ERROR_NORM_TAXICAB;
      else
        {
          input_error (_("Unknown error norm"));
          goto exit_on_error;
        }
      xmlFree (buffer);
    }
  else
    input->norm = ERROR_NORM_EUCLIDIAN;

  // Closing the XML document
  xmlFreeDoc (doc);

#if DEBUG_INPUT
  fprintf (stderr, "input_open_xml: end\n");
#endif
  return 1;

exit_on_error:
  xmlFree (buffer);
  xmlFreeDoc (doc);
#if DEBUG_INPUT
  fprintf (stderr, "input_open_xml: end\n");
#endif
  return 0;
}

static inline int
input_open_json (JsonParser * parser)
{
  Experiment *experiment;
  JsonNode *node, *child;
  JsonObject *object;
  JsonArray *array;
  const char *buffer;
  int error_code;
  unsigned int i, n;

#if DEBUG_INPUT
```

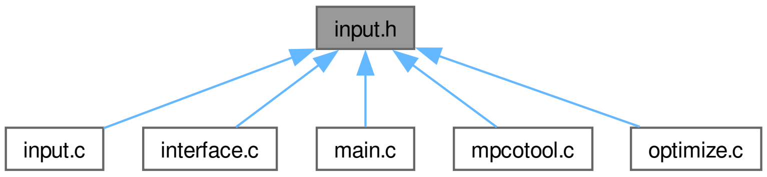
```
  fprintf (stderr, "input_open_json: start\n");
#endif

  // Resetting input data
  input->type = INPUT_TYPE_JSON;

  // Getting the root node
#if DEBUG_INPUT
  fprintf (stderr, "input_open_json: getting the root node\n");
#endif
  node = json_parser_get_root (parser);
  object = json_node_get_object (node);

  // Getting result and variables file names
  if (!input->result)
    {
      buffer = json_object_get_string_member (object, LABEL_RESULT_FILE);
      if (!buffer)
        buffer = result_name;
      input->result = g_strdup (buffer);
    }
  else
    input->result = g_strdup (result_name);
  if (!input->variables)
    {
      buffer = json_object_get_string_member (object, LABEL_VARIABLES_FILE);
      if (!buffer)
        buffer = variables_name;
      input->variables = g_strdup (buffer);
    }
  else
    input->variables = g_strdup (variables_name);

  // Opening simulator program name
  buffer = json_object_get_string_member (object, LABEL_SIMULATOR);
  if (!buffer)
    {
      input_error (_("Bad simulator program"));
      goto exit_on_error;
    }
  input->simulator = g_strdup (buffer);

  // Opening evaluator program name
  buffer = json_object_get_string_member (object, LABEL_EVALUATOR);
  if (buffer)
    input->evaluator = g_strdup (buffer);

  // Opening cleaner program name
  buffer = json_object_get_string_member (object, LABEL_CLEANER);
  if (buffer)
    input->cleaner = g_strdup (buffer);

  // Obtaining pseudo-random numbers generator seed
  input->seed
    = jb_json_object_get_uint_with_default (object, LABEL_SEED,
                                            &error_code, DEFAULT_RANDOM_SEED);
  if (!error_code)
    {
      input_error (_("Bad pseudo-random numbers generator seed"));
      goto exit_on_error;
    }

  // Opening algorithm
  buffer = json_object_get_string_member (object, LABEL_ALGORITHM);
  if (!strcmp (buffer, LABEL_MONTE_CARLO))
    {
      input->algorithm = ALGORITHM_MONTE_CARLO;

      // Obtaining simulations number
      input->nsimulations
        = jb_json_object_get_uint (object, LABEL_NSIMULATIONS, &error_code);
      if (!error_code)
        {
          input_error (_("Bad simulations number"));
          goto exit_on_error;
        }
    }
  else if (!strcmp (buffer, LABEL_SWEEP))
    input->algorithm = ALGORITHM_SWEEP;
  else if (!strcmp (buffer, LABEL_ORTHOGONAL))
    input->algorithm = ALGORITHM_ORTHOGONAL;
  else if (!strcmp (buffer, LABEL_GENETIC))
    {
      input->algorithm = ALGORITHM_GENETIC;

      // Obtaining population
      if (json_object_get_member (object, LABEL_NPOPULATION))
        {
          input->nsimulations
            = jb_json_object_get_uint (object, LABEL_NPOPULATION, &error_code);
          if (!error_code || input->nsimulations < 3)
            {
              input_error (_("Invalid population number"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No population number"));
          goto exit_on_error;
        }

      // Obtaining generations
      if (json_object_get_member (object, LABEL_NGENERATIONS))
        {
          input->niterations
            = jb_json_object_get_uint_with_default (object, LABEL_NGENERATIONS,
                                                    &error_code, 1);
          if (!error_code || !input->niterations)
            {
              input_error (_("Invalid generations number"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No generations number"));
          goto exit_on_error;
        }

      // Obtaining mutation probability
      if (json_object_get_member (object, LABEL_MUTATION))
        {
          input->mutation_ratio
            = jb_json_object_get_float (object, LABEL_MUTATION, &error_code);
          if (!error_code || input->mutation_ratio < 0.
              || input->mutation_ratio >= 1.)
            {
              input_error (_("Invalid mutation probability"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No mutation probability"));
          goto exit_on_error;
        }

      // Obtaining reproduction probability
      if (json_object_get_member (object, LABEL_REPRODUCTION))
        {
          input->reproduction_ratio
            = jb_json_object_get_float (object, LABEL_REPRODUCTION,
                                        &error_code);
          if (!error_code || input->reproduction_ratio < 0.
              || input->reproduction_ratio >= 1.0)
            {
              input_error (_("Invalid reproduction probability"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No reproduction probability"));
          goto exit_on_error;
        }

      // Obtaining adaptation probability
      if (json_object_get_member (object, LABEL_ADAPTATION))
        {
          input->adaptation_ratio
            = jb_json_object_get_float (object, LABEL_ADAPTATION, &error_code);
          if (!error_code || input->adaptation_ratio < 0.
              || input->adaptation_ratio >= 1.)
            {
              input_error (_("Invalid adaptation probability"));
              goto exit_on_error;
            }
        }
      else
        {
          input_error (_("No adaptation probability"));
          goto exit_on_error;
        }

      // Checking survivals
      i = input->mutation_ratio * input->nsimulations;
      i += input->reproduction_ratio * input->nsimulations;
      i += input->adaptation_ratio * input->nsimulations;
      if (i > input->nsimulations - 2)
        {
          input_error
            (_("No enough survival entities to reproduce the population"));
          goto exit_on_error;
        }
    }
  else
    {
      input_error (_("Unknown algorithm"));
      goto exit_on_error;
    }

  if (input->algorithm == ALGORITHM_MONTE_CARLO
      || input->algorithm == ALGORITHM_SWEEP
      || input->algorithm == ALGORITHM_ORTHOGONAL)
    {

      // Obtaining iterations number
      input->niterations
        = jb_json_object_get_uint (object, LABEL_NITERATIONS, &error_code);
      if (!error_code || !input->niterations)
        {
          input_error (_("Bad iterations number"));
          goto exit_on_error;
        }

      // Obtaining best number
      input->nbest
        = jb_json_object_get_uint_with_default (object, LABEL_NBEST,
                                                &error_code, 1);
      if (!error_code || !input->nbest)
        {
          input_error (_("Invalid best number"));
          goto exit_on_error;
        }

      // Obtaining tolerance
      input->tolerance
        = jb_json_object_get_float_with_default (object, LABEL_TOLERANCE,
                                                 &error_code, 0.);
      if (!error_code || input->tolerance < 0.)
        {
          input_error (_("Invalid tolerance"));
          goto exit_on_error;
        }

      // Getting hill climbing method parameters
      if (json_object_get_member (object, LABEL_NSTEPS))
        {
          input->nsteps
            = jb_json_object_get_uint (object, LABEL_NSTEPS, &error_code);
          if (!error_code)
            {
              input_error (_("Invalid steps number"));
              goto exit_on_error;
            }
          if (json_object_has_member (object, LABEL_NFINAL_STEPS))
            {
              input->nfinal_steps
                = jb_json_object_get_uint (object, LABEL_NFINAL_STEPS,
                                           &error_code);
              if (!error_code)
                {
                  input_error (_("Invalid final steps number"));
                  goto exit_on_error;
                }
            }
          else
            input->nfinal_steps = input->nsteps;
          buffer = json_object_get_string_member (object, LABEL_CLIMBING);
          if (!strcmp (buffer, LABEL_COORDINATES))
            input->climbing = CLIMBING_METHOD_COORDINATES;
          else if (!strcmp (buffer, LABEL_RANDOM))
            {
              input->climbing = CLIMBING_METHOD_RANDOM;
              input->nestimates
                = jb_json_object_get_uint (object, LABEL_NESTIMATES,
                                           &error_code);
              if (!error_code || !input->nestimates)
                {
                  input_error (_("Invalid estimates number"));
                  goto exit_on_error;
                }
            }
          else
            {
              input_error (_("Unknown method to estimate the hill climbing"));
              goto exit_on_error;
            }
          input->relaxation
            = jb_json_object_get_float_with_default (object, LABEL_RELAXATION,
                                                     &error_code,
                                                     DEFAULT_RELAXATION);
          if (!error_code || input->relaxation < 0. || input->relaxation > 2.)
            {
              input_error (_("Invalid relaxation parameter"));
              goto exit_on_error;
            }
        }
      else
        input->nsteps = input->nfinal_steps = 0;
    }
  // Obtaining the threshold
  input->threshold
    = jb_json_object_get_float_with_default (object, LABEL_THRESHOLD,
                                             &error_code, 0.);

  if (!error_code)
    {
      input_error (_("Invalid threshold"));
      goto exit_on_error;
    }

  // Reading the experimental data
  array = json_object_get_array_member (object, LABEL_EXPERIMENTS);
  n = json_array_get_length (array);
  input->experiment = experiment = (Experiment *)
    g_malloc (n * sizeof (Experiment));
  for (i = 0; i < n; ++i)
    {
#if DEBUG_INPUT
      fprintf (stderr, "input_open_json: nexperiments=%u\n",
               input->nexperiments);
#endif
      child = json_array_get_element (array, i);
      if (!input->nexperiments)
        {
          if (!experiment_open_json (experiment, child, 0))
            goto exit_on_error;
        }
      else
        {
          if (!experiment_open_json (experiment + input->nexperiments,
                                     child, experiment->ninputs))
            goto exit_on_error;
          if (experiment[experiment->ninputs].template_flags
              != experiment->template_flags)
            {
              input_error ("bad template inputs");
              goto exit_on_error;
            }
        }
      ++input->nexperiments;
#if DEBUG_INPUT
      fprintf (stderr, "input_open_json: nexperiments=%u\n",
               input->nexperiments);
#endif
    }
  if (!input->nexperiments)
    {
      input_error (_("No optimization experiments"));
      goto exit_on_error;
    }
  input->template_flags = experiment->template_flags;

  // Reading the variables data
  array = json_object_get_array_member (object, LABEL_VARIABLES);
  n = json_array_get_length (array);
  input->variable = (Variable *) g_malloc (n * sizeof (Variable));
  for (i = 0; i < n; ++i)
    {
#if DEBUG_INPUT
      fprintf (stderr, "input_open_json: nvariables=%u\n", input->nvariables);
#endif
      child = json_array_get_element (array, i);
      if (!variable_open_json (input->variable + input->nvariables, child,
                               input->algorithm, input->nsteps))
        goto exit_on_error;
      ++input->nvariables;
    }
  if (!input->nvariables)
    {
      input_error (_("No optimization variables"));
      goto exit_on_error;
    }

  // Obtaining the error norm
  if (json_object_get_member (object, LABEL_NORM))
    {
      buffer = json_object_get_string_member (object, LABEL_NORM);
      if (!strcmp (buffer, LABEL_EUCLIDIAN))
        input->norm = ERROR_NORM_EUCLIDIAN;
      else if (!strcmp (buffer, LABEL_MAXIMUM))
        input->norm = ERROR_NORM_MAXIMUM;
      else if (!strcmp (buffer, LABEL_P))
        {
          input->norm = ERROR_NORM_P;
          input->p = jb_json_object_get_float (object, LABEL_P, &error_code);
          if (!error_code)
            {
              input_error (_("Bad P parameter"));
              goto exit_on_error;
            }
        }
      else if (!strcmp (buffer, LABEL_TAXICAB))
        input->norm = ERROR_NORM_TAXICAB;
      else
        {
          input_error (_("Unknown error norm"));
          goto exit_on_error;
        }
    }
  else
    input->norm = ERROR_NORM_EUCLIDIAN;

  // Closing the JSON document
  g_object_unref (parser);

#if DEBUG_INPUT
  fprintf (stderr, "input_open_json: end\n");
#endif
  return 1;

exit_on_error:
  g_object_unref (parser);
#if DEBUG_INPUT
  fprintf (stderr, "input_open_json: end\n");
#endif
  return 0;
}

int
input_open (char *filename)
{
  xmlDoc *doc;
  JsonParser *parser;

#if DEBUG_INPUT
  fprintf (stderr, "input_open: start\n");
#endif

  // Resetting input data
  input_new ();

  // Opening input file
#if DEBUG_INPUT
  fprintf (stderr, "input_open: opening the input file %s\n", filename);
  fprintf (stderr, "input_open: trying XML format\n");
#endif
  doc = xmlParseFile (filename);
  if (!doc)
    {
#if DEBUG_INPUT
      fprintf (stderr, "input_open: trying JSON format\n");
#endif
      parser = json_parser_new ();
      if (!json_parser_load_from_file (parser, filename, NULL))
        {
          input_error (_("Unable to parse the input file"));
          goto exit_on_error;
        }
      if (!input_open_json (parser))
        goto exit_on_error;
    }
  else if (!input_open_xml (doc))
```

```
    goto exit_on_error;

  // Getting the working directory
  input->directory = g_path_get_dirname (filename);
  input->name = g_path_get_basename (filename);

#if DEBUG_INPUT
  fprintf (stderr, "input_open: end\n");
#endif
  return 1;

exit_on_error:
  jb_show_error (error_message);
  g_free (error_message);
  input_free ();
#if DEBUG_INPUT
  fprintf (stderr, "input_open: end\n");
#endif
  return 0;
}
```

4.9 input.h File Reference

Header file to define the input functions.

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



Data Structures

- struct Input

  Struct to define the optimization input file.

Enumerations

- enum ClimbingMethod { CLIMBING_METHOD_COORDINATES = 0 , CLIMBING_METHOD_RANDOM = 1 }

  Enum to define the methods to estimate the hill climbing.
- 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 ()
- void input_free ()
- int input_open (char ∗filename)

Variables

- Input input [1]

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

  Name of the result file.
- const char ∗ variables_name

  Name of the variables file.

4.9.1 Detailed Description

Header file to define the input functions.

Authors

Javier Burguete.

Copyright

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Definition in file input.h.

4.9.2 Enumeration Type Documentation

4.9.2.1 ClimbingMethod

```
enum ClimbingMethod
```

Enum to define the methods to estimate the hill climbing.

Enumerator

CLIMBING_METHOD_COORDINATES	Coordinates hill climbing method.
CLIMBING_METHOD_RANDOM	Random hill climbing method.

Definition at line 42 of file input.h.

```
00043 {
00044   CLIMBING_METHOD_COORDINATES = 0,
00045   CLIMBING_METHOD_RANDOM = 1,
00046 };
```

4.9.2.2 ErrorNorm

```
enum ErrorNorm
```

Enum to define the error norm.

Enumerator

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

Definition at line 49 of file input.h.

```
{
  ERROR_NORM_EUCLIDIAN = 0,
  ERROR_NORM_MAXIMUM = 1,
  ERROR_NORM_P = 2,
  ERROR_NORM_TAXICAB = 3
};
```

4.9.3 Function Documentation

4.9.3.1 input_free()

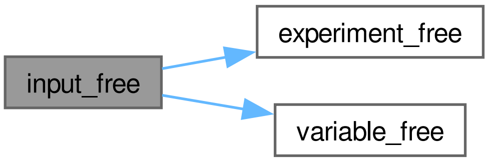
```
void input_free ( )
```

Function to free the memory of the input file data.

Definition at line 86 of file input.c.

```
{
  unsigned int i;
#if DEBUG_INPUT
  fprintf (stderr, "input_free: start\n");
#endif
  g_free (input->name);
  g_free (input->directory);
  for (i = 0; i < input->nexperiments; ++i)
    experiment_free (input->experiment + i, input->type);
  for (i = 0; i < input->nvariables; ++i)
    variable_free (input->variable + i, input->type);
  g_free (input->experiment);
  g_free (input->variable);
  if (input->type == INPUT_TYPE_XML)
    {
      xmlFree (input->cleaner);
      xmlFree (input->evaluator);
      xmlFree (input->simulator);
      xmlFree (input->result);
      xmlFree (input->variables);
    }
  else
    {
      g_free (input->cleaner);
      g_free (input->evaluator);
      g_free (input->simulator);
      g_free (input->result);
      g_free (input->variables);
    }
  input->nexperiments = input->nvariables = input->nsteps
    = input->nfinal_steps = 0;
#if DEBUG_INPUT
  fprintf (stderr, "input_free: end\n");
#endif
}
```

Here is the call graph for this function:



4.9.3.2 input_new()

```
void input_new ( )
```

Function to create a new Input struct.

Definition at line 66 of file input.c.

```
{
#if DEBUG_INPUT
  fprintf (stderr, "input_new: start\n");
#endif
  input->nvariables = input->nexperiments = input->nsteps = input->nfinal_steps
    = 0;
  input->simulator = input->evaluator = input->cleaner = input->directory
    = input->name = NULL;
  input->experiment = NULL;
  input->variable = NULL;
#if DEBUG_INPUT
  fprintf (stderr, "input_new: end\n");
#endif
}
```

4.9.3.3 input_open()

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

Function to open the input file.

Returns

1_on_success, 0_on_error.

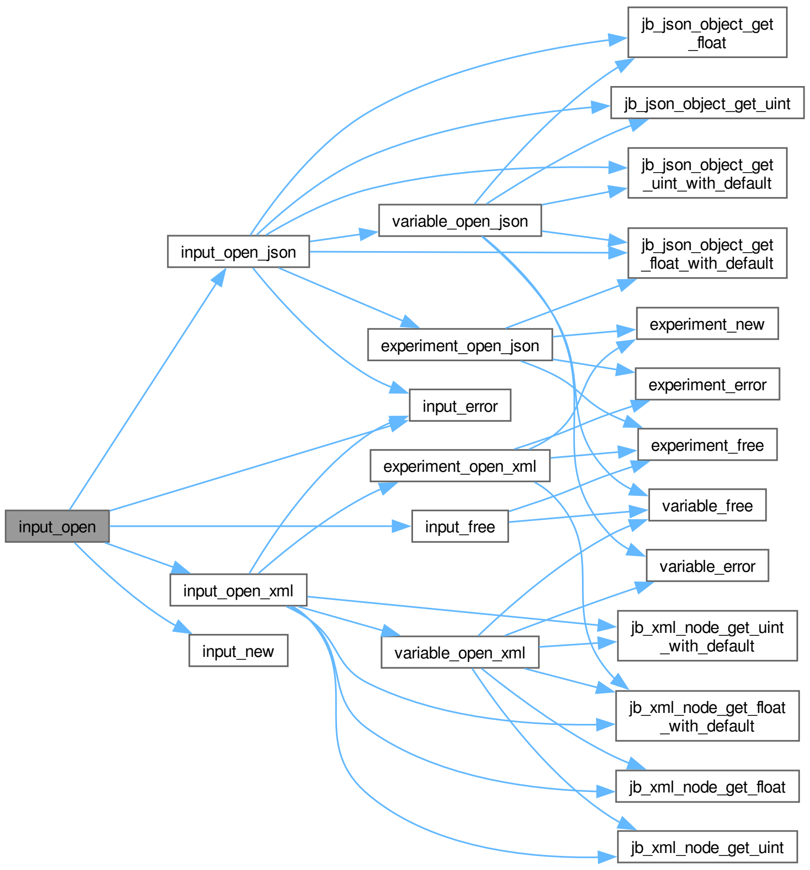
Parameters

filename	Input data file name.

Definition at line 1021 of file input.c.

```
{
  xmlDoc *doc;
  JsonParser *parser;

#if DEBUG_INPUT
  fprintf (stderr, "input_open: start\n");
#endif

  // Resetting input data
  input_new ();

  // Opening input file
#if DEBUG_INPUT
  fprintf (stderr, "input_open: opening the input file %s\n", filename);
  fprintf (stderr, "input_open: trying XML format\n");
#endif
  doc = xmlParseFile (filename);
  if (!doc)
    {
#if DEBUG_INPUT
      fprintf (stderr, "input_open: trying JSON format\n");
#endif
      parser = json_parser_new ();
      if (!json_parser_load_from_file (parser, filename, NULL))
        {
          input_error (_("Unable to parse the input file"));
          goto exit_on_error;
        }
      if (!input_open_json (parser))
        goto exit_on_error;
    }
  else if (!input_open_xml (doc))
    goto exit_on_error;

  // Getting the working directory
  input->directory = g_path_get_dirname (filename);
  input->name = g_path_get_basename (filename);

#if DEBUG_INPUT
  fprintf (stderr, "input_open: end\n");
#endif
  return 1;

exit_on_error:
  jb_show_error (error_message);
  g_free (error_message);
  input_free ();
#if DEBUG_INPUT
  fprintf (stderr, "input_open: end\n");
#endif
  return 0;
}
```

Here is the call graph for this function:



4.9.4 Variable Documentation

4.9.4.1 input

```
Input input[1] [extern]
```

Global Input struct to set the input data.

Definition at line 57 of file input.c.

4.9.4.2 result_name

```
const char* result_name [extern]
```

Name of the result file.

Definition at line 59 of file input.c.

4.9.4.3 variables_name

```
const char* variables_name  [extern]
```

Name of the variables file.

Definition at line 60 of file input.c.

4.10 input.h

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#ifndef INPUT__H
#define INPUT__H 1

enum ClimbingMethod
{
  CLIMBING_METHOD_COORDINATES = 0,
  CLIMBING_METHOD_RANDOM = 1,
};

enum ErrorNorm
{
  ERROR_NORM_EUCLIDIAN = 0,
  ERROR_NORM_MAXIMUM = 1,
  ERROR_NORM_P = 2,
  ERROR_NORM_TAXICAB = 3
};

typedef struct
{
  Experiment *experiment;
  Variable *variable;
  char *result;
  char *variables;
  char *simulator;
  char *evaluator;
  char *cleaner;
  char *directory;
  char *name;
  double tolerance;
  double mutation_ratio;
  double reproduction_ratio;
  double adaptation_ratio;
  double relaxation;
  double p;
  double threshold;
  unsigned long int seed;
  unsigned int nvariables;
  unsigned int nexperiments;
  unsigned int nsimulations;
  unsigned int algorithm;
  unsigned int nsteps;
  unsigned int nfinal_steps;
  unsigned int climbing;
  unsigned int nestimates;
  unsigned int niterations;
  unsigned int nbest;
  unsigned int norm;
  unsigned int type;
  unsigned int template_flags;
} Input;

extern Input input[1];
extern const char *result_name;
extern const char *variables_name;

// Public functions
void input_new ();
void input_free ();
int input_open (char *filename);

#endif
```
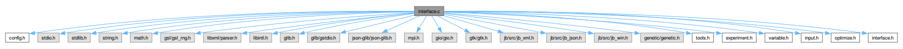

4.11 interface.c File Reference

Source file to define the graphical interface functions.

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

Include dependency graph for interface.c:



Macros

- #define DEBUG_INTERFACE 1

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

    Macro to define the initial input file.

Functions

- static void input_save_climbing_xml (xmlNode ∗node)
- static void input_save_climbing_json (JsonNode ∗node)
- static void input_save_xml (xmlDoc ∗doc)
- static void input_save_json (JsonGenerator ∗generator)
- static void input_save (char ∗filename)
- static void dialog_options_close (GtkDialog ∗dlg, int response_id)
- static void options_new ()
- static void running_new ()
- static unsigned int window_get_algorithm ()
- static unsigned int window_get_climbing ()
- static unsigned int window_get_norm ()
- static void window_save_climbing ()
- static void dialog_save_close (GtkFileChooserDialog ∗dlg, int response_id)
- static void window_save ()
- static void window_run ()
- static void window_help ()
- static void window_about ()
- static void window_update_climbing ()
- static void window_update ()
- static void window_set_algorithm ()
- static void window_set_experiment ()
- static void window_remove_experiment ()
- static void window_add_experiment ()
- static void dialog_name_experiment_close (GtkFileChooserDialog ∗dlg, int response_id, void ∗data)
- static void window_name_experiment ()
- static void window_weight_experiment ()
- static void window_inputs_experiment ()
- static void window_template_experiment_close (GtkFileChooserDialog ∗dlg, int response_id, void ∗data)
- static void window_template_experiment (void ∗data)
- static void window_set_variable ()
- static void window_remove_variable ()
- static void window_add_variable ()
- static void window_label_variable ()
- static void window_precision_variable ()
- static void window_rangemin_variable ()
- static void window_rangemax_variable ()
- static void window_rangeminabs_variable ()
- static void window_rangemaxabs_variable ()
- static void window_step_variable ()
- static void window_update_variable ()
- static int window_read (char ∗filename)
- static void dialog_open_close (GtkFileChooserDialog ∗dlg, int response_id)
- static void window_open ()
- static void dialog_simulator_close (GtkFileChooserDialog ∗dlg, int response_id)
- static void dialog_simulator ()
- static void dialog_evaluator_close (GtkFileChooserDialog ∗dlg, int response_id)
- static void dialog_evaluator ()
- static void dialog_cleaner_close (GtkFileChooserDialog ∗dlg, int response_id)
- static void dialog_cleaner ()
- void window_new (GtkApplication ∗application)

Variables

- Window window [1]

  Window struct to define the main interface window.
- static const char ∗ logo [ ]

  Logo pixmap.
- static Options options [1]

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

  Running struct to define the running dialog.

4.11.1 Detailed Description

Source file to define the graphical interface functions.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file interface.c.

4.11.2 Macro Definition Documentation

4.11.2.1 DEBUG_INTERFACE

```
#define DEBUG_INTERFACE 1
```

Macro to debug interface functions.

Definition at line 69 of file interface.c.

4.11.2.2 INPUT_FILE

```
#define INPUT_FILE "test-ga.xml"
```

Macro to define the initial input file.

Definition at line 78 of file interface.c.

4.11.3 Function Documentation

4.11.3.1 dialog_cleaner()

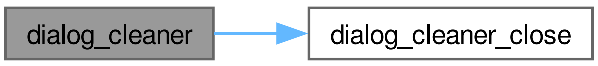
```
static void dialog_cleaner ( )  [static]
```

Function to open a dialog to save the cleaner file.

Definition at line 2340 of file interface.c.

```
{
  GtkFileChooserDialog *dlg;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_cleaner: start\n");
#endif
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Open cleaner file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_OPEN,
                                 _("_Cancel"), GTK_RESPONSE_CANCEL,
                                 _("_Open"), GTK_RESPONSE_ACCEPT, NULL);
  g_signal_connect (dlg, "response", G_CALLBACK (dialog_cleaner_close), NULL);
  gtk_window_present (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_cleaner: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.2 dialog_cleaner_close()

```
static void dialog_cleaner_close (
             GtkFileChooserDialog * dlg,
             int response_id )  [static]
```

Function to save the close the cleaner file dialog.

Parameters

dlg	GtkFileChooserDialog dialog.
response←_id	Response identifier.

Definition at line 2309 of file interface.c.

```
{
  GFile *file1, *file2;
  char *buffer1, *buffer2;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_cleaner_close: start\n");
#endif
```

```
  if (response_id == GTK_RESPONSE_OK)
    {
      buffer1 = gtk_file_chooser_get_current_name (GTK_FILE_CHOOSER (dlg));
      file1 = g_file_new_for_path (buffer1);
      file2 = g_file_new_for_path (input->directory);
      buffer2 = g_file_get_relative_path (file2, file1);
      input->cleaner = g_strdup (buffer2);
      g_free (buffer2);
      g_object_unref (file2);
      g_object_unref (file1);
      g_free (buffer1);
    }
  gtk_window_destroy (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_cleaner_close: end\n");
#endif
}
```

4.11.3.3 dialog_evaluator()

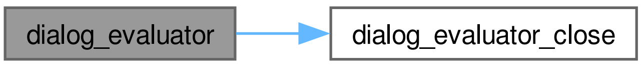
```
static void dialog_evaluator ( ) [static]
```

Function to open a dialog to save the evaluator file.

Definition at line 2286 of file interface.c.

```
{
  GtkFileChooserDialog *dlg;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_evaluator: start\n");
#endif
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Open evaluator file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_OPEN,
                                 _("_Cancel"), GTK_RESPONSE_CANCEL,
                                 _("_Open"), GTK_RESPONSE_ACCEPT, NULL);
  g_signal_connect (dlg, "response", G_CALLBACK (dialog_evaluator_close), NULL);
  gtk_window_present (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_evaluator: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.4 dialog_evaluator_close()

```
static void dialog_evaluator_close (
            GtkFileChooserDialog * dlg,
            int response_id ) [static]
```

Function to save the close the evaluator file dialog.

Parameters

dlg	GtkFileChooserDialog dialog.
response←↩ _id	Response identifier.

Definition at line 2255 of file interface.c.

```
{
  GFile *file1, *file2;
  char *buffer1, *buffer2;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_evaluator_close: start\n");
#endif
  if (response_id == GTK_RESPONSE_OK)
    {
      buffer1 = gtk_file_chooser_get_current_name (GTK_FILE_CHOOSER (dlg));
      file1 = g_file_new_for_path (buffer1);
      file2 = g_file_new_for_path (input->directory);
      buffer2 = g_file_get_relative_path (file2, file1);
      input->evaluator = g_strdup (buffer2);
      g_free (buffer2);
      g_object_unref (file2);
      g_object_unref (file1);
      g_free (buffer1);
    }
  gtk_window_destroy (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_evaluator_close: end\n");
#endif
}
```

4.11.3.5 dialog_name_experiment_close()

```
static void dialog_name_experiment_close (
            GtkFileChooserDialog * dlg,
            int response_id,
            void * data ) [static]
```

Function to close the experiment name dialog.

Parameters

dlg	GtkFileChooserDialog struct.
response←↩ _id	Response identifier.
data	Function data.

Definition at line 1487 of file interface.c.

```
{
  char *buffer;
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_name_experiment_close: start\n");
#endif
  i = (size_t) data;
  if (response_id == GTK_RESPONSE_OK)
    {
      buffer = gtk_file_chooser_get_current_name (GTK_FILE_CHOOSER (dlg));
      g_signal_handler_block (window->combo_experiment, window->id_experiment);
      gtk_combo_box_text_remove (window->combo_experiment, i);
      gtk_combo_box_text_insert_text (window->combo_experiment, i, buffer);
      gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
      g_signal_handler_unblock (window->combo_experiment,
                                window->id_experiment);
      g_free (buffer);
    }
#if DEBUG_INTERFACE
```

```
  fprintf (stderr, "window_name_experiment_close: end\n");
#endif
}
```

4.11.3.6 dialog_open_close()

```
static void dialog_open_close (
              GtkFileChooserDialog * dlg,
              int response_id )  [static]
```

Function to close the input data dialog.

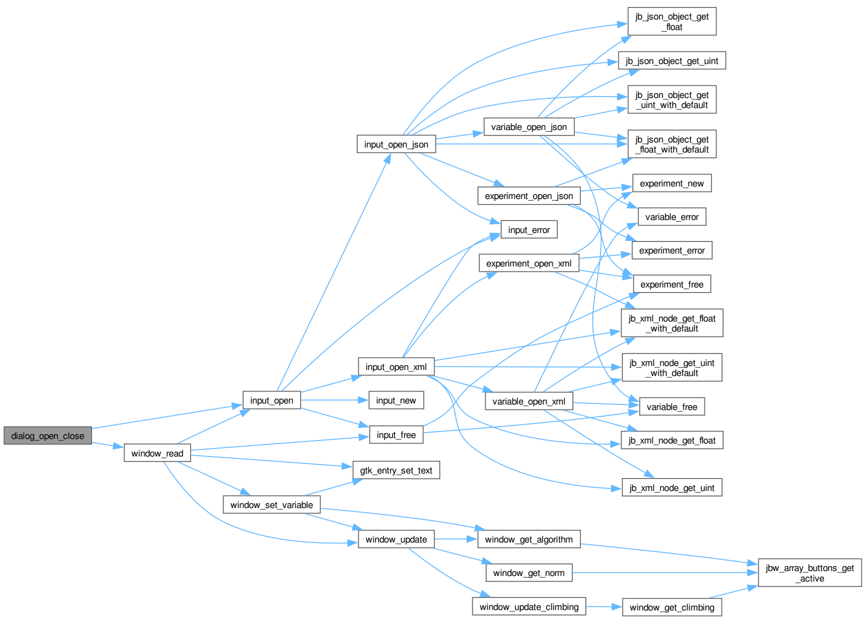
Parameters

dlg	GtkFileChooserDialog dialog.
response↩_id	Response identifier.

Definition at line 2089 of file interface.c.

```
{
  char *buffer, *directory, *name;
  GFile *file;

#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_open_close: start\n");
#endif

  // Saving a backup of the current input file
  directory = g_strdup (input->directory);
  name = g_strdup (input->name);

  // If OK saving
  if (response_id == GTK_RESPONSE_OK)
    {

      // Traying to open the input file
      file = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (dlg));
      buffer = g_file_get_path (file);
#if DEBUG_INTERFACE
      fprintf (stderr, "dialog_open_close: file name=%s\n", buffer);
#endif
      if (!window_read (buffer))
        {
#if DEBUG_INTERFACE
          fprintf (stderr, "dialog_open_close: error reading input file\n");
#endif
          g_free (buffer);

          // Reading backup file on error
          buffer = g_build_filename (directory, name, NULL);
          input->result = input->variables = NULL;
          if (!input_open (buffer))
            {

              // Closing on backup file reading error
#if DEBUG_INTERFACE
              fprintf (stderr,
                       "dialog_open_close: error reading backup file\n");
#endif
            }
        }
      g_free (buffer);
      g_object_unref (file);
    }

  // Freeing and closing
  g_free (name);
  g_free (directory);
  gtk_window_destroy (GTK_WINDOW (dlg));

#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_open_close: end\n");
#endif

}
```

Here is the call graph for this function:



4.11.3.7 dialog_options_close()

```
static void dialog_options_close (
              GtkDialog * dlg,
              int response_id )  [static]
```

Function to close the options dialog.

Parameters

dlg	GtkDialog options dialog.
response_id	Response identifier.

Definition at line 656 of file interface.c.

```
{
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_options_close: start\n");
#endif
  if (response_id == GTK_RESPONSE_OK)
    {
      input->seed
        = (unsigned long int) gtk_spin_button_get_value (options->spin_seed);
      nthreads = gtk_spin_button_get_value_as_int (options->spin_threads);
      nthreads_climbing
        = gtk_spin_button_get_value_as_int (options->spin_climbing);
    }
  gtk_window_destroy (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_options_close: end\n");
#endif
}
```

4.11.3.8 dialog_save_close()

```
static void dialog_save_close (
            GtkFileChooserDialog * dlg,
            int response_id )  [static]
```

Function to close the save dialog.

Parameters

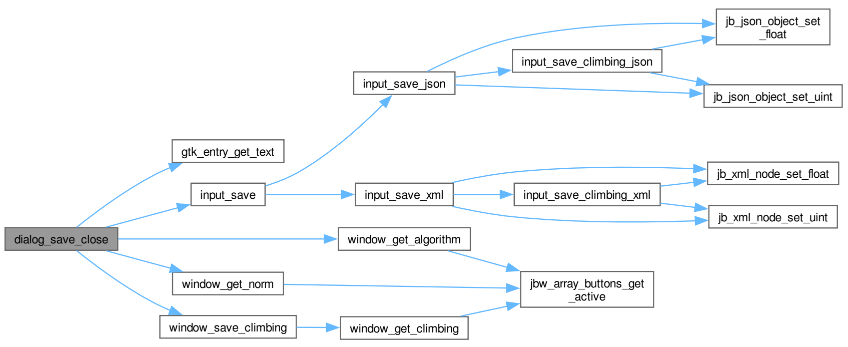
dlg	GtkFileChooserDialog dialog.
response←_id	Response identifier.

Definition at line 872 of file interface.c.

```
{
  GtkFileFilter *filter1;
  char *buffer;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_save_close: start\n");
#endif
  // If OK response then saving
  if (response_id == GTK_RESPONSE_OK)
    {
      // Setting input file type
      filter1 = gtk_file_chooser_get_filter (GTK_FILE_CHOOSER (dlg));
      buffer = (char *) gtk_file_filter_get_name (filter1);
      if (!strcmp (buffer, "XML"))
        input->type = INPUT_TYPE_XML;
      else
        input->type = INPUT_TYPE_JSON;

      // Adding properties to the root XML node
      input->simulator
        = g_strdup (gtk_button_get_label (window->button_simulator));
      if (gtk_check_button_get_active (window->check_evaluator))
        input->evaluator
          = g_strdup (gtk_button_get_label (window->button_evaluator));
      else
        input->evaluator = NULL;
      if (gtk_check_button_get_active (window->check_cleaner))
        input->cleaner
          = g_strdup (gtk_button_get_label (window->button_cleaner));
      else
        input->cleaner = NULL;
      if (input->type == INPUT_TYPE_XML)
        {
          input->result
            = (char *) xmlStrdup ((const xmlChar *)
                                  gtk_entry_get_text (window->entry_result));
          input->variables
            = (char *) xmlStrdup ((const xmlChar *)
                                  gtk_entry_get_text (window->entry_variables));
        }
      else
        {
          input->result = g_strdup (gtk_entry_get_text (window->entry_result));
          input->variables =
            g_strdup (gtk_entry_get_text (window->entry_variables));
        }

      // Setting the algorithm
      switch (window_get_algorithm ())
        {
        case ALGORITHM_MONTE_CARLO:
          input->algorithm = ALGORITHM_MONTE_CARLO;
          input->nsimulations
            = gtk_spin_button_get_value_as_int (window->spin_simulations);
          input->niterations
            = gtk_spin_button_get_value_as_int (window->spin_iterations);
          input->tolerance = gtk_spin_button_get_value (window->spin_tolerance);
          input->nbest = gtk_spin_button_get_value_as_int (window->spin_bests);
          window_save_climbing ();
          break;
        case ALGORITHM_SWEEP:
          input->algorithm = ALGORITHM_SWEEP;
          input->niterations
```

```
            = gtk_spin_button_get_value_as_int (window->spin_iterations);
          input->tolerance = gtk_spin_button_get_value (window->spin_tolerance);
          input->nbest = gtk_spin_button_get_value_as_int (window->spin_bests);
          window_save_climbing ();
          break;
        case ALGORITHM_ORTHOGONAL:
          input->algorithm = ALGORITHM_ORTHOGONAL;
          input->niterations
            = gtk_spin_button_get_value_as_int (window->spin_iterations);
          input->tolerance = gtk_spin_button_get_value (window->spin_tolerance);
          input->nbest = gtk_spin_button_get_value_as_int (window->spin_bests);
          window_save_climbing ();
          break;
        default:
          input->algorithm = ALGORITHM_GENETIC;
          input->nsimulations
            = gtk_spin_button_get_value_as_int (window->spin_population);
          input->niterations
            = gtk_spin_button_get_value_as_int (window->spin_generations);
          input->mutation_ratio
            = gtk_spin_button_get_value (window->spin_mutation);
          input->reproduction_ratio
            = gtk_spin_button_get_value (window->spin_reproduction);
          input->adaptation_ratio
            = gtk_spin_button_get_value (window->spin_adaptation);
        }
      input->norm = window_get_norm ();
      input->p = gtk_spin_button_get_value (window->spin_p);
      input->threshold = gtk_spin_button_get_value (window->spin_threshold);

      // Saving the XML file
      buffer = gtk_file_chooser_get_current_name (GTK_FILE_CHOOSER (dlg));
      input_save (buffer);

      // Closing and freeing memory
      g_free (buffer);
    }
  gtk_window_destroy (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_save_close: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.9 dialog_simulator()

```
static void dialog_simulator ( )  [static]
```

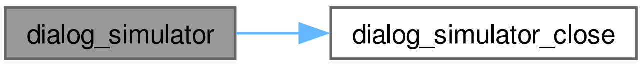
Function to open a dialog to save the simulator file.

Definition at line 2232 of file interface.c.

```
{
  GtkFileChooserDialog *dlg;
#if DEBUG_INTERFACE
```

```
  fprintf (stderr, "dialog_simulator: start\n");
#endif
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Open simulator file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_OPEN,
                                 _("_Cancel"), GTK_RESPONSE_CANCEL,
                                 _("_Open"), GTK_RESPONSE_ACCEPT, NULL);
  g_signal_connect (dlg, "response", G_CALLBACK (dialog_simulator_close), NULL);
  gtk_window_present (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_simulator: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.10 dialog_simulator_close()

```
static void dialog_simulator_close (
            GtkFileChooserDialog * dlg,
            int response_id )  [static]
```

Function to save the close the simulator file dialog.

Parameters

dlg	GtkFileChooserDialog dialog.
response←_id	Response identifier.

Definition at line 2201 of file interface.c.

```
{
  GFile *file1, *file2;
  char *buffer1, *buffer2;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_simulator_close: start\n");
#endif
  if (response_id == GTK_RESPONSE_OK)
    {
      buffer1 = gtk_file_chooser_get_current_name (GTK_FILE_CHOOSER (dlg));
      file1 = g_file_new_for_path (buffer1);
      file2 = g_file_new_for_path (input->directory);
      buffer2 = g_file_get_relative_path (file2, file1);
      input->simulator = g_strdup (buffer2);
      g_free (buffer2);
      g_object_unref (file2);
      g_object_unref (file1);
      g_free (buffer1);
    }
  gtk_window_destroy (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_simulator_close: end\n");
#endif
}
```

4.11.3.11 input_save()

```
static void input_save (
            char * filename )  [inline], [static]
```

Function to save the input file.

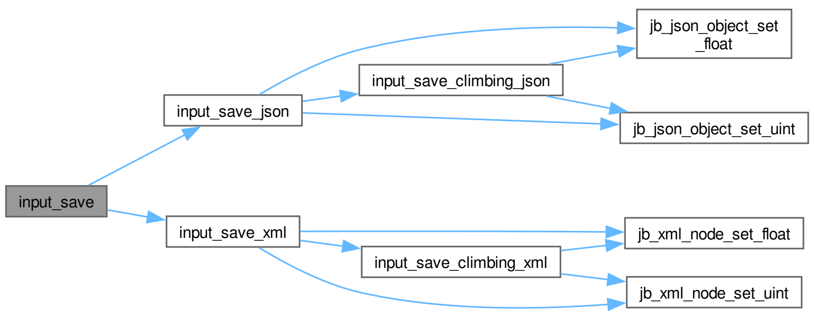
Parameters

filename	Input file name.

Definition at line 608 of file interface.c.

```
{
  xmlDoc *doc;
  JsonGenerator *generator;

#if DEBUG_INTERFACE
  fprintf (stderr, "input_save: start\n");
#endif

  // Getting the input file directory
  input->name = g_path_get_basename (filename);
  input->directory = g_path_get_dirname (filename);

  if (input->type == INPUT_TYPE_XML)
    {
      // Opening the input file
      doc = xmlNewDoc ((const xmlChar *) "1.0");
      input_save_xml (doc);

      // Saving the XML file
      xmlSaveFormatFile (filename, doc, 1);

      // Freeing memory
      xmlFreeDoc (doc);
    }
  else
    {
      // Opening the input file
      generator = json_generator_new ();
      json_generator_set_pretty (generator, TRUE);
      input_save_json (generator);

      // Saving the JSON file
      json_generator_to_file (generator, filename, NULL);

      // Freeing memory
      g_object_unref (generator);
    }

#if DEBUG_INTERFACE
  fprintf (stderr, "input_save: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.12 input_save_climbing_json()

```
static void input_save_climbing_json (
             JsonNode * node )  [static]
```

Function to save the hill climbing method data in a JSON node.

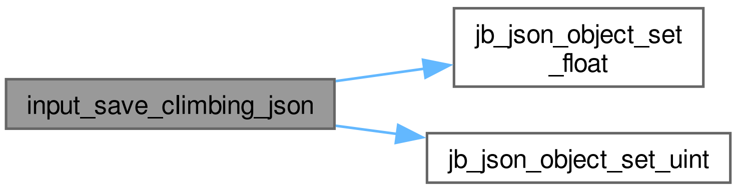
Parameters

node	JSON node.

Definition at line 206 of file interface.c.

```
{
  JsonObject *object;
#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_climbing_json: start\n");
#endif
  object = json_node_get_object (node);
  if (input->nsteps)
    {
      jb_json_object_set_uint (object, LABEL_NSTEPS, input->nsteps);
      if (input->relaxation != DEFAULT_RELAXATION)
        jb_json_object_set_float (object, LABEL_RELAXATION, input->relaxation);
      switch (input->climbing)
        {
        case CLIMBING_METHOD_COORDINATES:
          json_object_set_string_member (object, LABEL_CLIMBING,
                                         LABEL_COORDINATES);
          break;
        default:
          json_object_set_string_member (object, LABEL_CLIMBING, LABEL_RANDOM);
          jb_json_object_set_uint (object, LABEL_NESTIMATES, input->nestimates);
        }
    }
#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_climbing_json: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.13 input_save_climbing_xml()

```
static void input_save_climbing_xml (
             xmlNode * node )  [static]
```

Function to save the hill climbing method data in a XML node.

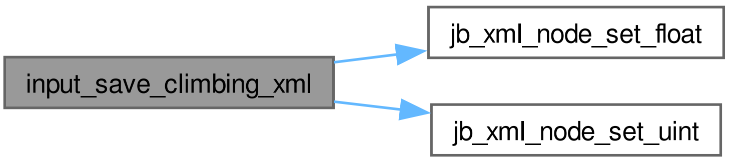
Parameters

node	XML node.

Definition at line 172 of file interface.c.

```
{
#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_climbing_xml: start\n");
#endif
  if (input->nsteps)
    {
      jb_xml_node_set_uint (node, (const xmlChar *) LABEL_NSTEPS,
                            input->nsteps);
      if (input->relaxation != DEFAULT_RELAXATION)
        jb_xml_node_set_float (node, (const xmlChar *) LABEL_RELAXATION,
                               input->relaxation);
      switch (input->climbing)
        {
        case CLIMBING_METHOD_COORDINATES:
          xmlSetProp (node, (const xmlChar *) LABEL_CLIMBING,
                      (const xmlChar *) LABEL_COORDINATES);
          break;
        default:
          xmlSetProp (node, (const xmlChar *) LABEL_CLIMBING,
                      (const xmlChar *) LABEL_RANDOM);
          jb_xml_node_set_uint (node, (const xmlChar *) LABEL_NESTIMATES,
                                input->nestimates);
        }
    }
#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_climbing_xml: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.14 input_save_json()

```
static void input_save_json (
             JsonGenerator * generator )  [inline], [static]
```

Function to save the input file in JSON format.

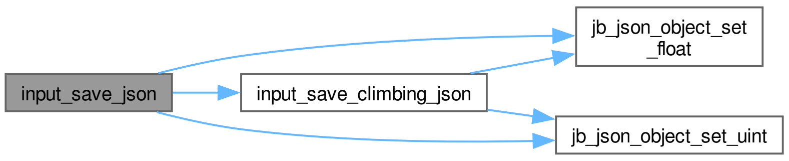
Parameters

generator	JsonGenerator struct.

Definition at line 427 of file interface.c.

```
{
  unsigned int i, j;
  char *buffer;
  JsonNode *node, *child;
  JsonObject *object;
  JsonArray *array;
  GFile *file, *file2;

#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_json: start\n");
#endif

  // Setting root JSON node
  object = json_object_new ();
  node = json_node_new (JSON_NODE_OBJECT);
  json_node_set_object (node, object);
  json_generator_set_root (generator, node);

  // Adding properties to the root JSON node
  if (strcmp (input->result, result_name))
    json_object_set_string_member (object, LABEL_RESULT_FILE, input->result);
  if (strcmp (input->variables, variables_name))
    json_object_set_string_member (object, LABEL_VARIABLES_FILE,
                                   input->variables);
  file = g_file_new_for_path (input->directory);
  file2 = g_file_new_for_path (input->simulator);
  buffer = g_file_get_relative_path (file, file2);
  g_object_unref (file2);
  json_object_set_string_member (object, LABEL_SIMULATOR, buffer);
  g_free (buffer);
  if (input->evaluator)
    {
      file2 = g_file_new_for_path (input->evaluator);
      buffer = g_file_get_relative_path (file, file2);
      g_object_unref (file2);
      if (strlen (buffer))
        json_object_set_string_member (object, LABEL_EVALUATOR, buffer);
      g_free (buffer);
    }
  if (input->cleaner)
    {
      file2 = g_file_new_for_path (input->cleaner);
      buffer = g_file_get_relative_path (file, file2);
      g_object_unref (file2);
      if (strlen (buffer))
        json_object_set_string_member (object, LABEL_CLEANER, buffer);
      g_free (buffer);
    }
  if (input->seed != DEFAULT_RANDOM_SEED)
    jb_json_object_set_uint (object, LABEL_SEED, input->seed);

  // Setting the algorithm
  buffer = (char *) g_slice_alloc (64);
  switch (input->algorithm)
    {
    case ALGORITHM_MONTE_CARLO:
      json_object_set_string_member (object, LABEL_ALGORITHM,
                                     LABEL_MONTE_CARLO);
      snprintf (buffer, 64, "%u", input->nsimulations);
      json_object_set_string_member (object, LABEL_NSIMULATIONS, buffer);
      snprintf (buffer, 64, "%u", input->niterations);
      json_object_set_string_member (object, LABEL_NITERATIONS, buffer);
      snprintf (buffer, 64, "%.3lg", input->tolerance);
      json_object_set_string_member (object, LABEL_TOLERANCE, buffer);
      snprintf (buffer, 64, "%u", input->nbest);
      json_object_set_string_member (object, LABEL_NBEST, buffer);
      input_save_climbing_json (node);
      break;
    case ALGORITHM_SWEEP:
      json_object_set_string_member (object, LABEL_ALGORITHM, LABEL_SWEEP);
      snprintf (buffer, 64, "%u", input->niterations);
      json_object_set_string_member (object, LABEL_NITERATIONS, buffer);
      snprintf (buffer, 64, "%.3lg", input->tolerance);
      json_object_set_string_member (object, LABEL_TOLERANCE, buffer);
      snprintf (buffer, 64, "%u", input->nbest);
      json_object_set_string_member (object, LABEL_NBEST, buffer);
      input_save_climbing_json (node);
      break;
    case ALGORITHM_ORTHOGONAL:
      json_object_set_string_member (object, LABEL_ALGORITHM, LABEL_ORTHOGONAL);
      snprintf (buffer, 64, "%u", input->niterations);
      json_object_set_string_member (object, LABEL_NITERATIONS, buffer);
      snprintf (buffer, 64, "%.3lg", input->tolerance);
      json_object_set_string_member (object, LABEL_TOLERANCE, buffer);
      snprintf (buffer, 64, "%u", input->nbest);
      json_object_set_string_member (object, LABEL_NBEST, buffer);
      input_save_climbing_json (node);
      break;
    default:
      json_object_set_string_member (object, LABEL_ALGORITHM, LABEL_GENETIC);
      snprintf (buffer, 64, "%u", input->nsimulations);
      json_object_set_string_member (object, LABEL_NPOPULATION, buffer);
      snprintf (buffer, 64, "%u", input->niterations);
      json_object_set_string_member (object, LABEL_NGENERATIONS, buffer);
      snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
      json_object_set_string_member (object, LABEL_MUTATION, buffer);
      snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
      json_object_set_string_member (object, LABEL_REPRODUCTION, buffer);
      snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
      json_object_set_string_member (object, LABEL_ADAPTATION, buffer);
      break;
    }
  g_slice_free1 (64, buffer);
  if (input->threshold != 0.)
    jb_json_object_set_float (object, LABEL_THRESHOLD, input->threshold);

  // Setting the experimental data
  array = json_array_new ();
  for (i = 0; i < input->nexperiments; ++i)
    {
      child = json_node_new (JSON_NODE_OBJECT);
      object = json_node_get_object (child);
      json_object_set_string_member (object, LABEL_NAME,
                                     input->experiment[i].name);
      if (input->experiment[i].weight != 1.)
        jb_json_object_set_float (object, LABEL_WEIGHT,
                                  input->experiment[i].weight);
      for (j = 0; j < input->experiment->ninputs; ++j)
        json_object_set_string_member (object, stencil[j],
                                       input->experiment[i].stencil[j]);
      json_array_add_element (array, child);
    }
  json_object_set_array_member (object, LABEL_EXPERIMENTS, array);

  // Setting the variables data
  array = json_array_new ();
  for (i = 0; i < input->nvariables; ++i)
    {
      child = json_node_new (JSON_NODE_OBJECT);
      object = json_node_get_object (child);
      json_object_set_string_member (object, LABEL_NAME,
                                     input->variable[i].name);
      jb_json_object_set_float (object, LABEL_MINIMUM,
                                input->variable[i].rangemin);
      if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
        jb_json_object_set_float (object, LABEL_ABSOLUTE_MINIMUM,
                                  input->variable[i].rangeminabs);
      jb_json_object_set_float (object, LABEL_MAXIMUM,
                                input->variable[i].rangemax);
      if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
        jb_json_object_set_float (object, LABEL_ABSOLUTE_MAXIMUM,
                                  input->variable[i].rangemaxabs);
      if (input->variable[i].precision != DEFAULT_PRECISION)
        jb_json_object_set_uint (object, LABEL_PRECISION,
                                 input->variable[i].precision);
      if (input->algorithm == ALGORITHM_SWEEP
          || input->algorithm == ALGORITHM_ORTHOGONAL)
        jb_json_object_set_uint (object, LABEL_NSWEEPS,
                                 input->variable[i].nsweeps);
      else if (input->algorithm == ALGORITHM_GENETIC)
        jb_json_object_set_uint (object, LABEL_NBITS, input->variable[i].nbits);
      if (input->nsteps)
        jb_json_object_set_float (object, LABEL_STEP, input->variable[i].step);
      json_array_add_element (array, child);
    }
  json_object_set_array_member (object, LABEL_VARIABLES, array);

  // Saving the error norm
  switch (input->norm)
    {
    case ERROR_NORM_MAXIMUM:
      json_object_set_string_member (object, LABEL_NORM, LABEL_MAXIMUM);
      break;
    case ERROR_NORM_P:
      json_object_set_string_member (object, LABEL_NORM, LABEL_P);
      jb_json_object_set_float (object, LABEL_P, input->p);
      break;
    case ERROR_NORM_TAXICAB:
      json_object_set_string_member (object, LABEL_NORM, LABEL_TAXICAB);
    }

#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_json: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.15 input_save_xml()

```
static void input_save_xml (
            xmlDoc * doc )  [inline], [static]
```

Function to save the input file in XML format.

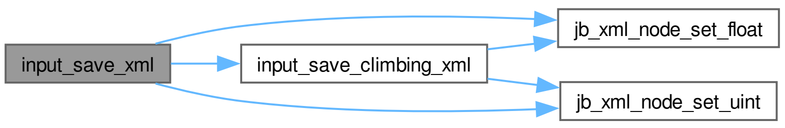
Parameters

doc	xmlDoc struct.

Definition at line 238 of file interface.c.

```
{
  unsigned int i, j;
  char *buffer;
  xmlNode *node, *child;
  GFile *file, *file2;

#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_xml: start\n");
#endif

  // Setting root XML node
  node = xmlNewDocNode (doc, 0, (const xmlChar *) LABEL_OPTIMIZE, 0);
  xmlDocSetRootElement (doc, node);

  // Adding properties to the root XML node
  if (xmlStrcmp
      ((const xmlChar *) input->result, (const xmlChar *) result_name))
    xmlSetProp (node, (const xmlChar *) LABEL_RESULT_FILE,
                (xmlChar *) input->result);
  if (xmlStrcmp
      ((const xmlChar *) input->variables, (const xmlChar *) variables_name))
    xmlSetProp (node, (const xmlChar *) LABEL_VARIABLES_FILE,
                (xmlChar *) input->variables);
  file = g_file_new_for_path (input->directory);
  file2 = g_file_new_for_path (input->simulator);
  buffer = g_file_get_relative_path (file, file2);
  g_object_unref (file2);
  xmlSetProp (node, (const xmlChar *) LABEL_SIMULATOR, (xmlChar *) buffer);
  g_free (buffer);
  if (input->evaluator)
    {
      file2 = g_file_new_for_path (input->evaluator);
      buffer = g_file_get_relative_path (file, file2);
      g_object_unref (file2);
      if (xmlStrlen ((xmlChar *) buffer))
        xmlSetProp (node, (const xmlChar *) LABEL_EVALUATOR,
                    (xmlChar *) buffer);
      g_free (buffer);
    }
  if (input->cleaner)
    {
      file2 = g_file_new_for_path (input->cleaner);
      buffer = g_file_get_relative_path (file, file2);
      g_object_unref (file2);
      if (xmlStrlen ((xmlChar *) buffer))
        xmlSetProp (node, (const xmlChar *) LABEL_CLEANER, (xmlChar *) buffer);
      g_free (buffer);
    }
  if (input->seed != DEFAULT_RANDOM_SEED)
    jb_xml_node_set_uint (node, (const xmlChar *) LABEL_SEED, input->seed);

  // Setting the algorithm
  buffer = (char *) g_slice_alloc (64);
  switch (input->algorithm)
    {
    case ALGORITHM_MONTE_CARLO:
      xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
                  (const xmlChar *) LABEL_MONTE_CARLO);
      snprintf (buffer, 64, "%u", input->nsimulations);
      xmlSetProp (node, (const xmlChar *) LABEL_NSIMULATIONS,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%u", input->niterations);
      xmlSetProp (node, (const xmlChar *) LABEL_NITERATIONS,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%.3lg", input->tolerance);
      xmlSetProp (node, (const xmlChar *) LABEL_TOLERANCE, (xmlChar *) buffer);
      snprintf (buffer, 64, "%u", input->nbest);
      xmlSetProp (node, (const xmlChar *) LABEL_NBEST, (xmlChar *) buffer);
      input_save_climbing_xml (node);
      break;
    case ALGORITHM_SWEEP:
      xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
                  (const xmlChar *) LABEL_SWEEP);
      snprintf (buffer, 64, "%u", input->niterations);
      xmlSetProp (node, (const xmlChar *) LABEL_NITERATIONS,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%.3lg", input->tolerance);
      xmlSetProp (node, (const xmlChar *) LABEL_TOLERANCE, (xmlChar *) buffer);
      snprintf (buffer, 64, "%u", input->nbest);
      xmlSetProp (node, (const xmlChar *) LABEL_NBEST, (xmlChar *) buffer);
      input_save_climbing_xml (node);
      break;
    case ALGORITHM_ORTHOGONAL:
      xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
                  (const xmlChar *) LABEL_ORTHOGONAL);
      snprintf (buffer, 64, "%u", input->niterations);
      xmlSetProp (node, (const xmlChar *) LABEL_NITERATIONS,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%.3lg", input->tolerance);
      xmlSetProp (node, (const xmlChar *) LABEL_TOLERANCE, (xmlChar *) buffer);
      snprintf (buffer, 64, "%u", input->nbest);
      xmlSetProp (node, (const xmlChar *) LABEL_NBEST, (xmlChar *) buffer);
      input_save_climbing_xml (node);
      break;
    default:
      xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
                  (const xmlChar *) LABEL_GENETIC);
      snprintf (buffer, 64, "%u", input->nsimulations);
      xmlSetProp (node, (const xmlChar *) LABEL_NPOPULATION,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%u", input->niterations);
      xmlSetProp (node, (const xmlChar *) LABEL_NGENERATIONS,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
      xmlSetProp (node, (const xmlChar *) LABEL_MUTATION, (xmlChar *) buffer);
      snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
      xmlSetProp (node, (const xmlChar *) LABEL_REPRODUCTION,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
      xmlSetProp (node, (const xmlChar *) LABEL_ADAPTATION, (xmlChar *) buffer);
      break;
    }
  g_slice_free1 (64, buffer);
  if (input->threshold != 0.)
    jb_xml_node_set_float (node, (const xmlChar *) LABEL_THRESHOLD,
                           input->threshold);

  // Setting the experimental data
  for (i = 0; i < input->nexperiments; ++i)
    {
      child = xmlNewChild (node, 0, (const xmlChar *) LABEL_EXPERIMENT, 0);
      xmlSetProp (child, (const xmlChar *) LABEL_NAME,
                  (xmlChar *) input->experiment[i].name);
      if (input->experiment[i].weight != 1.)
        jb_xml_node_set_float (child, (const xmlChar *) LABEL_WEIGHT,
                               input->experiment[i].weight);
      for (j = 0; j < input->experiment->ninputs; ++j)
        xmlSetProp (child, (const xmlChar *) stencil[j],
                    (xmlChar *) input->experiment[i].stencil[j]);
    }

  // Setting the variables data
  for (i = 0; i < input->nvariables; ++i)
    {
      child = xmlNewChild (node, 0, (const xmlChar *) LABEL_VARIABLE, 0);
      xmlSetProp (child, (const xmlChar *) LABEL_NAME,
                  (xmlChar *) input->variable[i].name);
      jb_xml_node_set_float (child, (const xmlChar *) LABEL_MINIMUM,
                             input->variable[i].rangemin);
      if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
        jb_xml_node_set_float (child, (const xmlChar *) LABEL_ABSOLUTE_MINIMUM,
                               input->variable[i].rangeminabs);
      jb_xml_node_set_float (child, (const xmlChar *) LABEL_MAXIMUM,
                             input->variable[i].rangemax);
      if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
        jb_xml_node_set_float (child, (const xmlChar *) LABEL_ABSOLUTE_MAXIMUM,
                               input->variable[i].rangemaxabs);
      if (input->variable[i].precision != DEFAULT_PRECISION)
        jb_xml_node_set_uint (child, (const xmlChar *) LABEL_PRECISION,
                              input->variable[i].precision);
      if (input->algorithm == ALGORITHM_SWEEP
          || input->algorithm == ALGORITHM_ORTHOGONAL)
        jb_xml_node_set_uint (child, (const xmlChar *) LABEL_NSWEEPS,
                              input->variable[i].nsweeps);
      else if (input->algorithm == ALGORITHM_GENETIC)
        jb_xml_node_set_uint (child, (const xmlChar *) LABEL_NBITS,
                              input->variable[i].nbits);
      if (input->nsteps)
        jb_xml_node_set_float (child, (const xmlChar *) LABEL_STEP,
                               input->variable[i].step);
    }

  // Saving the error norm
  switch (input->norm)
    {
    case ERROR_NORM_MAXIMUM:
      xmlSetProp (node, (const xmlChar *) LABEL_NORM,
                  (const xmlChar *) LABEL_MAXIMUM);
      break;
    case ERROR_NORM_P:
      xmlSetProp (node, (const xmlChar *) LABEL_NORM,
                  (const xmlChar *) LABEL_P);
      jb_xml_node_set_float (node, (const xmlChar *) LABEL_P, input->p);
      break;
    case ERROR_NORM_TAXICAB:
      xmlSetProp (node, (const xmlChar *) LABEL_NORM,
                  (const xmlChar *) LABEL_TAXICAB);
    }

#if DEBUG_INTERFACE
  fprintf (stderr, "input_save: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.16 options_new()

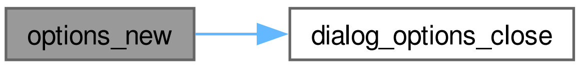
```
static void options_new ( )  [static]
```

Function to open the options dialog.

Definition at line 680 of file interface.c.

```
{
#if DEBUG_INTERFACE
  fprintf (stderr, "options_new: start\n");
#endif
  options->label_seed = (GtkLabel *)
    gtk_label_new (_("Pseudo-random numbers generator seed"));
  options->spin_seed = (GtkSpinButton *)
    gtk_spin_button_new_with_range (0., (gdouble) G_MAXULONG, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (options->spin_seed),
     _("Seed to init the pseudo-random numbers generator"));
  gtk_spin_button_set_value (options->spin_seed, (gdouble) input->seed);
  options->label_threads = (GtkLabel *)
    gtk_label_new (_("Threads number for the stochastic algorithm"));
  options->spin_threads
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (options->spin_threads),
     _("Number of threads to perform the calibration/optimization for "
       "the stochastic algorithm"));
  gtk_spin_button_set_value (options->spin_threads, (gdouble) nthreads);
  options->label_climbing = (GtkLabel *)
    gtk_label_new (_("Threads number for the hill climbing method"));
  options->spin_climbing =
    (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (options->spin_climbing),
     _("Number of threads to perform the calibration/optimization for the "
       "hill climbing method"));
  gtk_spin_button_set_value (options->spin_climbing,
                             (gdouble) nthreads_climbing);
  options->grid = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (options->grid, GTK_WIDGET (options->label_seed), 0, 0, 1, 1);
  gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_seed), 1, 0, 1, 1);
  gtk_grid_attach (options->grid, GTK_WIDGET (options->label_threads),
                   0, 1, 1, 1);
  gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_threads),
                   1, 1, 1, 1);
  gtk_grid_attach (options->grid, GTK_WIDGET (options->label_climbing), 0, 2, 1,
                   1);
  gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_climbing), 1, 2, 1,
                   1);
#if !GTK4
  gtk_widget_show_all (GTK_WIDGET (options->grid));
#else
  gtk_widget_show (GTK_WIDGET (options->grid));
#endif
  options->dialog = (GtkDialog *)
    gtk_dialog_new_with_buttons (_("Options"),
                                 window->window,
                                 GTK_DIALOG_MODAL,
                                 _("_OK"), GTK_RESPONSE_OK,
                                 _("_Cancel"), GTK_RESPONSE_CANCEL, NULL);
  gtk_box_append (GTK_BOX (gtk_dialog_get_content_area (options->dialog)),
                  GTK_WIDGET (options->grid));
  g_signal_connect (options->dialog, "response",
                    G_CALLBACK (dialog_options_close), NULL);
  gtk_window_present (GTK_WINDOW (options->dialog));
#if DEBUG_INTERFACE
  fprintf (stderr, "options_new: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.17 running_new()

```
static void running_new ( )  [inline], [static]
```

Function to open the running dialog.

Definition at line 748 of file interface.c.

```
{
#if DEBUG_INTERFACE
  fprintf (stderr, "running_new: start\n");
#endif
  running->label = (GtkLabel *) gtk_label_new (_("Calculating ..."));
  running->spinner = (GtkSpinner *) gtk_spinner_new ();
  running->grid = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (running->grid, GTK_WIDGET (running->label), 0, 0, 1, 1);
  gtk_grid_attach (running->grid, GTK_WIDGET (running->spinner), 0, 1, 1, 1);
  running->dialog = (GtkDialog *)
    gtk_dialog_new_with_buttons (_("Calculating"),
                                 window->window, GTK_DIALOG_MODAL, NULL, NULL);
  gtk_window_set_child (GTK_WINDOW
                        (gtk_dialog_get_content_area (running->dialog)),
                        GTK_WIDGET (running->grid));
  gtk_spinner_start (running->spinner);
#if !GTK4
  gtk_widget_show_all (GTK_WIDGET (running->dialog));
#else
  gtk_widget_show (GTK_WIDGET (running->dialog));
#endif
#if DEBUG_INTERFACE
  fprintf (stderr, "running_new: end\n");
#endif
}
```

4.11.3.18 window_about()

```
static void window_about ( )  [static]
```

Function to show an about dialog.

Definition at line 1120 of file interface.c.

```
{
  static const gchar *authors[] = {
    "Javier Burguete Tolosa <jburguete@eead.csic.es>",
    "Borja Latorre Garcés <borja.latorre@csic.es>",
    NULL
  };
#if DEBUG_INTERFACE
  fprintf (stderr, "window_about: start\n");
#endif
  gtk_show_about_dialog
    (window->window,
     "program_name", "MPCOTool",
     "comments",
     _("The Multi-Purposes Calibration and Optimization Tool.\n"
       "A software to perform calibrations or optimizations of empirical "
       "parameters"),
     "authors", authors,
     "translator-credits",
     "Javier Burguete Tolosa <jburguete@eead.csic.es> "
     "(english, french and spanish)\n"
     "Uğur Çayoğlu (german)",
     "version", "4.10.2",
     "copyright", "Copyright 2012-2023 Javier Burguete Tolosa",
     "logo", window->logo,
     "website", "https://github.com/jburguete/mpcotool",
     "license-type", GTK_LICENSE_BSD, NULL);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_about: end\n");
#endif
}
```

4.11.3.19 window_add_experiment()

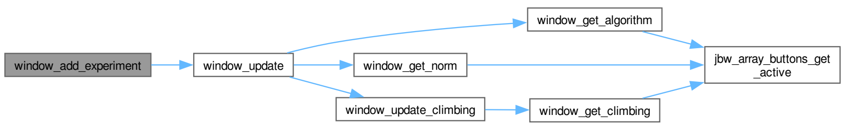
```
static void window_add_experiment ( )  [static]
```

Function to add an experiment in the main window.

Definition at line 1438 of file interface.c.

```
{
  unsigned int i, j;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_add_experiment: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
  g_signal_handler_block (window->combo_experiment, window->id_experiment);
  gtk_combo_box_text_insert_text
    (window->combo_experiment, i, input->experiment[i].name);
  g_signal_handler_unblock (window->combo_experiment, window->id_experiment);
  input->experiment = (Experiment *) g_realloc
    (input->experiment, (input->nexperiments + 1) * sizeof (Experiment));
  for (j = input->nexperiments - 1; j > i; --j)
    memcpy (input->experiment + j + 1, input->experiment + j,
            sizeof (Experiment));
  input->experiment[j + 1].weight = input->experiment[j].weight;
  input->experiment[j + 1].ninputs = input->experiment[j].ninputs;
  if (input->type == INPUT_TYPE_XML)
    {
      input->experiment[j + 1].name
        = (char *) xmlStrdup ((xmlChar *) input->experiment[j].name);
      for (j = 0; j < input->experiment->ninputs; ++j)
        input->experiment[i + 1].stencil[j]
          = (char *) xmlStrdup ((xmlChar *) input->experiment[i].stencil[j]);
    }
  else
    {
      input->experiment[j + 1].name = g_strdup (input->experiment[j].name);
      for (j = 0; j < input->experiment->ninputs; ++j)
        input->experiment[i + 1].stencil[j]
          = g_strdup (input->experiment[i].stencil[j]);
    }
  ++input->nexperiments;
  for (j = 0; j < input->experiment->ninputs; ++j)
    g_signal_handler_block (window->button_template[j], window->id_input[j]);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i + 1);
  for (j = 0; j < input->experiment->ninputs; ++j)
    g_signal_handler_unblock (window->button_template[j], window->id_input[j]);
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_add_experiment: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.20 window_add_variable()

```
static void window_add_variable ( )  [static]
```

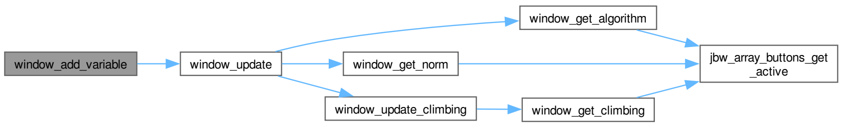
Function to add a variable in the main window.

Definition at line 1775 of file interface.c.

```
{
  unsigned int i, j;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_add_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  g_signal_handler_block (window->combo_variable, window->id_variable);
  gtk_combo_box_text_insert_text (window->combo_variable, i,
                                  input->variable[i].name);
  g_signal_handler_unblock (window->combo_variable, window->id_variable);
  input->variable = (Variable *) g_realloc
```

```
    (input->variable, (input->nvariables + 1) * sizeof (Variable));
  for (j = input->nvariables - 1; j > i; --j)
    memcpy (input->variable + j + 1, input->variable + j, sizeof (Variable));
  memcpy (input->variable + j + 1, input->variable + j, sizeof (Variable));
  if (input->type == INPUT_TYPE_XML)
    input->variable[j + 1].name
      = (char *) xmlStrdup ((xmlChar *) input->variable[j].name);
  else
    input->variable[j + 1].name = g_strdup (input->variable[j].name);
  ++input->nvariables;
  g_signal_handler_block (window->entry_variable, window->id_variable_label);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i + 1);
  g_signal_handler_unblock (window->entry_variable, window->id_variable_label);
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_add_variable: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.21 window_get_algorithm()

```
static unsigned int window_get_algorithm ( )  [static]
```

Function to get the stochastic algorithm number.

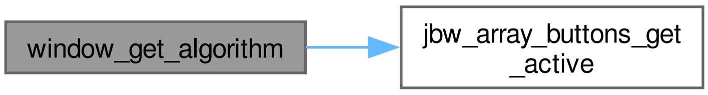
Returns

Stochastic algorithm number.

Definition at line 781 of file interface.c.

```
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_get_algorithm: start\n");
#endif
  i = jbw_array_buttons_get_active (window->button_algorithm, NALGORITHMS);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_get_algorithm: %u\n", i);
  fprintf (stderr, "window_get_algorithm: end\n");
#endif
  return i;
}
```

Here is the call graph for this function:



4.11.3.22 window_get_climbing()

```
static unsigned int window_get_climbing ( )  [static]
```

Function to get the hill climbing method number.

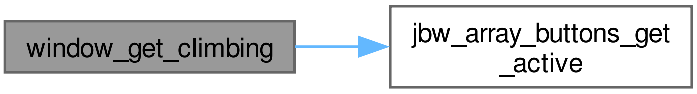
Returns

Hill climbing method number.

Definition at line 801 of file interface.c.

```
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_get_climbing: start\n");
#endif
  i = jbw_array_buttons_get_active (window->button_climbing, NCLIMBINGS);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_get_climbing: %u\n", i);
  fprintf (stderr, "window_get_climbing: end\n");
#endif
  return i;
}
```

Here is the call graph for this function:



4.11.3.23 window_get_norm()

```
static unsigned int window_get_norm ( )  [static]
```

Function to get the norm method number.

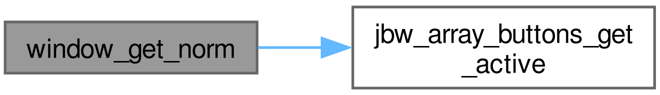
Returns

Norm method number.

Definition at line 821 of file interface.c.

```
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_get_norm: start\n");
#endif
  i = jbw_array_buttons_get_active (window->button_norm, NNORMS);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_get_norm: %u\n", i);
  fprintf (stderr, "window_get_norm: end\n");
#endif
  return i;
}
```

Here is the call graph for this function:



4.11.3.24 window_help()

```
static void window_help ( )  [static]
```

Function to show a help dialog.

Definition at line 1092 of file interface.c.

```
{
  char *buffer, *buffer2;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_help: start\n");
#endif
  buffer2 = g_build_filename (window->application_directory, "..", "manuals",
                              _("user-manual.pdf"), NULL);
  buffer = g_filename_to_uri (buffer2, NULL, NULL);
  g_free (buffer2);
#if GTK4
  gtk_show_uri (window->window, buffer, GDK_CURRENT_TIME);
#else
  gtk_show_uri_on_window (window->window, buffer, GDK_CURRENT_TIME, NULL);
#endif
#if DEBUG_INTERFACE
  fprintf (stderr, "window_help: uri=%s\n", buffer);
#endif
  g_free (buffer);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_help: end\n");
#endif
}
```

4.11.3.25 window_inputs_experiment()

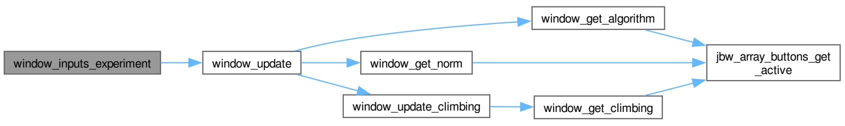
```
static void window_inputs_experiment ( )  [static]
```

Function to update the experiment input templates number in the main window.

Definition at line 1571 of file interface.c.

```
{
  unsigned int j;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_inputs_experiment: start\n");
#endif
  j = input->experiment->ninputs - 1;
  if (j && !gtk_check_button_get_active (window->check_template[j]))
    --input->experiment->ninputs;
  if (input->experiment->ninputs < MAX_NINPUTS
      && gtk_check_button_get_active (window->check_template[j]))
    ++input->experiment->ninputs;
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_inputs_experiment: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.26 window_label_variable()

```
static void window_label_variable ( )  [static]
```

Function to set the variable label in the main window.

Definition at line 1810 of file interface.c.

```
{
  unsigned int i;
  const char *buffer;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_label_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  buffer = gtk_entry_get_text (window->entry_variable);
  g_signal_handler_block (window->combo_variable, window->id_variable);
  gtk_combo_box_text_remove (window->combo_variable, i);
  gtk_combo_box_text_insert_text (window->combo_variable, i, buffer);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
  g_signal_handler_unblock (window->combo_variable, window->id_variable);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_label_variable: end\n");
#endif
}
```

Here is the call graph for this function:

window_label_variable
gtk_entry_get_text

4.11.3.27 window_name_experiment()

```
static void window_name_experiment ( )  [static]
```

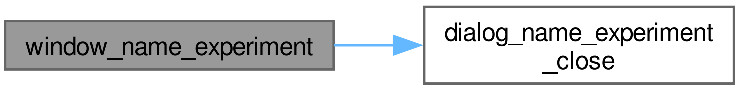
Function to set the experiment name in the main window.

Definition at line 1518 of file interface.c.

```
{
  GtkFileChooserDialog *dlg;
  GMainLoop *loop;
  const char *buffer;
  unsigned int i;
#if DEBUG_INTERFACE
```

```
  fprintf (stderr, "window_name_experiment: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
  buffer = gtk_button_get_label (window->button_experiment);
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Open experiment file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_OPEN,
                                 _("_Cancel"),
                                 GTK_RESPONSE_CANCEL,
                                 _("_Open"), GTK_RESPONSE_OK, NULL);
  gtk_file_chooser_set_current_name (GTK_FILE_CHOOSER (dlg), buffer);
  g_signal_connect (dlg, "response", G_CALLBACK (dialog_name_experiment_close),
                    (void *) (size_t) i);
  gtk_window_present (GTK_WINDOW (dlg));
  loop = g_main_loop_new (NULL, 0);
  g_signal_connect_swapped (dlg, "destroy", G_CALLBACK (g_main_loop_quit),
                            loop);
  g_main_loop_run (loop);
  g_main_loop_unref (loop);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_name_experiment: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.28 window_new()

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

Function to open the main window.

Parameters

application	GtkApplication struct.

Definition at line 2363 of file interface.c.

```
{
  unsigned int i;
  char *buffer, *buffer2, buffer3[64];
  const char *label_algorithm[NALGORITHMS] = {
    "_Monte-Carlo", _("_Sweep"), _("_Genetic"), _("_Orthogonal")
  };
  const char *tip_algorithm[NALGORITHMS] = {
    _("Monte-Carlo brute force algorithm"),
    _("Sweep brute force algorithm"),
    _("Genetic algorithm"),
    _("Orthogonal sampling brute force algorithm"),
  };
  const char *label_climbing[NCLIMBINGS] = {
    _("_Coordinates climbing"), _("_Random climbing")
  };
  const char *tip_climbing[NCLIMBINGS] = {
    _("Coordinates climbing estimate method"),
    _("Random climbing estimate method")
  };
  const char *label_norm[NNORMS] = { "L2", "L", "Lp", "L1" };
  const char *tip_norm[NNORMS] = {
    _("Euclidean error norm (L2)"),
    _("Maximum error norm (L)"),
    _("P error norm (Lp)"),
    _("Taxicab error norm (L1)")
  };
#if !GTK4
  const char *close = "delete-event";
#else
  const char *close = "close-request";
#endif

#if DEBUG_INTERFACE
  fprintf (stderr, "window_new: start\n");
#endif

  // Creating the window
  window->window = window_parent = main_window
    = (GtkWindow *) gtk_application_window_new (application);

  // Finish when closing the window
  g_signal_connect_swapped (window->window, close,
                            G_CALLBACK (g_application_quit),
                            G_APPLICATION (application));

  // Setting the window title
  gtk_window_set_title (window->window, "MPCOTool");

  // Creating the open button
  window->button_open = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("document-open", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("document-open");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_open),
                               _("Open a case"));
  g_signal_connect (window->button_open, "clicked", window_open, NULL);

  // Creating the save button
  window->button_save = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("document-save", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("document-save");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_save),
                               _("Save the case"));
  g_signal_connect (window->button_save, "clicked", (GCallback) window_save,
                    NULL);

  // Creating the run button
  window->button_run = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("system-run", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("system-run");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_run),
                               _("Run the optimization"));
  g_signal_connect (window->button_run, "clicked", window_run, NULL);

  // Creating the options button
  window->button_options = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("preferences-system", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("preferences-system");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_options),
                               _("Edit the case"));
  g_signal_connect (window->button_options, "clicked", options_new, NULL);

  // Creating the help button
  window->button_help = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("help-browser", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("help-browser");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_help), _("Help"));
  g_signal_connect (window->button_help, "clicked", window_help, NULL);

  // Creating the about button
  window->button_about = (GtkButton *)
```

```
#if !GTK4
    gtk_button_new_from_icon_name ("help-about", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("help-about");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_about), _("About"));
  g_signal_connect (window->button_about, "clicked", window_about, NULL);

  // Creating the exit button
  window->button_exit = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("application-exit", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("application-exit");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_exit), _("Exit"));
  g_signal_connect_swapped (window->button_exit, "clicked",
                            G_CALLBACK (g_application_quit),
                            G_APPLICATION (application));

  // Creating the buttons bar
  window->box_buttons = (GtkBox *) gtk_box_new (GTK_ORIENTATION_HORIZONTAL, 0);
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_open));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_save));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_run));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_options));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_help));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_about));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_exit));

  // Creating the simulator program label and entry
  window->label_simulator = (GtkLabel *) gtk_label_new (_("Simulator program"));
  window->button_simulator = (GtkButton *)
    gtk_button_new_with_mnemonic (_("Simulator program"));
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_simulator),
                               _("Simulator program executable file"));
  gtk_widget_set_hexpand (GTK_WIDGET (window->button_simulator), TRUE);
  g_signal_connect (window->button_simulator, "clicked",
                    G_CALLBACK (dialog_simulator), NULL);

  // Creating the evaluator program label and entry
  window->check_evaluator = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Evaluator program"));
  g_signal_connect (window->check_evaluator, "toggled", window_update, NULL);
  window->button_evaluator = (GtkButton *)
    gtk_button_new_with_mnemonic (_("Evaluator program"));
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->button_evaluator),
     _("Optional evaluator program executable file"));
  g_signal_connect (window->button_evaluator, "clicked",
                    G_CALLBACK (dialog_evaluator), NULL);

  // Creating the cleaner program label and entry
  window->check_cleaner = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Cleaner program"));
  g_signal_connect (window->check_cleaner, "toggled", window_update, NULL);
  window->button_cleaner = (GtkButton *)
    gtk_button_new_with_mnemonic (_("Cleaner program"));
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->button_cleaner),
     _("Optional cleaner program executable file"));
  g_signal_connect (window->button_cleaner, "clicked",
                    G_CALLBACK (dialog_cleaner), NULL);

  // Creating the results files labels and entries
  window->label_result = (GtkLabel *) gtk_label_new (_("Result file"));
  window->entry_result = (GtkEntry *) gtk_entry_new ();
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->entry_result), _("Best results file"));
  window->label_variables = (GtkLabel *) gtk_label_new (_("Variables file"));
  window->entry_variables = (GtkEntry *) gtk_entry_new ();
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->entry_variables), _("All simulated results file"));

  // Creating the files grid and attaching widgets
  window->grid_files = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->label_simulator),
                   0, 0, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->button_simulator),
                   1, 0, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->check_evaluator),
                   0, 1, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->button_evaluator),
                   1, 1, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->check_cleaner),
                   0, 2, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->button_cleaner),
                      1, 2, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->label_result),
                      0, 3, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->entry_result),
                      1, 3, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->label_variables),
                      0, 4, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->entry_variables),
                      1, 4, 1, 1);

  // Creating the algorithm properties
  window->label_simulations = (GtkLabel *) gtk_label_new
    (_("Simulations number"));
  window->spin_simulations
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_simulations),
     _("Number of simulations to perform for each iteration"));
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_simulations), TRUE);
  window->label_iterations = (GtkLabel *)
    gtk_label_new (_("Iterations number"));
  window->spin_iterations
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_iterations), _("Number of iterations"));
  g_signal_connect
    (window->spin_iterations, "value-changed", window_update, NULL);
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_iterations), TRUE);
  window->label_tolerance = (GtkLabel *) gtk_label_new (_("Tolerance"));
  window->spin_tolerance =
    (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_tolerance),
     _("Tolerance to set the variable interval on the next iteration"));
  window->label_bests = (GtkLabel *) gtk_label_new (_("Bests number"));
  window->spin_bests
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_bests),
     _("Number of best simulations used to set the variable interval "
       "on the next iteration"));
  window->label_population
    = (GtkLabel *) gtk_label_new (_("Population number"));
  window->spin_population
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_population),
     _("Number of population for the genetic algorithm"));
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_population), TRUE);
  window->label_generations
    = (GtkLabel *) gtk_label_new (_("Generations number"));
  window->spin_generations
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_generations),
     _("Number of generations for the genetic algorithm"));
  window->label_mutation = (GtkLabel *) gtk_label_new (_("Mutation ratio"));
  window->spin_mutation
    = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_mutation),
     _("Ratio of mutation for the genetic algorithm"));
  window->label_reproduction
    = (GtkLabel *) gtk_label_new (_("Reproduction ratio"));
  window->spin_reproduction
    = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_reproduction),
     _("Ratio of reproduction for the genetic algorithm"));
  window->label_adaptation = (GtkLabel *) gtk_label_new (_("Adaptation ratio"));
  window->spin_adaptation
    = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_adaptation),
     _("Ratio of adaptation for the genetic algorithm"));
  window->label_threshold = (GtkLabel *) gtk_label_new (_("Threshold"));
  window->spin_threshold = (GtkSpinButton *)
    gtk_spin_button_new_with_range (-G_MAXDOUBLE, G_MAXDOUBLE,
                                    precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_threshold),
     _("Threshold in the objective function to finish the simulations"));
  window->scrolled_threshold = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
```

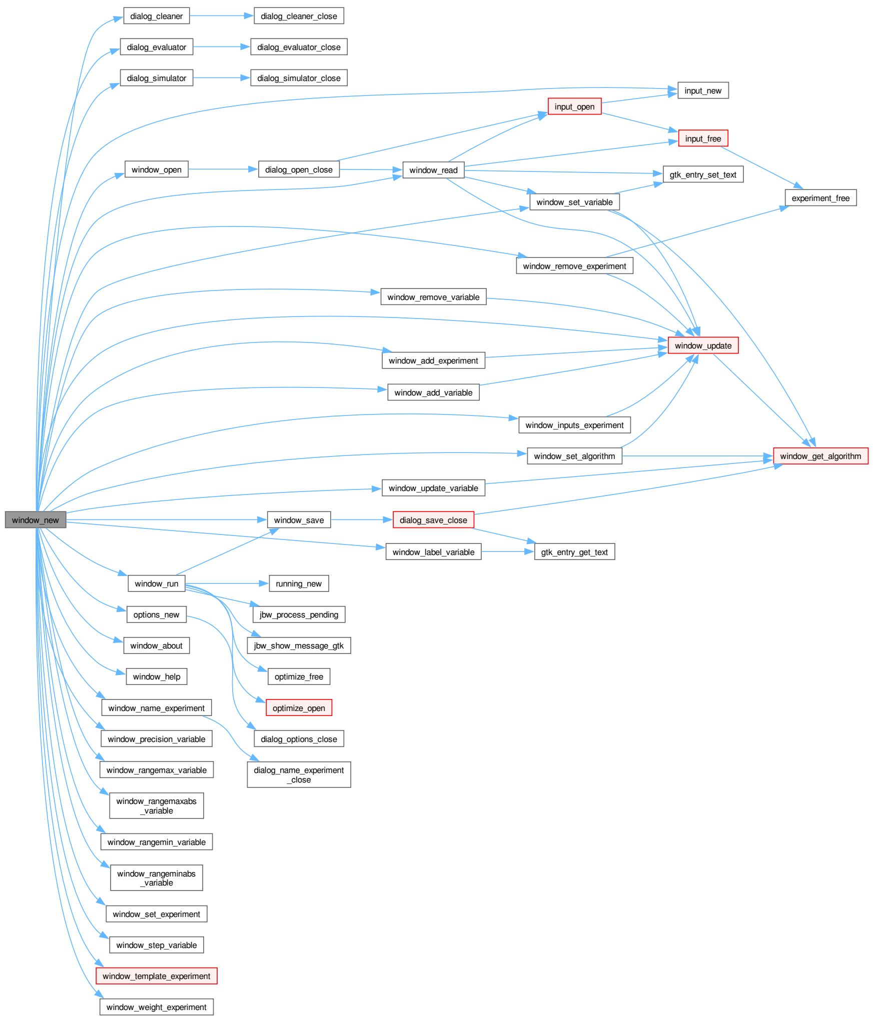
```
#endif
  gtk_scrolled_window_set_child (window->scrolled_threshold,
                                 GTK_WIDGET (window->spin_threshold));
//  gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_threshold), TRUE);
//  gtk_widget_set_halign (GTK_WIDGET (window->scrolled_threshold),
//                         GTK_ALIGN_FILL);

  // Creating the hill climbing method properties
  window->check_climbing = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Hill climbing method"));
  g_signal_connect (window->check_climbing, "toggled", window_update, NULL);
  window->grid_climbing = (GtkGrid *) gtk_grid_new ();
#if !GTK4
  window->button_climbing[0] = (GtkRadioButton *)
    gtk_radio_button_new_with_mnemonic (NULL, label_climbing[0]);
#else
  window->button_climbing[0] = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (label_climbing[0]);
#endif
  gtk_grid_attach (window->grid_climbing,
                   GTK_WIDGET (window->button_climbing[0]), 0, 0, 1, 1);
  g_signal_connect (window->button_climbing[0], "toggled", window_update, NULL);
  for (i = 0; ++i < NCLIMBINGS;)
    {
#if !GTK4
      window->button_climbing[i] = (GtkRadioButton *)
        gtk_radio_button_new_with_mnemonic
        (gtk_radio_button_get_group (window->button_climbing[0]),
         label_climbing[i]);
#else
      window->button_climbing[i] = (GtkCheckButton *)
        gtk_check_button_new_with_mnemonic (label_climbing[i]);
      gtk_check_button_set_group (window->button_climbing[i],
                                  window->button_climbing[0]);
#endif
      gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_climbing[i]),
                                   tip_climbing[i]);
      gtk_grid_attach (window->grid_climbing,
                       GTK_WIDGET (window->button_climbing[i]), 0, i, 1, 1);
      g_signal_connect (window->button_climbing[i], "toggled", window_update,
                        NULL);
    }
  window->label_steps = (GtkLabel *) gtk_label_new (_("Steps number"));
  window->spin_steps = (GtkSpinButton *)
    gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_steps), TRUE);
  window->label_final_steps
    = (GtkLabel *) gtk_label_new (_("Final steps number"));
  window->spin_final_steps = (GtkSpinButton *)
    gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_final_steps), TRUE);
  window->label_estimates
    = (GtkLabel *) gtk_label_new (_("Climbing estimates number"));
  window->spin_estimates = (GtkSpinButton *)
    gtk_spin_button_new_with_range (1., 1.e3, 1.);
  window->label_relaxation
    = (GtkLabel *) gtk_label_new (_("Relaxation parameter"));
  window->spin_relaxation = (GtkSpinButton *)
    gtk_spin_button_new_with_range (0., 2., 0.001);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->label_steps),
                   0, NCLIMBINGS, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->spin_steps),
                   1, NCLIMBINGS, 1, 1);
  gtk_grid_attach (window->grid_climbing,
                   GTK_WIDGET (window->label_final_steps),
                   0, NCLIMBINGS + 1, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->spin_final_steps),
                   1, NCLIMBINGS + 1, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->label_estimates),
                   0, NCLIMBINGS + 2, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->spin_estimates),
                   1, NCLIMBINGS + 2, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->label_relaxation),
                   0, NCLIMBINGS + 3, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->spin_relaxation),
                   1, NCLIMBINGS + 3, 1, 1);

  // Creating the array of algorithms
  window->grid_algorithm = (GtkGrid *) gtk_grid_new ();
#if !GTK4
  window->button_algorithm[0] = (GtkRadioButton *)
    gtk_radio_button_new_with_mnemonic (NULL, label_algorithm[0]);
#else
  window->button_algorithm[0] = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (label_algorithm[0]);
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[0]),
                                 tip_algorithm[0]);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->button_algorithm[0]), 0, 0, 1, 1);
  g_signal_connect (window->button_algorithm[0], "toggled",
                    window_set_algorithm, NULL);
  for (i = 0; ++i < NALGORITHMS;)
    {
#if !GTK4
      window->button_algorithm[i] = (GtkRadioButton *)
        gtk_radio_button_new_with_mnemonic
        (gtk_radio_button_get_group (window->button_algorithm[0]),
         label_algorithm[i]);
#else
      window->button_algorithm[i] = (GtkCheckButton *)
        gtk_check_button_new_with_mnemonic (label_algorithm[i]);
      gtk_check_button_set_group (window->button_algorithm[i],
                                  window->button_algorithm[0]);
#endif
        gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[i]),
                                     tip_algorithm[i]);
      gtk_grid_attach (window->grid_algorithm,
                       GTK_WIDGET (window->button_algorithm[i]), 0, i, 1, 1);
      g_signal_connect (window->button_algorithm[i], "toggled",
                        window_set_algorithm, NULL);
    }
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_simulations),
                   0, NALGORITHMS, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->spin_simulations), 1, NALGORITHMS, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_iterations),
                   0, NALGORITHMS + 1, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_iterations),
                   1, NALGORITHMS + 1, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->label_tolerance),
                   0, NALGORITHMS + 2, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_tolerance),
                   1, NALGORITHMS + 2, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->label_bests),
                   0, NALGORITHMS + 3, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_bests),
                   1, NALGORITHMS + 3, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_population),
                   0, NALGORITHMS + 4, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_population),
                   1, NALGORITHMS + 4, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_generations),
                   0, NALGORITHMS + 5, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->spin_generations),
                   1, NALGORITHMS + 5, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->label_mutation),
                   0, NALGORITHMS + 6, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_mutation),
                   1, NALGORITHMS + 6, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_reproduction),
                   0, NALGORITHMS + 7, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->spin_reproduction),
                   1, NALGORITHMS + 7, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_adaptation),
                   0, NALGORITHMS + 8, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_adaptation),
                   1, NALGORITHMS + 8, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->check_climbing),
                   0, NALGORITHMS + 9, 2, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->grid_climbing),
                   0, NALGORITHMS + 10, 2, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->label_threshold),
                   0, NALGORITHMS + 11, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->scrolled_threshold),
                   1, NALGORITHMS + 11, 1, 1);
  window->frame_algorithm = (GtkFrame *) gtk_frame_new (_("Algorithm"));
  gtk_frame_set_child (window->frame_algorithm,
                       GTK_WIDGET (window->grid_algorithm));

  // Creating the variable widgets
  window->combo_variable = (GtkComboBoxText *) gtk_combo_box_text_new ();
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->combo_variable), _("Variables selector"));
  window->id_variable = g_signal_connect
```

```
    (window->combo_variable, "changed", window_set_variable, NULL);
#if !GTK4
  window->button_add_variable = (GtkButton *)
    gtk_button_new_from_icon_name ("list-add", GTK_ICON_SIZE_BUTTON);
#else
  window->button_add_variable = (GtkButton *)
    gtk_button_new_from_icon_name ("list-add");
#endif
  g_signal_connect (window->button_add_variable, "clicked", window_add_variable,
                    NULL);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_variable),
                               _("Add variable"));
#if !GTK4
  window->button_remove_variable = (GtkButton *)
    gtk_button_new_from_icon_name ("list-remove", GTK_ICON_SIZE_BUTTON);
#else
  window->button_remove_variable = (GtkButton *)
    gtk_button_new_from_icon_name ("list-remove");
#endif
  g_signal_connect (window->button_remove_variable, "clicked",
                    window_remove_variable, NULL);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_remove_variable),
                               _("Remove variable"));
  window->label_variable = (GtkLabel *) gtk_label_new (_("Name"));
  window->entry_variable = (GtkEntry *) gtk_entry_new ();
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->entry_variable), _("Variable name"));
  gtk_widget_set_hexpand (GTK_WIDGET (window->entry_variable), TRUE);
  window->id_variable_label = g_signal_connect
    (window->entry_variable, "changed", window_label_variable, NULL);
  window->label_min = (GtkLabel *) gtk_label_new (_("Minimum"));
  window->spin_min = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_min), _("Minimum initial value of the variable"));
  window->scrolled_min = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_min,
                                 GTK_WIDGET (window->spin_min));
  g_signal_connect (window->spin_min, "value-changed",
                    window_rangemin_variable, NULL);
  window->label_max = (GtkLabel *) gtk_label_new (_("Maximum"));
  window->spin_max = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_max), _("Maximum initial value of the variable"));
  window->scrolled_max = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_max,
                                 GTK_WIDGET (window->spin_max));
  g_signal_connect (window->spin_max, "value-changed",
                    window_rangemax_variable, NULL);
  window->check_minabs = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Absolute minimum"));
  g_signal_connect (window->check_minabs, "toggled", window_update, NULL);
  window->spin_minabs = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_minabs),
     _("Minimum allowed value of the variable"));
  window->scrolled_minabs = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_minabs,
                                 GTK_WIDGET (window->spin_minabs));
  g_signal_connect (window->spin_minabs, "value-changed",
                    window_rangeminabs_variable, NULL);
  window->check_maxabs = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Absolute maximum"));
  g_signal_connect (window->check_maxabs, "toggled", window_update, NULL);
  window->spin_maxabs = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_maxabs),
     _("Maximum allowed value of the variable"));
  window->scrolled_maxabs = (GtkScrolledWindow *)
```

```
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_maxabs,
                                 GTK_WIDGET (window->spin_maxabs));
  g_signal_connect (window->spin_maxabs, "value-changed",
                    window_rangemaxabs_variable, NULL);
  window->label_precision = (GtkLabel *) gtk_label_new (_("Precision digits"));
  window->spin_precision = (GtkSpinButton *)
    gtk_spin_button_new_with_range (0., (gdouble) DEFAULT_PRECISION, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_precision),
     _("Number of precision floating point digits\n"
       "0 is for integer numbers"));
  g_signal_connect (window->spin_precision, "value-changed",
                    window_precision_variable, NULL);
  window->label_sweeps = (GtkLabel *) gtk_label_new (_("Sweeps number"));
  window->spin_sweeps =
    (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->spin_sweeps),
                               _("Number of steps sweeping the variable"));
  g_signal_connect (window->spin_sweeps, "value-changed",
                    window_update_variable, NULL);
  window->label_bits = (GtkLabel *) gtk_label_new (_("Bits number"));
  window->spin_bits
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_bits),
     _("Number of bits to encode the variable"));
  g_signal_connect
    (window->spin_bits, "value-changed", window_update_variable, NULL);
  window->label_step = (GtkLabel *) gtk_label_new (_("Step size"));
  window->spin_step = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_step),
     _("Initial step size for the hill climbing method"));
  window->scrolled_step = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_step,
                                 GTK_WIDGET (window->spin_step));
  g_signal_connect
    (window->spin_step, "value-changed", window_step_variable, NULL);
  window->grid_variable = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->combo_variable), 0, 0, 2, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->button_add_variable), 2, 0, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->button_remove_variable), 3, 0, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_variable), 0, 1, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->entry_variable), 1, 1, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_min), 0, 2, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_min), 1, 2, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_max), 0, 3, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_max), 1, 3, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->check_minabs), 0, 4, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_minabs), 1, 4, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->check_maxabs), 0, 5, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_maxabs), 1, 5, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_precision), 0, 6, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->spin_precision), 1, 6, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_sweeps), 0, 7, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->spin_sweeps), 1, 7, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_bits), 0, 8, 1, 1);
  gtk_grid_attach (window->grid_variable,
                    GTK_WIDGET (window->spin_bits), 1, 8, 3, 1);
  gtk_grid_attach (window->grid_variable,
                    GTK_WIDGET (window->label_step), 0, 9, 1, 1);
  gtk_grid_attach (window->grid_variable,
                    GTK_WIDGET (window->scrolled_step), 1, 9, 3, 1);
  window->frame_variable = (GtkFrame *) gtk_frame_new (_("Variable"));
  gtk_frame_set_child (window->frame_variable,
                        GTK_WIDGET (window->grid_variable));

  // Creating the experiment widgets
  window->combo_experiment = (GtkComboBoxText *) gtk_combo_box_text_new ();
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->combo_experiment),
                               _("Experiment selector"));
  window->id_experiment = g_signal_connect
    (window->combo_experiment, "changed", window_set_experiment, NULL);
#if !GTK4
  window->button_add_experiment = (GtkButton *)
    gtk_button_new_from_icon_name ("list-add", GTK_ICON_SIZE_BUTTON);
#else
  window->button_add_experiment = (GtkButton *)
    gtk_button_new_from_icon_name ("list-add");
#endif
  g_signal_connect
    (window->button_add_experiment, "clicked", window_add_experiment, NULL);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_experiment),
                               _("Add experiment"));
#if !GTK4
  window->button_remove_experiment = (GtkButton *)
    gtk_button_new_from_icon_name ("list-remove", GTK_ICON_SIZE_BUTTON);
#else
  window->button_remove_experiment = (GtkButton *)
    gtk_button_new_from_icon_name ("list-remove");
#endif
  g_signal_connect (window->button_remove_experiment, "clicked",
                    window_remove_experiment, NULL);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_remove_experiment),
                               _("Remove experiment"));
  window->label_experiment
    = (GtkLabel *) gtk_label_new (_("Experimental data file"));
  window->button_experiment = (GtkButton *)
    gtk_button_new_with_mnemonic (_("Experimental data file"));
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_experiment),
                               _("Experimental data file"));
  g_signal_connect (window->button_experiment, "clicked",
                    window_name_experiment, NULL);
  gtk_widget_set_hexpand (GTK_WIDGET (window->button_experiment), TRUE);
  window->label_weight = (GtkLabel *) gtk_label_new (_("Weight"));
  window->spin_weight
    = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_weight),
     _("Weight factor to build the objective function"));
  g_signal_connect
    (window->spin_weight, "value-changed", window_weight_experiment, NULL);
  window->grid_experiment = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->combo_experiment), 0, 0, 2, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->button_add_experiment), 2, 0, 1, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->button_remove_experiment), 3, 0, 1, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->label_experiment), 0, 1, 1, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->button_experiment), 1, 1, 3, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->label_weight), 0, 2, 1, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->spin_weight), 1, 2, 3, 1);
  for (i = 0; i < MAX_NINPUTS; ++i)
    {
      snprintf (buffer3, 64, "%s %u", _("Input template"), i + 1);
      window->check_template[i] = (GtkCheckButton *)
        gtk_check_button_new_with_label (buffer3);
      window->id_template[i]
        = g_signal_connect (window->check_template[i], "toggled",
                            window_inputs_experiment, NULL);
      gtk_grid_attach (window->grid_experiment,
                        GTK_WIDGET (window->check_template[i]), 0, 3 + i, 1, 1);
      window->button_template[i] = (GtkButton *)
        gtk_button_new_with_mnemonic (_("Input template"));

      gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_template[i]),
                                   _("Experimental input template file"));
      window->id_input[i] =
        g_signal_connect_swapped (window->button_template[i], "clicked",
                                  (GCallback) window_template_experiment,
                                   (void *) (size_t) i);
      gtk_grid_attach (window->grid_experiment,
                       GTK_WIDGET (window->button_template[i]), 1, 3 + i, 3, 1);
    }
  window->frame_experiment = (GtkFrame *) gtk_frame_new (_("Experiment"));
  gtk_frame_set_child (window->frame_experiment,
                       GTK_WIDGET (window->grid_experiment));

  // Creating the error norm widgets
  window->frame_norm = (GtkFrame *) gtk_frame_new (_("Error norm"));
  window->grid_norm = (GtkGrid *) gtk_grid_new ();
  gtk_frame_set_child (window->frame_norm, GTK_WIDGET (window->grid_norm));
#if !GTK4
  window->button_norm[0] = (GtkRadioButton *)
    gtk_radio_button_new_with_mnemonic (NULL, label_norm[0]);
#else
  window->button_norm[0] = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (label_norm[0]);
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[0]),
                               tip_norm[0]);
  gtk_grid_attach (window->grid_norm,
                   GTK_WIDGET (window->button_norm[0]), 0, 0, 1, 1);
  g_signal_connect (window->button_norm[0], "toggled", window_update, NULL);
  for (i = 0; ++i < NNORMS;)
    {
#if !GTK4
      window->button_norm[i] = (GtkRadioButton *)
        gtk_radio_button_new_with_mnemonic
        (gtk_radio_button_get_group (window->button_norm[0]), label_norm[i]);
#else
      window->button_norm[i] = (GtkCheckButton *)
        gtk_check_button_new_with_mnemonic (label_norm[i]);
      gtk_check_button_set_group (window->button_norm[i],
                                  window->button_norm[0]);
#endif
      gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[i]),
                                   tip_norm[i]);
      gtk_grid_attach (window->grid_norm,
                       GTK_WIDGET (window->button_norm[i]), 0, i, 1, 1);
      g_signal_connect (window->button_norm[i], "toggled", window_update, NULL);
    }
  window->label_p = (GtkLabel *) gtk_label_new (_("P parameter"));
  gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->label_p), 1, 1, 1, 1);
  window->spin_p = (GtkSpinButton *)
    gtk_spin_button_new_with_range (-G_MAXDOUBLE, G_MAXDOUBLE, 0.01);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->spin_p),
                               _("P parameter for the P error norm"));
  window->scrolled_p = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_p,
                                 GTK_WIDGET (window->spin_p));
  gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_p), TRUE);
  gtk_widget_set_halign (GTK_WIDGET (window->scrolled_p), GTK_ALIGN_FILL);
  gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->scrolled_p),
                   1, 2, 1, 2);

  // Creating the grid and attaching the widgets to the grid
  window->grid = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (window->grid, GTK_WIDGET (window->box_buttons), 0, 0, 3, 1);
  gtk_grid_attach (window->grid, GTK_WIDGET (window->grid_files), 0, 1, 1, 1);
  gtk_grid_attach (window->grid,
                   GTK_WIDGET (window->frame_algorithm), 0, 2, 1, 1);
  gtk_grid_attach (window->grid,
                   GTK_WIDGET (window->frame_variable), 1, 2, 1, 1);
  gtk_grid_attach (window->grid,
                   GTK_WIDGET (window->frame_experiment), 2, 2, 1, 1);
  gtk_grid_attach (window->grid, GTK_WIDGET (window->frame_norm), 1, 1, 2, 1);
  gtk_window_set_child (window->window, GTK_WIDGET (window->grid));

  // Setting the window logo
  window->logo = gdk_pixbuf_new_from_xpm_data (logo);
#if !GTK4
  gtk_window_set_icon (window->window, window->logo);
#endif

  // Showing the window
#if !GTK4
  gtk_widget_show_all (GTK_WIDGET (window->window));
#else
  gtk_widget_show (GTK_WIDGET (window->window));
#endif

```

```
  // In GTK+ 3.16 and 3.18 the default scrolled size is wrong
#if GTK_MINOR_VERSION >= 16
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_min), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_max), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_minabs), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_maxabs), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_step), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_p), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_threshold), -1, 40);
#endif

  // Reading initial example
  input_new ();
  buffer2 = g_get_current_dir ();
  buffer = g_build_filename (buffer2, "..", "tests", "test1", INPUT_FILE, NULL);
  g_free (buffer2);
  window_read (buffer);
  g_free (buffer);

#if DEBUG_INTERFACE
  fprintf (stderr, "window_new: start\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.29 window_open()

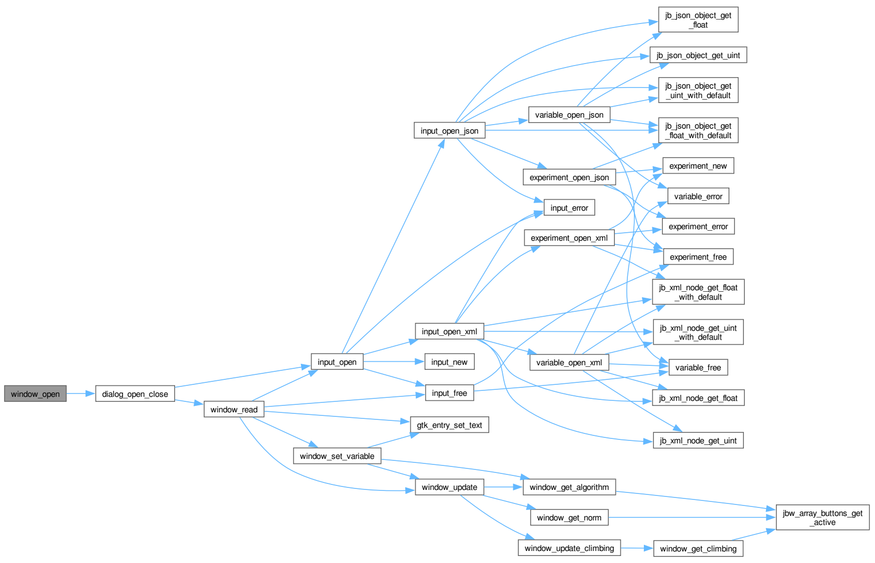
```
static void window_open ( )  [static]
```

Function to open the input data.

Definition at line 2153 of file interface.c.

```
{
  GtkFileChooserDialog *dlg;
  GtkFileFilter *filter;

#if DEBUG_INTERFACE
  fprintf (stderr, "window_open: start\n");
#endif

  // Opening dialog
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Open input file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_OPEN,
                                 _("_Cancel"), GTK_RESPONSE_CANCEL,
                                 _("_OK"), GTK_RESPONSE_OK, NULL);

  // Adding XML filter
  filter = (GtkFileFilter *) gtk_file_filter_new ();
  gtk_file_filter_set_name (filter, "XML");
  gtk_file_filter_add_pattern (filter, "*.xml");
  gtk_file_filter_add_pattern (filter, "*.XML");
  gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter);

  // Adding JSON filter
  filter = (GtkFileFilter *) gtk_file_filter_new ();
  gtk_file_filter_set_name (filter, "JSON");
  gtk_file_filter_add_pattern (filter, "*.json");
  gtk_file_filter_add_pattern (filter, "*.JSON");
  gtk_file_filter_add_pattern (filter, "*.js");
  gtk_file_filter_add_pattern (filter, "*.JS");
  gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter);

  // Connecting the close function
  g_signal_connect (dlg, "response", G_CALLBACK (dialog_open_close), NULL);

  // Showing modal dialog
  gtk_window_present (GTK_WINDOW (dlg));

#if DEBUG_INTERFACE
  fprintf (stderr, "window_open: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.30 window_precision_variable()

```
static void window_precision_variable ( )   [static]
```

Function to update the variable precision in the main window.

Definition at line 1833 of file interface.c.

```
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_precision_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  input->variable[i].precision
    = (unsigned int) gtk_spin_button_get_value_as_int (window->spin_precision);
  gtk_spin_button_set_digits (window->spin_min, input->variable[i].precision);
  gtk_spin_button_set_digits (window->spin_max, input->variable[i].precision);
  gtk_spin_button_set_digits (window->spin_minabs,
                              input->variable[i].precision);
  gtk_spin_button_set_digits (window->spin_maxabs,
                              input->variable[i].precision);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_precision_variable: end\n");
#endif
}
```

4.11.3.31 window_rangemax_variable()

`static void window_rangemax_variable ( ) [static]`

Function to update the variable rangemax in the main window.

Definition at line 1874 of file interface.c.

```
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangemax_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  input->variable[i].rangemax = gtk_spin_button_get_value (window->spin_max);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangemax_variable: end\n");
#endif
}
```

4.11.3.32 window_rangemaxabs_variable()

`static void window_rangemaxabs_variable ( ) [static]`

Function to update the variable rangemaxabs in the main window.

Definition at line 1909 of file interface.c.

```
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangemaxabs_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  input->variable[i].rangemaxabs
    = gtk_spin_button_get_value (window->spin_maxabs);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangemaxabs_variable: end\n");
#endif
}
```

4.11.3.33 window_rangemin_variable()

`static void window_rangemin_variable ( ) [static]`

Function to update the variable rangemin in the main window.

Definition at line 1857 of file interface.c.

```
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangemin_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  input->variable[i].rangemin = gtk_spin_button_get_value (window->spin_min);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangemin_variable: end\n");
#endif
}
```

4.11.3.34 window_rangeminabs_variable()

```
static void window_rangeminabs_variable ( )  [static]
```

Function to update the variable rangeminabs in the main window.

Definition at line 1891 of file interface.c.

```
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangeminabs_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  input->variable[i].rangeminabs
    = gtk_spin_button_get_value (window->spin_minabs);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangeminabs_variable: end\n");
#endif
}
```

4.11.3.35 window_read()

```
static int window_read (
              char * filename )  [static]
```

Function to read the input data of a file.

Returns

1 on succes, 0 on error.

Parameters

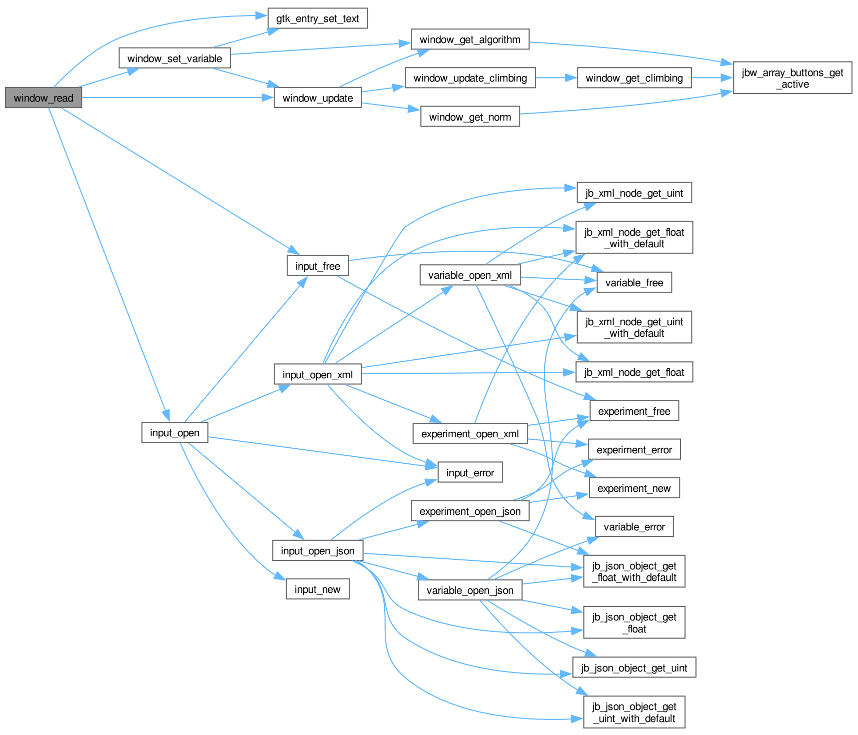
filename	File name.

Definition at line 1983 of file interface.c.

```
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_read: start\n");
  fprintf (stderr, "window_read: file name=%s\n", filename);
#endif

  // Reading new input file
  input_free ();
  input->result = input->variables = NULL;
  if (!input_open (filename))
    {
#if DEBUG_INTERFACE
      fprintf (stderr, "window_read: end\n");
#endif
      return 0;
    }

  // Setting GTK+ widgets data
  gtk_entry_set_text (window->entry_result, input->result);
  gtk_entry_set_text (window->entry_variables, input->variables);
  gtk_button_set_label (window->button_simulator, input->simulator);
  gtk_check_button_set_active (window->check_evaluator,
                               (size_t) input->evaluator);
  if (input->evaluator)
    gtk_button_set_label (window->button_evaluator, input->evaluator);
  gtk_check_button_set_active (window->check_cleaner, (size_t) input->cleaner);
  if (input->cleaner)
    gtk_button_set_label (window->button_cleaner, input->cleaner);
  gtk_check_button_set_active (window->button_algorithm[input->algorithm],
                               TRUE);
  switch (input->algorithm)
```

```
    {
    case ALGORITHM_MONTE_CARLO:
      gtk_spin_button_set_value (window->spin_simulations,
                                 (gdouble) input->nsimulations);
      // fallthrough
    case ALGORITHM_SWEEP:
    case ALGORITHM_ORTHOGONAL:
      gtk_spin_button_set_value (window->spin_iterations,
                                 (gdouble) input->niterations);
      gtk_spin_button_set_value (window->spin_bests, (gdouble) input->nbest);
      gtk_spin_button_set_value (window->spin_tolerance, input->tolerance);
      gtk_check_button_set_active (window->check_climbing, input->nsteps);
      if (input->nsteps)
        {
          gtk_check_button_set_active
            (window->button_climbing[input->climbing], TRUE);
          gtk_spin_button_set_value (window->spin_steps,
                                     (gdouble) input->nsteps);
          gtk_spin_button_set_value (window->spin_final_steps,
                                     (gdouble) input->nfinal_steps);
          gtk_spin_button_set_value (window->spin_relaxation,
                                     (gdouble) input->relaxation);
          switch (input->climbing)
            {
            case CLIMBING_METHOD_RANDOM:
              gtk_spin_button_set_value (window->spin_estimates,
                                         (gdouble) input->nestimates);
            }
        }
      break;
    default:
      gtk_spin_button_set_value (window->spin_population,
                                 (gdouble) input->nsimulations);
      gtk_spin_button_set_value (window->spin_generations,
                                 (gdouble) input->niterations);
      gtk_spin_button_set_value (window->spin_mutation, input->mutation_ratio);
      gtk_spin_button_set_value (window->spin_reproduction,
                                 input->reproduction_ratio);
      gtk_spin_button_set_value (window->spin_adaptation,
                                 input->adaptation_ratio);
    }
  gtk_check_button_set_active (window->button_norm[input->norm], TRUE);
  gtk_spin_button_set_value (window->spin_p, input->p);
  gtk_spin_button_set_value (window->spin_threshold, input->threshold);
  g_signal_handler_block (window->combo_experiment, window->id_experiment);
  gtk_combo_box_text_remove_all (window->combo_experiment);
  for (i = 0; i < input->nexperiments; ++i)
    gtk_combo_box_text_append_text (window->combo_experiment,
                                    input->experiment[i].name);
  g_signal_handler_unblock (window->combo_experiment, window->id_experiment);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
  g_signal_handler_block (window->combo_variable, window->id_variable);
  g_signal_handler_block (window->entry_variable, window->id_variable_label);
  gtk_combo_box_text_remove_all (window->combo_variable);
  for (i = 0; i < input->nvariables; ++i)
    gtk_combo_box_text_append_text (window->combo_variable,
                                    input->variable[i].name);
  g_signal_handler_unblock (window->entry_variable, window->id_variable_label);
  g_signal_handler_unblock (window->combo_variable, window->id_variable);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
  window_set_variable ();
  window_update ();

#if DEBUG_INTERFACE
  fprintf (stderr, "window_read: end\n");
#endif
  return 1;
}
```

Here is the call graph for this function:



4.11.3.36 window_remove_experiment()

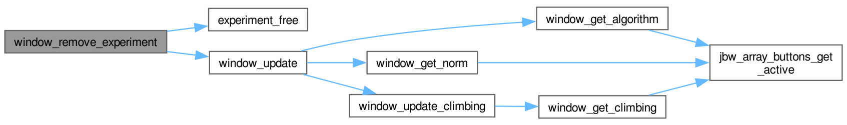
```
static void window_remove_experiment ( )  [static]
```

Function to remove an experiment in the main window.

Definition at line 1405 of file interface.c.

```
01406 {
01407   unsigned int i, j;
01408 #if DEBUG_INTERFACE
01409   fprintf (stderr, "window_remove_experiment: start\n");
01410 #endif
01411   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01412   g_signal_handler_block (window->combo_experiment, window->id_experiment);
01413   gtk_combo_box_text_remove (window->combo_experiment, i);
01414   g_signal_handler_unblock (window->combo_experiment, window->id_experiment);
01415   experiment_free (input->experiment + i, input->type);
01416   --input->nexperiments;
01417   for (j = i; j < input->nexperiments; ++j)
01418     memcpy (input->experiment + j, input->experiment + j + 1,
01419             sizeof (Experiment));
01420   j = input->nexperiments - 1;
01421   if (i > j)
01422     i = j;
01423   for (j = 0; j < input->experiment->ninputs; ++j)
01424     g_signal_handler_block (window->button_template[j], window->id_input[j]);
01425   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
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_remove_experiment: end\n");
01431 #endif
01432 }
```

Here is the call graph for this function:



4.11.3.37 window_remove_variable()

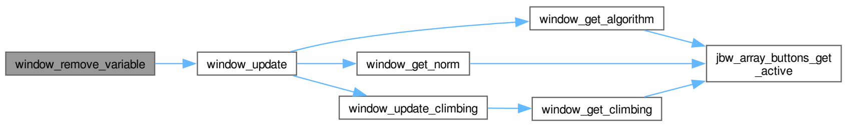
```
static void window_remove_variable ( ) [static]
```

Function to remove a variable in the main window.

Definition at line 1745 of file interface.c.

```
{
  unsigned int i, j;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_remove_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  g_signal_handler_block (window->combo_variable, window->id_variable);
  gtk_combo_box_text_remove (window->combo_variable, i);
  g_signal_handler_unblock (window->combo_variable, window->id_variable);
  xmlFree (input->variable[i].name);
  --input->nvariables;
  for (j = i; j < input->nvariables; ++j)
    memcpy (input->variable + j, input->variable + j + 1, sizeof (Variable));
  j = input->nvariables - 1;
  if (i > j)
    i = j;
  g_signal_handler_block (window->entry_variable, window->id_variable_label);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
  g_signal_handler_unblock (window->entry_variable, window->id_variable_label);
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_remove_variable: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.38 window_run()

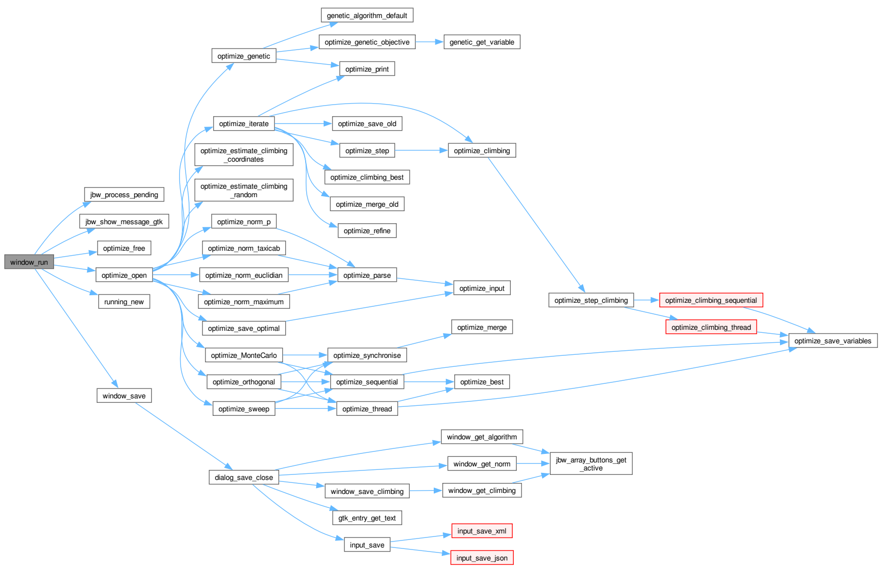
```
static void window_run ( ) [static]
```

Function to run a optimization.

Definition at line 1044 of file interface.c.

```
{
  char *msg, *msg2, buffer[64], buffer2[64];
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_run: start\n");
#endif
  window_save ();
  running_new ();
  jbw_process_pending ();
  optimize_open ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_run: closing running dialog\n");
#endif
  gtk_spinner_stop (running->spinner);
  gtk_window_destroy (GTK_WINDOW (running->dialog));
#if DEBUG_INTERFACE
  fprintf (stderr, "window_run: displaying results\n");
#endif
  snprintf (buffer, 64, "error = %.15le\n", optimize->error_old[0]);
  msg2 = g_strdup (buffer);
  for (i = 0; i < optimize->nvariables; ++i, msg2 = msg)
    {
      snprintf (buffer, 64, "%s = %s\n",
                input->variable[i].name, format[input->variable[i].precision]);
      snprintf (buffer2, 64, buffer, optimize->value_old[i]);
      msg = g_strconcat (msg2, buffer2, NULL);
      g_free (msg2);
    }
  snprintf (buffer, 64, "%s = %.6lg s", _("Calculation time"),
            optimize->calculation_time);
  msg = g_strconcat (msg2, buffer, NULL);
  g_free (msg2);
  jbw_show_message_gtk (_("Best result"), msg, INFO_TYPE);
  g_free (msg);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_run: freeing memory\n");
#endif
  optimize_free ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_run: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.39 window_save()

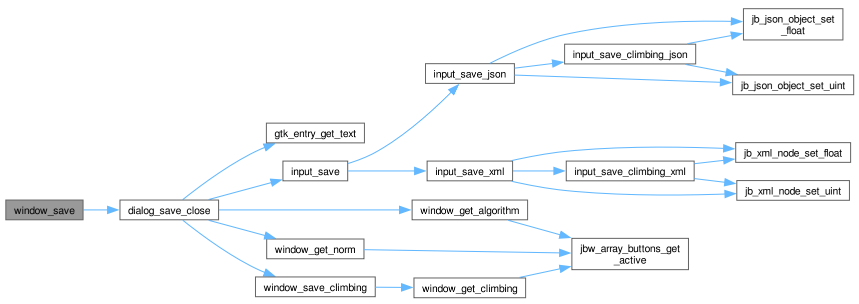
```
static void window_save ( ) [static]
```

Function to save the input file.

Definition at line 984 of file interface.c.

```
{
  GtkFileChooserDialog *dlg;
  GtkFileFilter *filter1, *filter2;
  char *buffer;

#if DEBUG_INTERFACE
  fprintf (stderr, "window_save: start\n");
#endif

  // Opening the saving dialog
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Save file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_SAVE,
                                 _("_Cancel"), GTK_RESPONSE_CANCEL,
                                 _("_OK"), GTK_RESPONSE_OK, NULL);
#if !GTK4
  gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
#endif
  buffer = g_build_filename (input->directory, input->name, NULL);
  gtk_file_chooser_set_current_name (GTK_FILE_CHOOSER (dlg), buffer);
  g_free (buffer);

  // Adding XML filter
  filter1 = (GtkFileFilter *) gtk_file_filter_new ();
  gtk_file_filter_set_name (filter1, "XML");
  gtk_file_filter_add_pattern (filter1, "*.xml");
  gtk_file_filter_add_pattern (filter1, "*.XML");
  gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter1);

  // Adding JSON filter
  filter2 = (GtkFileFilter *) gtk_file_filter_new ();
  gtk_file_filter_set_name (filter2, "JSON");
  gtk_file_filter_add_pattern (filter2, "*.json");
  gtk_file_filter_add_pattern (filter2, "*.JSON");
  gtk_file_filter_add_pattern (filter2, "*.js");
  gtk_file_filter_add_pattern (filter2, "*.JS");
  gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter2);

  if (input->type == INPUT_TYPE_XML)
    gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter1);
  else
    gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter2);

  // Connecting the close function
  g_signal_connect (dlg, "response", G_CALLBACK (dialog_save_close), NULL);

  // Showing modal dialog
  gtk_window_present (GTK_WINDOW (dlg));

#if DEBUG_INTERFACE
  fprintf (stderr, "window_save: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.40 window_save_climbing()

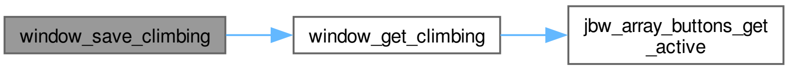
```
static void window_save_climbing ( )  [static]
```

Function to save the hill climbing method data in the input file.

Definition at line 839 of file interface.c.

```
{
#if DEBUG_INTERFACE
  fprintf (stderr, "window_save_climbing: start\n");
#endif
  if (gtk_check_button_get_active (window->check_climbing))
    {
      input->nsteps = gtk_spin_button_get_value_as_int (window->spin_steps);
      input->nfinal_steps
        = gtk_spin_button_get_value_as_int (window->spin_final_steps);
      input->relaxation = gtk_spin_button_get_value (window->spin_relaxation);
      switch (window_get_climbing ())
        {
        case CLIMBING_METHOD_COORDINATES:
          input->climbing = CLIMBING_METHOD_COORDINATES;
          break;
        default:
          input->climbing = CLIMBING_METHOD_RANDOM;
          input->nestimates
            = gtk_spin_button_get_value_as_int (window->spin_estimates);
        }
    }
  else
    input->nsteps = 0;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_save_climbing: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.41 window_set_algorithm()

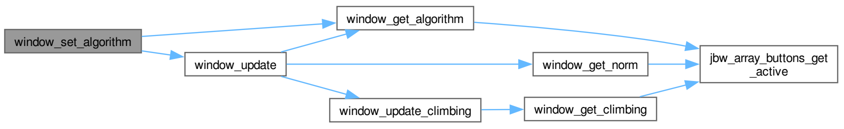
```
static void window_set_algorithm ( )  [static]
```

Function to avoid memory errors changing the algorithm.

Definition at line 1342 of file interface.c.

```
{
  int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_algorithm: start\n");
#endif
  i = window_get_algorithm ();
  switch (i)
    {
    case ALGORITHM_SWEEP:
    case ALGORITHM_ORTHOGONAL:
      i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
      if (i < 0)
        i = 0;
      gtk_spin_button_set_value (window->spin_sweeps,
                                 (gdouble) input->variable[i].nsweeps);
      break;
    case ALGORITHM_GENETIC:
      i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
      if (i < 0)
        i = 0;
      gtk_spin_button_set_value (window->spin_bits,
                                 (gdouble) input->variable[i].nbits);
    }
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_algorithm: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.42 window_set_experiment()

```
static void window_set_experiment ( )  [static]
```

Function to set the experiment data in the main window.

Definition at line 1376 of file interface.c.

```
{
  unsigned int i, j;
  char *buffer1;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_experiment: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
  gtk_spin_button_set_value (window->spin_weight, input->experiment[i].weight);
  buffer1 = gtk_combo_box_text_get_active_text (window->combo_experiment);
  gtk_button_set_label (window->button_experiment, buffer1);
  g_free (buffer1);
  for (j = 0; j < input->experiment->ninputs; ++j)
    {
      g_signal_handler_block (window->button_template[j], window->id_input[j]);
      gtk_button_set_label (window->button_template[j],
                            input->experiment[i].stencil[j]);
      g_signal_handler_unblock
        (window->button_template[j], window->id_input[j]);
    }
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_experiment: end\n");
#endif
}
```

4.11.3.43 window_set_variable()

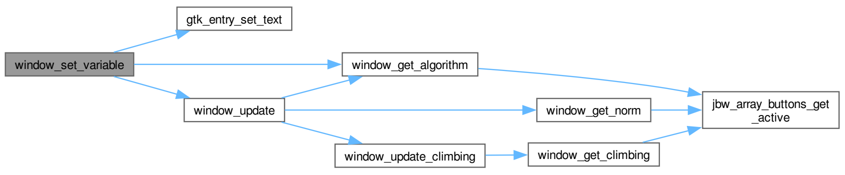
```
static void window_set_variable ( )  [static]
```

Function to set the variable data in the main window.

Definition at line 1670 of file interface.c.

```
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  g_signal_handler_block (window->entry_variable, window->id_variable_label);
  gtk_entry_set_text (window->entry_variable, input->variable[i].name);
  g_signal_handler_unblock (window->entry_variable, window->id_variable_label);
  gtk_spin_button_set_value (window->spin_min, input->variable[i].rangemin);
  gtk_spin_button_set_value (window->spin_max, input->variable[i].rangemax);
  if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
    {
      gtk_spin_button_set_value (window->spin_minabs,
                                 input->variable[i].rangeminabs);
      gtk_check_button_set_active (window->check_minabs, 1);
    }
  else
    {
      gtk_spin_button_set_value (window->spin_minabs, -G_MAXDOUBLE);
      gtk_check_button_set_active (window->check_minabs, 0);
    }
  if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
    {
      gtk_spin_button_set_value (window->spin_maxabs,
                                 input->variable[i].rangemaxabs);
      gtk_check_button_set_active (window->check_maxabs, 1);
    }
  else
    {
      gtk_spin_button_set_value (window->spin_maxabs, G_MAXDOUBLE);
      gtk_check_button_set_active (window->check_maxabs, 0);
    }
  gtk_spin_button_set_value (window->spin_precision,
                             input->variable[i].precision);
  gtk_spin_button_set_value (window->spin_steps, (gdouble) input->nsteps);
  gtk_spin_button_set_value (window->spin_final_steps,
                             (gdouble) input->nfinal_steps);
  if (input->nsteps)
    gtk_spin_button_set_value (window->spin_step, input->variable[i].step);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_variable: precision[%u]=%u\n", i,
           input->variable[i].precision);
#endif
  switch (window_get_algorithm ())
    {
    case ALGORITHM_SWEEP:
    case ALGORITHM_ORTHOGONAL:
      gtk_spin_button_set_value (window->spin_sweeps,
                                 (gdouble) input->variable[i].nsweeps);
#if DEBUG_INTERFACE
      fprintf (stderr, "window_set_variable: nsweeps[%u]=%u\n", i,
               input->variable[i].nsweeps);
#endif
      break;
    case ALGORITHM_GENETIC:
      gtk_spin_button_set_value (window->spin_bits,
                                 (gdouble) input->variable[i].nbits);
#if DEBUG_INTERFACE
      fprintf (stderr, "window_set_variable: nbits[%u]=%u\n", i,
               input->variable[i].nbits);
#endif
      break;
    }
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_variable: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.44 window_step_variable()

```
static void window_step_variable ( ) [static]
```

Function to update the variable step in the main window.

Definition at line 1927 of file interface.c.

```
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_step_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  input->variable[i].step = gtk_spin_button_get_value (window->spin_step);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_step_variable: end\n");
#endif
}
```

4.11.3.45 window_template_experiment()

```
static void window_template_experiment (
            void * data )  [static]
```

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

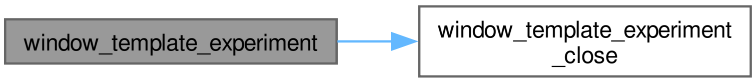
Parameters

data	Callback data (i-th input template).

Definition at line 1633 of file interface.c.

```
{
  GtkFileChooserDialog *dlg;
  GMainLoop *loop;
  const char *buffer;
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_template_experiment: start\n");
#endif
  i = (size_t) data;
  buffer = gtk_button_get_label (window->button_template[i]);
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Open template file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_OPEN,
                                 _("_Cancel"),
                                 GTK_RESPONSE_CANCEL,
                                 _("_Open"), GTK_RESPONSE_ACCEPT, NULL);
  gtk_file_chooser_set_current_name (GTK_FILE_CHOOSER (dlg), buffer);
  g_signal_connect (dlg, "response",
                    G_CALLBACK (window_template_experiment_close), data);
  gtk_window_present (GTK_WINDOW (dlg));
  loop = g_main_loop_new (NULL, 0);
  g_signal_connect_swapped (dlg, "destroy", G_CALLBACK (g_main_loop_quit),
                            loop);
  g_main_loop_run (loop);
  g_main_loop_unref (loop);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_template_experiment: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.46 window_template_experiment_close()

```
static void window_template_experiment_close (
             GtkFileChooserDialog * dlg,
             int response_id,
             void * data )  [static]
```

Function to close the experiment template dialog.

Parameters

dlg	GtkFileChooserDialg struct.
response←_id	Response identifier.
data	Function data.

Definition at line 1593 of file interface.c.

```
{
  GFile *file1, *file2;
  char *buffer1, *buffer2;
  unsigned int i, j;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_template_experiment_close: start\n");
#endif
  if (response_id == GTK_RESPONSE_OK)
    {
      i = (size_t) data;
      j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
      buffer1 = gtk_file_chooser_get_current_name (GTK_FILE_CHOOSER (dlg));
      file1 = g_file_new_for_path (buffer1);
      file2 = g_file_new_for_path (input->directory);
      buffer2 = g_file_get_relative_path (file2, file1);
      if (input->type == INPUT_TYPE_XML)
        input->experiment[j].stencil[i]
          = (char *) xmlStrdup ((xmlChar *) buffer2);
      else
        input->experiment[j].stencil[i] = g_strdup (buffer2);
      g_free (buffer2);
      g_object_unref (file2);
      g_object_unref (file1);
      g_free (buffer1);
    }
  gtk_window_destroy (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "window_template_experiment_close: end\n");
#endif
}
```

4.11.3.47 window_update()

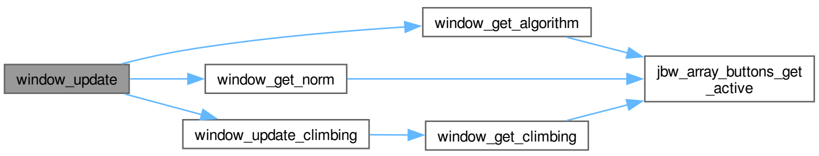
```
static void window_update ( )  [static]
```

Function to update the main window view.

Definition at line 1187 of file interface.c.

```
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_update: start\n");
#endif
  gtk_widget_set_sensitive
    (GTK_WIDGET (window->button_evaluator),
     gtk_check_button_get_active (window->check_evaluator));
  gtk_widget_set_sensitive
    (GTK_WIDGET (window->button_cleaner),
     gtk_check_button_get_active (window->check_cleaner));
  gtk_widget_hide (GTK_WIDGET (window->label_simulations));
  gtk_widget_hide (GTK_WIDGET (window->spin_simulations));
  gtk_widget_hide (GTK_WIDGET (window->label_iterations));
  gtk_widget_hide (GTK_WIDGET (window->spin_iterations));
  gtk_widget_hide (GTK_WIDGET (window->label_tolerance));
  gtk_widget_hide (GTK_WIDGET (window->spin_tolerance));
  gtk_widget_hide (GTK_WIDGET (window->label_bests));
  gtk_widget_hide (GTK_WIDGET (window->spin_bests));
  gtk_widget_hide (GTK_WIDGET (window->label_population));
  gtk_widget_hide (GTK_WIDGET (window->spin_population));
  gtk_widget_hide (GTK_WIDGET (window->label_generations));
  gtk_widget_hide (GTK_WIDGET (window->spin_generations));
  gtk_widget_hide (GTK_WIDGET (window->label_mutation));
  gtk_widget_hide (GTK_WIDGET (window->spin_mutation));
  gtk_widget_hide (GTK_WIDGET (window->label_reproduction));
  gtk_widget_hide (GTK_WIDGET (window->spin_reproduction));
  gtk_widget_hide (GTK_WIDGET (window->label_adaptation));
  gtk_widget_hide (GTK_WIDGET (window->spin_adaptation));
  gtk_widget_hide (GTK_WIDGET (window->label_sweeps));
  gtk_widget_hide (GTK_WIDGET (window->spin_sweeps));
  gtk_widget_hide (GTK_WIDGET (window->label_bits));
  gtk_widget_hide (GTK_WIDGET (window->spin_bits));
  gtk_widget_hide (GTK_WIDGET (window->check_climbing));
  gtk_widget_hide (GTK_WIDGET (window->grid_climbing));
  gtk_widget_hide (GTK_WIDGET (window->label_step));
  gtk_widget_hide (GTK_WIDGET (window->spin_step));
  gtk_widget_hide (GTK_WIDGET (window->label_p));
  gtk_widget_hide (GTK_WIDGET (window->spin_p));
  i = gtk_spin_button_get_value_as_int (window->spin_iterations);
  switch (window_get_algorithm ())
    {
    case ALGORITHM_MONTE_CARLO:
      gtk_widget_show (GTK_WIDGET (window->label_simulations));
      gtk_widget_show (GTK_WIDGET (window->spin_simulations));
      gtk_widget_show (GTK_WIDGET (window->label_iterations));
      gtk_widget_show (GTK_WIDGET (window->spin_iterations));
      if (i > 1)
        {
          gtk_widget_show (GTK_WIDGET (window->label_tolerance));
          gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
          gtk_widget_show (GTK_WIDGET (window->label_bests));
          gtk_widget_show (GTK_WIDGET (window->spin_bests));
        }
      window_update_climbing ();
      break;
    case ALGORITHM_SWEEP:
    case ALGORITHM_ORTHOGONAL:
      gtk_widget_show (GTK_WIDGET (window->label_iterations));
      gtk_widget_show (GTK_WIDGET (window->spin_iterations));
      if (i > 1)
        {
          gtk_widget_show (GTK_WIDGET (window->label_tolerance));
          gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
          gtk_widget_show (GTK_WIDGET (window->label_bests));
          gtk_widget_show (GTK_WIDGET (window->spin_bests));
        }
      gtk_widget_show (GTK_WIDGET (window->label_sweeps));
      gtk_widget_show (GTK_WIDGET (window->spin_sweeps));
      gtk_widget_show (GTK_WIDGET (window->check_climbing));
      window_update_climbing ();
      break;
    default:
      gtk_widget_show (GTK_WIDGET (window->label_population));
      gtk_widget_show (GTK_WIDGET (window->spin_population));
      gtk_widget_show (GTK_WIDGET (window->label_generations));
      gtk_widget_show (GTK_WIDGET (window->spin_generations));
      gtk_widget_show (GTK_WIDGET (window->label_mutation));
      gtk_widget_show (GTK_WIDGET (window->spin_mutation));
      gtk_widget_show (GTK_WIDGET (window->label_reproduction));
      gtk_widget_show (GTK_WIDGET (window->spin_reproduction));
      gtk_widget_show (GTK_WIDGET (window->label_adaptation));
      gtk_widget_show (GTK_WIDGET (window->spin_adaptation));
      gtk_widget_show (GTK_WIDGET (window->label_bits));
      gtk_widget_show (GTK_WIDGET (window->spin_bits));
    }
  gtk_widget_set_sensitive
    (GTK_WIDGET (window->button_remove_experiment), input->nexperiments > 1);
  gtk_widget_set_sensitive
    (GTK_WIDGET (window->button_remove_variable), input->nvariables > 1);
  for (i = 0; i < input->experiment->ninputs; ++i)
    {
      gtk_widget_show (GTK_WIDGET (window->check_template[i]));
      gtk_widget_show (GTK_WIDGET (window->button_template[i]));
      gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 0);
      gtk_widget_set_sensitive (GTK_WIDGET (window->button_template[i]), 1);
      g_signal_handler_block
        (window->check_template[i], window->id_template[i]);
      g_signal_handler_block (window->button_template[i], window->id_input[i]);
      gtk_check_button_set_active (window->check_template[i], 1);
      g_signal_handler_unblock (window->button_template[i],
                                window->id_input[i]);
      g_signal_handler_unblock (window->check_template[i],
                                window->id_template[i]);
    }
  if (i > 0)
    {
      gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i - 1]), 1);
      gtk_widget_set_sensitive (GTK_WIDGET (window->button_template[i - 1]),
                                gtk_check_button_get_active
                                (window->check_template[i - 1]));
    }
  if (i < MAX_NINPUTS)
    {
      gtk_widget_show (GTK_WIDGET (window->check_template[i]));
      gtk_widget_show (GTK_WIDGET (window->button_template[i]));
      gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 1);
      gtk_widget_set_sensitive
        (GTK_WIDGET (window->button_template[i]),
         gtk_check_button_get_active (window->check_template[i]));
      g_signal_handler_block
        (window->check_template[i], window->id_template[i]);
      g_signal_handler_block (window->button_template[i], window->id_input[i]);
      gtk_check_button_set_active (window->check_template[i], 0);
      g_signal_handler_unblock (window->button_template[i],
                                window->id_input[i]);
      g_signal_handler_unblock (window->check_template[i],
                                window->id_template[i]);
    }
  while (++i < MAX_NINPUTS)
    {
      gtk_widget_hide (GTK_WIDGET (window->check_template[i]));
      gtk_widget_hide (GTK_WIDGET (window->button_template[i]));
    }
  gtk_widget_set_sensitive
    (GTK_WIDGET (window->spin_minabs),
     gtk_check_button_get_active (window->check_minabs));
  gtk_widget_set_sensitive
    (GTK_WIDGET (window->spin_maxabs),
     gtk_check_button_get_active (window->check_maxabs));
  if (window_get_norm () == ERROR_NORM_P)
    {
      gtk_widget_show (GTK_WIDGET (window->label_p));
      gtk_widget_show (GTK_WIDGET (window->spin_p));
    }
#if DEBUG_INTERFACE
  fprintf (stderr, "window_update: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.48 window_update_climbing()

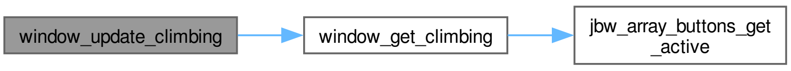
```
static void window_update_climbing ( ) [static]
```

Function to update hill climbing method widgets view in the main window.

Definition at line 1156 of file interface.c.

```
{
#if DEBUG_INTERFACE
  fprintf (stderr, "window_update_climbing: start\n");
#endif
  gtk_widget_show (GTK_WIDGET (window->check_climbing));
  if (gtk_check_button_get_active (window->check_climbing))
    {
      gtk_widget_show (GTK_WIDGET (window->grid_climbing));
      gtk_widget_show (GTK_WIDGET (window->label_step));
      gtk_widget_show (GTK_WIDGET (window->spin_step));
    }
  switch (window_get_climbing ())
    {
    case CLIMBING_METHOD_COORDINATES:
      gtk_widget_hide (GTK_WIDGET (window->label_estimates));
      gtk_widget_hide (GTK_WIDGET (window->spin_estimates));
      break;
    default:
      gtk_widget_show (GTK_WIDGET (window->label_estimates));
      gtk_widget_show (GTK_WIDGET (window->spin_estimates));
    }
#if DEBUG_INTERFACE
  fprintf (stderr, "window_update_climbing: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.49 window_update_variable()

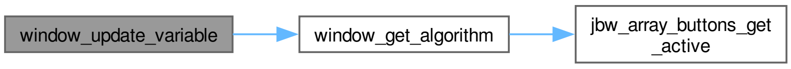
```
static void window_update_variable ( )  [static]
```

Function to update the variable data in the main window.

Definition at line 1944 of file interface.c.

```
{
  int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_update_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  if (i < 0)
    i = 0;
  switch (window_get_algorithm ())
    {
    case ALGORITHM_SWEEP:
    case ALGORITHM_ORTHOGONAL:
      input->variable[i].nsweeps
        = gtk_spin_button_get_value_as_int (window->spin_sweeps);
#if DEBUG_INTERFACE
      fprintf (stderr, "window_update_variable: nsweeps[%d]=%u\n", i,
               input->variable[i].nsweeps);
#endif
      break;
    case ALGORITHM_GENETIC:
      input->variable[i].nbits
        = gtk_spin_button_get_value_as_int (window->spin_bits);
#if DEBUG_INTERFACE
      fprintf (stderr, "window_update_variable: nbits[%d]=%u\n", i,
               input->variable[i].nbits);
#endif
    }
#if DEBUG_INTERFACE
  fprintf (stderr, "window_update_variable: end\n");
#endif
}
```

Here is the call graph for this function:



4.11.3.50 window_weight_experiment()

```
static void window_weight_experiment ( )  [static]
```

Function to update the experiment weight in the main window.

Definition at line 1554 of file interface.c.
```
01555 {
01556   unsigned int i;
01557 #if DEBUG_INTERFACE
01558   fprintf (stderr, "window_weight_experiment: start\n");
01559 #endif
01560   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
01561   input->experiment[i].weight = gtk_spin_button_get_value (window->spin_weight);
01562 #if DEBUG_INTERFACE
01563   fprintf (stderr, "window_weight_experiment: end\n");
01564 #endif
01565 }
```

4.11.4 Variable Documentation

4.11.4.1 logo

```
const char∗ logo[ ]  [static]
```

Logo pixmap.

Definition at line 84 of file interface.c.
```
00084                              {
00085   "32 32 3 1",
00086   "     c None",
00087   ".    c #0000FF",
00088   "+    c #FF0000",
00089   "                                ",
00090   "                                ",
00091   "                                ",
00092   "     .      .      .      .     ",
00093   "     .      .      .      .     ",
00094   "     .      .      .      .     ",
00095   "     .      .      .      .     ",
00096   "     .      .     +++     .     ",
00097   "     .      .    +++++    .     ",
00098   "     .      .    +++++    .     ",
00099   "     .      .    +++++    .     ",
00100   "    +++     .     +++    +++    ",
00101   "   +++++    .      .    +++++   ",
00102   "   +++++    .      .    +++++   ",
00103   "   +++++    .      .    +++++   ",
00104   "    +++     .      .     +++    ",
00105   "     .      .      .      .     ",
00106   "     .     +++     .      .     ",
00107   "     .    +++++    .      .     ",
00108   "     .    +++++    .      .     ",
00109   "     .    +++++    .      .     ",
00110   "     .     +++     .      .     ",
00111   "     .      .      .      .     ",
"     .     .     .     .     ",
"     .     .     .     .     ",
"     .     .     .     .     ",
"     .     .     .     .     ",
"     .     .     .     .     ",
"     .     .     .     .     ",
"                               ",
"                               ",
"                               "
};
```

4.11.4.2 options

`Options options[1] [static]`

Options struct to define the options dialog.

Definition at line 163 of file interface.c.

4.11.4.3 running

`Running running[1] [static]`

Running struct to define the running dialog.

Definition at line 165 of file interface.c.

4.11.4.4 window

`Window window[1]`

Window struct to define the main interface window.

Definition at line 81 of file interface.c.

4.12 interface.c

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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```

```c
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CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#define _GNU_SOURCE
#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>
#ifdef G_OS_WIN32
#include <windows.h>
#endif
#if HAVE_MPI
#include <mpi.h>
#endif
#include <gio/gio.h>
#include <gtk/gtk.h>
#include "jb/src/jb_xml.h"
#include "jb/src/jb_json.h"
#include "jb/src/jb_win.h"
#include "genetic/genetic.h"
#include "tools.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"
#include "optimize.h"
#include "interface.h"

#define DEBUG_INTERFACE 1

#ifdef G_OS_WIN32
#define INPUT_FILE "test-ga-win.xml"
#else
#define INPUT_FILE "test-ga.xml"
#endif

Window window[1];

static const char *logo[] = {
  "32 32 3 1",
  "      c None",
  ".     c #0000FF",
  "+     c #FF0000",
  "                                ",
  "                                ",
  "                                ",
  "     .      .      .      .     ",
  "     .      .      .      .     ",
  "     .      .      .      .     ",
  "     .      .      .      .     ",
  "     .      .     +++     .     ",
  "     .      .    +++++    .     ",
  "     .      .    +++++    .     ",
  "     .      .    +++++    .     ",
  "    +++     .     +++    +++    ",
  "   +++++    .      .    +++++   ",
  "   +++++    .      .    +++++   ",
  "   +++++    .      .    +++++   ",
  "    +++     .      .     +++    ",
  "     .      .      .      .     ",
  "     .     +++     .      .     ",
  "     .    +++++    .      .     ",
  "     .    +++++    .      .     ",
  "     .    +++++    .      .     ",
  "     .     +++     .      .     ",
  "     .      .      .      .     ",
  "     .      .      .      .     ",
  "     .      .      .      .     ",
  "     .      .      .      .     ",
  "     .      .      .      .     ",
  "     .      .      .      .     ",
  "     .      .      .      .     ",
  "                                ",
  "                                ",
  "                                "
};

```

```
/*
const char * logo[] = {
"32 32 3 1",
"     c #FFFFFFFFFFFF",
".    c #00000000FFFF",
"X    c #FFFF00000000",
"                                ",
"                                ",
"                                ",
"     .      .      .      .     ",
"     .      .      .      .     ",
"     .      .      .      .     ",
"     .      .      .      .     ",
"     .      .     XXX     .     ",
"     .      .    XXXXX    .     ",
"     .      .    XXXXX    .     ",
"     .      .    XXXXX    .     ",
"    XXX     .     XXX    XXX    ",
"   XXXXX    .      .    XXXXX   ",
"   XXXXX    .      .    XXXXX   ",
"   XXXXX    .      .    XXXXX   ",
"    XXX     .      .     XXX    ",
"     .      .      .      .     ",
"     .     XXX     .      .     ",
"     .    XXXXX    .      .     ",
"     .    XXXXX    .      .     ",
"     .    XXXXX    .      .     ",
"     .     XXX     .      .     ",
"     .      .      .      .     ",
"     .      .      .      .     ",
"     .      .      .      .     ",
"     .      .      .      .     ",
"     .      .      .      .     ",
"     .      .      .      .     ",
"     .      .      .      .     ",
"                                ",
"                                ",
"                                "};
*/

static Options options[1];
static Running running[1];

static void
input_save_climbing_xml (xmlNode * node)
{
#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_climbing_xml: start\n");
#endif
  if (input->nsteps)
    {
      jb_xml_node_set_uint (node, (const xmlChar *) LABEL_NSTEPS,
                            input->nsteps);
      if (input->relaxation != DEFAULT_RELAXATION)
        jb_xml_node_set_float (node, (const xmlChar *) LABEL_RELAXATION,
                               input->relaxation);
      switch (input->climbing)
        {
        case CLIMBING_METHOD_COORDINATES:
          xmlSetProp (node, (const xmlChar *) LABEL_CLIMBING,
                      (const xmlChar *) LABEL_COORDINATES);
          break;
        default:
          xmlSetProp (node, (const xmlChar *) LABEL_CLIMBING,
                      (const xmlChar *) LABEL_RANDOM);
          jb_xml_node_set_uint (node, (const xmlChar *) LABEL_NESTIMATES,
                                input->nestimates);
        }
    }
#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_climbing_xml: end\n");
#endif
}

static void
input_save_climbing_json (JsonNode * node)
{
  JsonObject *object;
#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_climbing_json: start\n");
#endif
  object = json_node_get_object (node);
  if (input->nsteps)
    {
      jb_json_object_set_uint (object, LABEL_NSTEPS, input->nsteps);
      if (input->relaxation != DEFAULT_RELAXATION)
        jb_json_object_set_float (object, LABEL_RELAXATION, input->relaxation);
      switch (input->climbing)
        {
        case CLIMBING_METHOD_COORDINATES:
          json_object_set_string_member (object, LABEL_CLIMBING,
                                         LABEL_COORDINATES);
          break;
        default:
          json_object_set_string_member (object, LABEL_CLIMBING, LABEL_RANDOM);
          jb_json_object_set_uint (object, LABEL_NESTIMATES, input->nestimates);
        }
    }
#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_climbing_json: end\n");
#endif
}

static inline void
input_save_xml (xmlDoc * doc)
{
  unsigned int i, j;
  char *buffer;
  xmlNode *node, *child;
  GFile *file, *file2;

#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_xml: start\n");
#endif

  // Setting root XML node
  node = xmlNewDocNode (doc, 0, (const xmlChar *) LABEL_OPTIMIZE, 0);
  xmlDocSetRootElement (doc, node);

  // Adding properties to the root XML node
  if (xmlStrcmp
      ((const xmlChar *) input->result, (const xmlChar *) result_name))
    xmlSetProp (node, (const xmlChar *) LABEL_RESULT_FILE,
                (xmlChar *) input->result);
  if (xmlStrcmp
      ((const xmlChar *) input->variables, (const xmlChar *) variables_name))
    xmlSetProp (node, (const xmlChar *) LABEL_VARIABLES_FILE,
                (xmlChar *) input->variables);
  file = g_file_new_for_path (input->directory);
  file2 = g_file_new_for_path (input->simulator);
  buffer = g_file_get_relative_path (file, file2);
  g_object_unref (file2);
  xmlSetProp (node, (const xmlChar *) LABEL_SIMULATOR, (xmlChar *) buffer);
  g_free (buffer);
  if (input->evaluator)
    {
      file2 = g_file_new_for_path (input->evaluator);
      buffer = g_file_get_relative_path (file, file2);
      g_object_unref (file2);
      if (xmlStrlen ((xmlChar *) buffer))
        xmlSetProp (node, (const xmlChar *) LABEL_EVALUATOR,
                    (xmlChar *) buffer);
      g_free (buffer);
    }
  if (input->cleaner)
    {
      file2 = g_file_new_for_path (input->cleaner);
      buffer = g_file_get_relative_path (file, file2);
      g_object_unref (file2);
      if (xmlStrlen ((xmlChar *) buffer))
        xmlSetProp (node, (const xmlChar *) LABEL_CLEANER, (xmlChar *) buffer);
      g_free (buffer);
    }
  if (input->seed != DEFAULT_RANDOM_SEED)
    jb_xml_node_set_uint (node, (const xmlChar *) LABEL_SEED, input->seed);

  // Setting the algorithm
  buffer = (char *) g_slice_alloc (64);
  switch (input->algorithm)
    {
    case ALGORITHM_MONTE_CARLO:
      xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
                  (const xmlChar *) LABEL_MONTE_CARLO);
      snprintf (buffer, 64, "%u", input->nsimulations);
      xmlSetProp (node, (const xmlChar *) LABEL_NSIMULATIONS,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%u", input->niterations);
      xmlSetProp (node, (const xmlChar *) LABEL_NITERATIONS,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%.3lg", input->tolerance);
      xmlSetProp (node, (const xmlChar *) LABEL_TOLERANCE, (xmlChar *) buffer);
      snprintf (buffer, 64, "%u", input->nbest);
      xmlSetProp (node, (const xmlChar *) LABEL_NBEST, (xmlChar *) buffer);
      input_save_climbing_xml (node);
      break;
    case ALGORITHM_SWEEP:
      xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
                  (const xmlChar *) LABEL_SWEEP);
      snprintf (buffer, 64, "%u", input->niterations);
      xmlSetProp (node, (const xmlChar *) LABEL_NITERATIONS,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%.3lg", input->tolerance);
      xmlSetProp (node, (const xmlChar *) LABEL_TOLERANCE, (xmlChar *) buffer);
      snprintf (buffer, 64, "%u", input->nbest);
      xmlSetProp (node, (const xmlChar *) LABEL_NBEST, (xmlChar *) buffer);
      input_save_climbing_xml (node);
      break;
    case ALGORITHM_ORTHOGONAL:
      xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
                  (const xmlChar *) LABEL_ORTHOGONAL);
      snprintf (buffer, 64, "%u", input->niterations);
      xmlSetProp (node, (const xmlChar *) LABEL_NITERATIONS,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%.3lg", input->tolerance);
      xmlSetProp (node, (const xmlChar *) LABEL_TOLERANCE, (xmlChar *) buffer);
      snprintf (buffer, 64, "%u", input->nbest);
      xmlSetProp (node, (const xmlChar *) LABEL_NBEST, (xmlChar *) buffer);
      input_save_climbing_xml (node);
      break;
    default:
      xmlSetProp (node, (const xmlChar *) LABEL_ALGORITHM,
                  (const xmlChar *) LABEL_GENETIC);
      snprintf (buffer, 64, "%u", input->nsimulations);
      xmlSetProp (node, (const xmlChar *) LABEL_NPOPULATION,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%u", input->niterations);
      xmlSetProp (node, (const xmlChar *) LABEL_NGENERATIONS,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
      xmlSetProp (node, (const xmlChar *) LABEL_MUTATION, (xmlChar *) buffer);
      snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
      xmlSetProp (node, (const xmlChar *) LABEL_REPRODUCTION,
                  (xmlChar *) buffer);
      snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
      xmlSetProp (node, (const xmlChar *) LABEL_ADAPTATION, (xmlChar *) buffer);
      break;
    }
  g_slice_free1 (64, buffer);
  if (input->threshold != 0.)
    jb_xml_node_set_float (node, (const xmlChar *) LABEL_THRESHOLD,
                           input->threshold);

  // Setting the experimental data
  for (i = 0; i < input->nexperiments; ++i)
    {
      child = xmlNewChild (node, 0, (const xmlChar *) LABEL_EXPERIMENT, 0);
      xmlSetProp (child, (const xmlChar *) LABEL_NAME,
                  (xmlChar *) input->experiment[i].name);
      if (input->experiment[i].weight != 1.)
        jb_xml_node_set_float (child, (const xmlChar *) LABEL_WEIGHT,
                               input->experiment[i].weight);
      for (j = 0; j < input->experiment->ninputs; ++j)
        xmlSetProp (child, (const xmlChar *) stencil[j],
                    (xmlChar *) input->experiment[i].stencil[j]);
    }

  // Setting the variables data
  for (i = 0; i < input->nvariables; ++i)
    {
      child = xmlNewChild (node, 0, (const xmlChar *) LABEL_VARIABLE, 0);
      xmlSetProp (child, (const xmlChar *) LABEL_NAME,
                  (xmlChar *) input->variable[i].name);
      jb_xml_node_set_float (child, (const xmlChar *) LABEL_MINIMUM,
                             input->variable[i].rangemin);
      if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
        jb_xml_node_set_float (child, (const xmlChar *) LABEL_ABSOLUTE_MINIMUM,
                               input->variable[i].rangeminabs);
      jb_xml_node_set_float (child, (const xmlChar *) LABEL_MAXIMUM,
                             input->variable[i].rangemax);
      if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
        jb_xml_node_set_float (child, (const xmlChar *) LABEL_ABSOLUTE_MAXIMUM,
                               input->variable[i].rangemaxabs);
      if (input->variable[i].precision != DEFAULT_PRECISION)
        jb_xml_node_set_uint (child, (const xmlChar *) LABEL_PRECISION,
                              input->variable[i].precision);
      if (input->algorithm == ALGORITHM_SWEEP
          || input->algorithm == ALGORITHM_ORTHOGONAL)
        jb_xml_node_set_uint (child, (const xmlChar *) LABEL_NSWEEPS,
                              input->variable[i].nsweeps);
      else if (input->algorithm == ALGORITHM_GENETIC)
        jb_xml_node_set_uint (child, (const xmlChar *) LABEL_NBITS,
                              input->variable[i].nbits);
      if (input->nsteps)
        jb_xml_node_set_float (child, (const xmlChar *) LABEL_STEP,
                               input->variable[i].step);
    }

  // Saving the error norm
  switch (input->norm)
    {
    case ERROR_NORM_MAXIMUM:
      xmlSetProp (node, (const xmlChar *) LABEL_NORM,
                  (const xmlChar *) LABEL_MAXIMUM);
      break;
    case ERROR_NORM_P:
      xmlSetProp (node, (const xmlChar *) LABEL_NORM,
                  (const xmlChar *) LABEL_P);
      jb_xml_node_set_float (node, (const xmlChar *) LABEL_P, input->p);
      break;
    case ERROR_NORM_TAXICAB:
      xmlSetProp (node, (const xmlChar *) LABEL_NORM,
                  (const xmlChar *) LABEL_TAXICAB);
    }

#if DEBUG_INTERFACE
  fprintf (stderr, "input_save: end\n");
#endif
}

static inline void
input_save_json (JsonGenerator * generator)
{
  unsigned int i, j;
  char *buffer;
  JsonNode *node, *child;
  JsonObject *object;
  JsonArray *array;
  GFile *file, *file2;

#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_json: start\n");
#endif

  // Setting root JSON node
  object = json_object_new ();
  node = json_node_new (JSON_NODE_OBJECT);
  json_node_set_object (node, object);
  json_generator_set_root (generator, node);

  // Adding properties to the root JSON node
  if (strcmp (input->result, result_name))
    json_object_set_string_member (object, LABEL_RESULT_FILE, input->result);
  if (strcmp (input->variables, variables_name))
    json_object_set_string_member (object, LABEL_VARIABLES_FILE,
                                   input->variables);
  file = g_file_new_for_path (input->directory);
  file2 = g_file_new_for_path (input->simulator);
  buffer = g_file_get_relative_path (file, file2);
  g_object_unref (file2);
  json_object_set_string_member (object, LABEL_SIMULATOR, buffer);
  g_free (buffer);
  if (input->evaluator)
    {
      file2 = g_file_new_for_path (input->evaluator);
      buffer = g_file_get_relative_path (file, file2);
      g_object_unref (file2);
      if (strlen (buffer))
        json_object_set_string_member (object, LABEL_EVALUATOR, buffer);
      g_free (buffer);
    }
  if (input->cleaner)
    {
      file2 = g_file_new_for_path (input->cleaner);
      buffer = g_file_get_relative_path (file, file2);
      g_object_unref (file2);
      if (strlen (buffer))
        json_object_set_string_member (object, LABEL_CLEANER, buffer);
      g_free (buffer);
    }
  if (input->seed != DEFAULT_RANDOM_SEED)
    jb_json_object_set_uint (object, LABEL_SEED, input->seed);

  // Setting the algorithm
  buffer = (char *) g_slice_alloc (64);
  switch (input->algorithm)
    {
    case ALGORITHM_MONTE_CARLO:
      json_object_set_string_member (object, LABEL_ALGORITHM,
                                   LABEL_MONTE_CARLO);
      snprintf (buffer, 64, "%u", input->nsimulations);
      json_object_set_string_member (object, LABEL_NSIMULATIONS, buffer);
      snprintf (buffer, 64, "%u", input->niterations);
      json_object_set_string_member (object, LABEL_NITERATIONS, buffer);
      snprintf (buffer, 64, "%.3lg", input->tolerance);
      json_object_set_string_member (object, LABEL_TOLERANCE, buffer);
      snprintf (buffer, 64, "%u", input->nbest);
      json_object_set_string_member (object, LABEL_NBEST, buffer);
      input_save_climbing_json (node);
      break;
    case ALGORITHM_SWEEP:
      json_object_set_string_member (object, LABEL_ALGORITHM, LABEL_SWEEP);
      snprintf (buffer, 64, "%u", input->niterations);
      json_object_set_string_member (object, LABEL_NITERATIONS, buffer);
      snprintf (buffer, 64, "%.3lg", input->tolerance);
      json_object_set_string_member (object, LABEL_TOLERANCE, buffer);
      snprintf (buffer, 64, "%u", input->nbest);
      json_object_set_string_member (object, LABEL_NBEST, buffer);
      input_save_climbing_json (node);
      break;
    case ALGORITHM_ORTHOGONAL:
      json_object_set_string_member (object, LABEL_ALGORITHM, LABEL_ORTHOGONAL);
      snprintf (buffer, 64, "%u", input->niterations);
      json_object_set_string_member (object, LABEL_NITERATIONS, buffer);
      snprintf (buffer, 64, "%.3lg", input->tolerance);
      json_object_set_string_member (object, LABEL_TOLERANCE, buffer);
      snprintf (buffer, 64, "%u", input->nbest);
      json_object_set_string_member (object, LABEL_NBEST, buffer);
      input_save_climbing_json (node);
      break;
    default:
      json_object_set_string_member (object, LABEL_ALGORITHM, LABEL_GENETIC);
      snprintf (buffer, 64, "%u", input->nsimulations);
      json_object_set_string_member (object, LABEL_NPOPULATION, buffer);
      snprintf (buffer, 64, "%u", input->niterations);
      json_object_set_string_member (object, LABEL_NGENERATIONS, buffer);
      snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
      json_object_set_string_member (object, LABEL_MUTATION, buffer);
      snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
      json_object_set_string_member (object, LABEL_REPRODUCTION, buffer);
      snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
      json_object_set_string_member (object, LABEL_ADAPTATION, buffer);
      break;
    }
  g_slice_free1 (64, buffer);
  if (input->threshold != 0.)
    jb_json_object_set_float (object, LABEL_THRESHOLD, input->threshold);

  // Setting the experimental data
  array = json_array_new ();
  for (i = 0; i < input->nexperiments; ++i)
    {
      child = json_node_new (JSON_NODE_OBJECT);
      object = json_node_get_object (child);
      json_object_set_string_member (object, LABEL_NAME,
                                     input->experiment[i].name);
      if (input->experiment[i].weight != 1.)
        jb_json_object_set_float (object, LABEL_WEIGHT,
                                  input->experiment[i].weight);
      for (j = 0; j < input->experiment->ninputs; ++j)
        json_object_set_string_member (object, stencil[j],
                                       input->experiment[i].stencil[j]);
      json_array_add_element (array, child);
    }
  json_object_set_array_member (object, LABEL_EXPERIMENTS, array);

  // Setting the variables data
  array = json_array_new ();
  for (i = 0; i < input->nvariables; ++i)
    {
      child = json_node_new (JSON_NODE_OBJECT);
      object = json_node_get_object (child);
      json_object_set_string_member (object, LABEL_NAME,
                                     input->variable[i].name);
      jb_json_object_set_float (object, LABEL_MINIMUM,
                                input->variable[i].rangemin);
      if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
        jb_json_object_set_float (object, LABEL_ABSOLUTE_MINIMUM,
                                  input->variable[i].rangeminabs);
      jb_json_object_set_float (object, LABEL_MAXIMUM,
                                input->variable[i].rangemax);
      if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
        jb_json_object_set_float (object, LABEL_ABSOLUTE_MAXIMUM,
                                  input->variable[i].rangemaxabs);
      if (input->variable[i].precision != DEFAULT_PRECISION)
        jb_json_object_set_uint (object, LABEL_PRECISION,
                                  input->variable[i].precision);
      if (input->algorithm == ALGORITHM_SWEEP
          || input->algorithm == ALGORITHM_ORTHOGONAL)
        jb_json_object_set_uint (object, LABEL_NSWEEPS,
                                  input->variable[i].nsweeps);
      else if (input->algorithm == ALGORITHM_GENETIC)
        jb_json_object_set_uint (object, LABEL_NBITS, input->variable[i].nbits);
      if (input->nsteps)
        jb_json_object_set_float (object, LABEL_STEP, input->variable[i].step);
      json_array_add_element (array, child);
    }
  json_object_set_array_member (object, LABEL_VARIABLES, array);

  // Saving the error norm
  switch (input->norm)
    {
    case ERROR_NORM_MAXIMUM:
      json_object_set_string_member (object, LABEL_NORM, LABEL_MAXIMUM);
      break;
    case ERROR_NORM_P:
      json_object_set_string_member (object, LABEL_NORM, LABEL_P);
      jb_json_object_set_float (object, LABEL_P, input->p);
      break;
    case ERROR_NORM_TAXICAB:
      json_object_set_string_member (object, LABEL_NORM, LABEL_TAXICAB);
    }

#if DEBUG_INTERFACE
  fprintf (stderr, "input_save_json: end\n");
#endif
}

static inline void
input_save (char *filename)
{
  xmlDoc *doc;
  JsonGenerator *generator;

#if DEBUG_INTERFACE
  fprintf (stderr, "input_save: start\n");
#endif

  // Getting the input file directory
  input->name = g_path_get_basename (filename);
  input->directory = g_path_get_dirname (filename);

  if (input->type == INPUT_TYPE_XML)
    {
      // Opening the input file
      doc = xmlNewDoc ((const xmlChar *) "1.0");
      input_save_xml (doc);

      // Saving the XML file
      xmlSaveFormatFile (filename, doc, 1);

      // Freeing memory
      xmlFreeDoc (doc);
    }
  else
    {
      // Opening the input file
      generator = json_generator_new ();
      json_generator_set_pretty (generator, TRUE);
      input_save_json (generator);

      // Saving the JSON file
      json_generator_to_file (generator, filename, NULL);

      // Freeing memory
      g_object_unref (generator);
    }

#if DEBUG_INTERFACE
  fprintf (stderr, "input_save: end\n");
#endif
}

static void
dialog_options_close (GtkDialog * dlg,
                      int response_id)
{
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_options_close: start\n");
#endif
  if (response_id == GTK_RESPONSE_OK)
    {
      input->seed
      = (unsigned long int) gtk_spin_button_get_value (options->spin_seed);
    nthreads = gtk_spin_button_get_value_as_int (options->spin_threads);
    nthreads_climbing
      = gtk_spin_button_get_value_as_int (options->spin_climbing);
  }
  gtk_window_destroy (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_options_close: end\n");
#endif
}

static void
options_new ()
{
#if DEBUG_INTERFACE
  fprintf (stderr, "options_new: start\n");
#endif
  options->label_seed = (GtkLabel *)
    gtk_label_new (_("Pseudo-random numbers generator seed"));
  options->spin_seed = (GtkSpinButton *)
    gtk_spin_button_new_with_range (0., (gdouble) G_MAXULONG, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (options->spin_seed),
     _("Seed to init the pseudo-random numbers generator"));
  gtk_spin_button_set_value (options->spin_seed, (gdouble) input->seed);
  options->label_threads = (GtkLabel *)
    gtk_label_new (_("Threads number for the stochastic algorithm"));
  options->spin_threads
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (options->spin_threads),
     _("Number of threads to perform the calibration/optimization for "
       "the stochastic algorithm"));
  gtk_spin_button_set_value (options->spin_threads, (gdouble) nthreads);
  options->label_climbing = (GtkLabel *)
    gtk_label_new (_("Threads number for the hill climbing method"));
  options->spin_climbing =
    (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (options->spin_climbing),
     _("Number of threads to perform the calibration/optimization for the "
       "hill climbing method"));
  gtk_spin_button_set_value (options->spin_climbing,
                             (gdouble) nthreads_climbing);
  options->grid = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (options->grid, GTK_WIDGET (options->label_seed), 0, 0, 1, 1);
  gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_seed), 1, 0, 1, 1);
  gtk_grid_attach (options->grid, GTK_WIDGET (options->label_threads),
                   0, 1, 1, 1);
  gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_threads),
                   1, 1, 1, 1);
  gtk_grid_attach (options->grid, GTK_WIDGET (options->label_climbing), 0, 2, 1,
                   1);
  gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_climbing), 1, 2, 1,
                   1);
#if !GTK4
  gtk_widget_show_all (GTK_WIDGET (options->grid));
#else
  gtk_widget_show (GTK_WIDGET (options->grid));
#endif
  options->dialog = (GtkDialog *)
    gtk_dialog_new_with_buttons (_("Options"),
                                 window->window,
                                 GTK_DIALOG_MODAL,
                                 _("_OK"), GTK_RESPONSE_OK,
                                 _("_Cancel"), GTK_RESPONSE_CANCEL, NULL);
  gtk_box_append (GTK_BOX (gtk_dialog_get_content_area (options->dialog)),
                  GTK_WIDGET (options->grid));
  g_signal_connect (options->dialog, "response",
                    G_CALLBACK (dialog_options_close), NULL);
  gtk_window_present (GTK_WINDOW (options->dialog));
#if DEBUG_INTERFACE
  fprintf (stderr, "options_new: end\n");
#endif
}

static inline void
running_new ()
{
#if DEBUG_INTERFACE
  fprintf (stderr, "running_new: start\n");
#endif
  running->label = (GtkLabel *) gtk_label_new (_("Calculating ..."));
  running->spinner = (GtkSpinner *) gtk_spinner_new ();
  running->grid = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (running->grid, GTK_WIDGET (running->label), 0, 0, 1, 1);
  gtk_grid_attach (running->grid, GTK_WIDGET (running->spinner), 0, 1, 1, 1);
  running->dialog = (GtkDialog *)
    gtk_dialog_new_with_buttons (_("Calculating"),
                                 window->window, GTK_DIALOG_MODAL, NULL, NULL);
  gtk_window_set_child (GTK_WINDOW
                        (gtk_dialog_get_content_area (running->dialog)),
                        GTK_WIDGET (running->grid));
  gtk_spinner_start (running->spinner);
#if !GTK4
  gtk_widget_show_all (GTK_WIDGET (running->dialog));
#else
  gtk_widget_show (GTK_WIDGET (running->dialog));
#endif
#if DEBUG_INTERFACE
  fprintf (stderr, "running_new: end\n");
#endif
}

static unsigned int
window_get_algorithm ()
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_get_algorithm: start\n");
#endif
  i = jbw_array_buttons_get_active (window->button_algorithm, NALGORITHMS);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_get_algorithm: %u\n", i);
  fprintf (stderr, "window_get_algorithm: end\n");
#endif
  return i;
}

static unsigned int
window_get_climbing ()
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_get_climbing: start\n");
#endif
  i = jbw_array_buttons_get_active (window->button_climbing, NCLIMBINGS);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_get_climbing: %u\n", i);
  fprintf (stderr, "window_get_climbing: end\n");
#endif
  return i;
}

static unsigned int
window_get_norm ()
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_get_norm: start\n");
#endif
  i = jbw_array_buttons_get_active (window->button_norm, NNORMS);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_get_norm: %u\n", i);
  fprintf (stderr, "window_get_norm: end\n");
#endif
  return i;
}

static void
window_save_climbing ()
{
#if DEBUG_INTERFACE
  fprintf (stderr, "window_save_climbing: start\n");
#endif
  if (gtk_check_button_get_active (window->check_climbing))
    {
      input->nsteps = gtk_spin_button_get_value_as_int (window->spin_steps);
      input->nfinal_steps
        = gtk_spin_button_get_value_as_int (window->spin_final_steps);
      input->relaxation = gtk_spin_button_get_value (window->spin_relaxation);
      switch (window_get_climbing ())
        {
        case CLIMBING_METHOD_COORDINATES:
          input->climbing = CLIMBING_METHOD_COORDINATES;
          break;
        default:
          input->climbing = CLIMBING_METHOD_RANDOM;
          input->nestimates
            = gtk_spin_button_get_value_as_int (window->spin_estimates);
        }
    }
  else
    input->nsteps = 0;
```

```
#if DEBUG_INTERFACE
  fprintf (stderr, "window_save_climbing: end\n");
#endif
}

static void
dialog_save_close (GtkFileChooserDialog * dlg,
                   int response_id)
{
  GtkFileFilter *filter1;
  char *buffer;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_save_close: start\n");
#endif
  // If OK response then saving
  if (response_id == GTK_RESPONSE_OK)
    {
      // Setting input file type
      filter1 = gtk_file_chooser_get_filter (GTK_FILE_CHOOSER (dlg));
      buffer = (char *) gtk_file_filter_get_name (filter1);
      if (!strcmp (buffer, "XML"))
        input->type = INPUT_TYPE_XML;
      else
        input->type = INPUT_TYPE_JSON;

      // Adding properties to the root XML node
      input->simulator
        = g_strdup (gtk_button_get_label (window->button_simulator));
      if (gtk_check_button_get_active (window->check_evaluator))
        input->evaluator
          = g_strdup (gtk_button_get_label (window->button_evaluator));
      else
        input->evaluator = NULL;
      if (gtk_check_button_get_active (window->check_cleaner))
        input->cleaner
          = g_strdup (gtk_button_get_label (window->button_cleaner));
      else
        input->cleaner = NULL;
      if (input->type == INPUT_TYPE_XML)
        {
          input->result
            = (char *) xmlStrdup ((const xmlChar *)
                                  gtk_entry_get_text (window->entry_result));
          input->variables
            = (char *) xmlStrdup ((const xmlChar *)
                                  gtk_entry_get_text (window->entry_variables));
        }
      else
        {
          input->result = g_strdup (gtk_entry_get_text (window->entry_result));
          input->variables =
            g_strdup (gtk_entry_get_text (window->entry_variables));
        }

      // Setting the algorithm
      switch (window_get_algorithm ())
        {
        case ALGORITHM_MONTE_CARLO:
          input->algorithm = ALGORITHM_MONTE_CARLO;
          input->nsimulations
            = gtk_spin_button_get_value_as_int (window->spin_simulations);
          input->niterations
            = gtk_spin_button_get_value_as_int (window->spin_iterations);
          input->tolerance = gtk_spin_button_get_value (window->spin_tolerance);
          input->nbest = gtk_spin_button_get_value_as_int (window->spin_bests);
          window_save_climbing ();
          break;
        case ALGORITHM_SWEEP:
          input->algorithm = ALGORITHM_SWEEP;
          input->niterations
            = gtk_spin_button_get_value_as_int (window->spin_iterations);
          input->tolerance = gtk_spin_button_get_value (window->spin_tolerance);
          input->nbest = gtk_spin_button_get_value_as_int (window->spin_bests);
          window_save_climbing ();
          break;
        case ALGORITHM_ORTHOGONAL:
          input->algorithm = ALGORITHM_ORTHOGONAL;
          input->niterations
            = gtk_spin_button_get_value_as_int (window->spin_iterations);
          input->tolerance = gtk_spin_button_get_value (window->spin_tolerance);
          input->nbest = gtk_spin_button_get_value_as_int (window->spin_bests);
          window_save_climbing ();
          break;
        default:
          input->algorithm = ALGORITHM_GENETIC;
          input->nsimulations
            = gtk_spin_button_get_value_as_int (window->spin_population);
          input->niterations
            = gtk_spin_button_get_value_as_int (window->spin_generations);
          input->mutation_ratio
            = gtk_spin_button_get_value (window->spin_mutation);
          input->reproduction_ratio
            = gtk_spin_button_get_value (window->spin_reproduction);
          input->adaptation_ratio
            = gtk_spin_button_get_value (window->spin_adaptation);
        }
      input->norm = window_get_norm ();
      input->p = gtk_spin_button_get_value (window->spin_p);
      input->threshold = gtk_spin_button_get_value (window->spin_threshold);

      // Saving the XML file
      buffer = gtk_file_chooser_get_current_name (GTK_FILE_CHOOSER (dlg));
      input_save (buffer);

      // Closing and freeing memory
      g_free (buffer);
    }
  gtk_window_destroy (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_save_close: end\n");
#endif
}

static void
window_save ()
{
  GtkFileChooserDialog *dlg;
  GtkFileFilter *filter1, *filter2;
  char *buffer;

#if DEBUG_INTERFACE
  fprintf (stderr, "window_save: start\n");
#endif

  // Opening the saving dialog
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Save file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_SAVE,
                                 _("_Cancel"), GTK_RESPONSE_CANCEL,
                                 _("_OK"), GTK_RESPONSE_OK, NULL);
#if !GTK4
  gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
#endif
  buffer = g_build_filename (input->directory, input->name, NULL);
  gtk_file_chooser_set_current_name (GTK_FILE_CHOOSER (dlg), buffer);
  g_free (buffer);

  // Adding XML filter
  filter1 = (GtkFileFilter *) gtk_file_filter_new ();
  gtk_file_filter_set_name (filter1, "XML");
  gtk_file_filter_add_pattern (filter1, "*.xml");
  gtk_file_filter_add_pattern (filter1, "*.XML");
  gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter1);

  // Adding JSON filter
  filter2 = (GtkFileFilter *) gtk_file_filter_new ();
  gtk_file_filter_set_name (filter2, "JSON");
  gtk_file_filter_add_pattern (filter2, "*.json");
  gtk_file_filter_add_pattern (filter2, "*.JSON");
  gtk_file_filter_add_pattern (filter2, "*.js");
  gtk_file_filter_add_pattern (filter2, "*.JS");
  gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter2);

  if (input->type == INPUT_TYPE_XML)
    gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter1);
  else
    gtk_file_chooser_set_filter (GTK_FILE_CHOOSER (dlg), filter2);

  // Connecting the close function
  g_signal_connect (dlg, "response", G_CALLBACK (dialog_save_close), NULL);

  // Showing modal dialog
  gtk_window_present (GTK_WINDOW (dlg));

#if DEBUG_INTERFACE
  fprintf (stderr, "window_save: end\n");
#endif
}

static void
window_run ()
{
  char *msg, *msg2, buffer[64], buffer2[64];
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_run: start\n");
#endif
  window_save ();
  running_new ();
  jbw_process_pending ();
  optimize_open ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_run: closing running dialog\n");
#endif
  gtk_spinner_stop (running->spinner);
  gtk_window_destroy (GTK_WINDOW (running->dialog));
#if DEBUG_INTERFACE
  fprintf (stderr, "window_run: displaying results\n");
#endif
  snprintf (buffer, 64, "error = %.15le\n", optimize->error_old[0]);
  msg2 = g_strdup (buffer);
  for (i = 0; i < optimize->nvariables; ++i, msg2 = msg)
    {
      snprintf (buffer, 64, "%s = %s\n",
                input->variable[i].name, format[input->variable[i].precision]);
      snprintf (buffer2, 64, buffer, optimize->value_old[i]);
      msg = g_strconcat (msg2, buffer2, NULL);
      g_free (msg2);
    }
  snprintf (buffer, 64, "%s = %.6lg s", _("Calculation time"),
            optimize->calculation_time);
  msg = g_strconcat (msg2, buffer, NULL);
  g_free (msg2);
  jbw_show_message_gtk (_("Best result"), msg, INFO_TYPE);
  g_free (msg);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_run: freeing memory\n");
#endif
  optimize_free ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_run: end\n");
#endif
}

static void
window_help ()
{
  char *buffer, *buffer2;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_help: start\n");
#endif
  buffer2 = g_build_filename (window->application_directory, "..", "manuals",
                              _("user-manual.pdf"), NULL);
  buffer = g_filename_to_uri (buffer2, NULL, NULL);
  g_free (buffer2);
#if GTK4
  gtk_show_uri (window->window, buffer, GDK_CURRENT_TIME);
#else
  gtk_show_uri_on_window (window->window, buffer, GDK_CURRENT_TIME, NULL);
#endif
#if DEBUG_INTERFACE
  fprintf (stderr, "window_help: uri=%s\n", buffer);
#endif
  g_free (buffer);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_help: end\n");
#endif
}

static void
window_about ()
{
  static const gchar *authors[] = {
    "Javier Burguete Tolosa <jburguete@eead.csic.es>",
    "Borja Latorre Garcés <borja.latorre@csic.es>",
    NULL
  };
#if DEBUG_INTERFACE
  fprintf (stderr, "window_about: start\n");
#endif
  gtk_show_about_dialog
    (window->window,
     "program_name", "MPCOTool",
     "comments",
     _("The Multi-Purposes Calibration and Optimization Tool.\n"
       "A software to perform calibrations or optimizations of empirical "
       "parameters"),
     "authors", authors,
     "translator-credits",
     "Javier Burguete Tolosa <jburguete@eead.csic.es> "
     "(english, french and spanish)\n"
     "Uğur Çayoğlu (german)",
     "version", "4.10.2",
     "copyright", "Copyright 2012-2023 Javier Burguete Tolosa",
     "logo", window->logo,
     "website", "https://github.com/jburguete/mpcotool",
     "license-type", GTK_LICENSE_BSD, NULL);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_about: end\n");
#endif
}

static void
window_update_climbing ()
{
#if DEBUG_INTERFACE
  fprintf (stderr, "window_update_climbing: start\n");
#endif
  gtk_widget_show (GTK_WIDGET (window->check_climbing));
  if (gtk_check_button_get_active (window->check_climbing))
    {
      gtk_widget_show (GTK_WIDGET (window->grid_climbing));
      gtk_widget_show (GTK_WIDGET (window->label_step));
      gtk_widget_show (GTK_WIDGET (window->spin_step));
    }
  switch (window_get_climbing ())
    {
    case CLIMBING_METHOD_COORDINATES:
      gtk_widget_hide (GTK_WIDGET (window->label_estimates));
      gtk_widget_hide (GTK_WIDGET (window->spin_estimates));
      break;
    default:
      gtk_widget_show (GTK_WIDGET (window->label_estimates));
      gtk_widget_show (GTK_WIDGET (window->spin_estimates));
    }
#if DEBUG_INTERFACE
  fprintf (stderr, "window_update_climbing: end\n");
#endif
}

static void
window_update ()
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_update: start\n");
#endif
  gtk_widget_set_sensitive
    (GTK_WIDGET (window->button_evaluator),
     gtk_check_button_get_active (window->check_evaluator));
  gtk_widget_set_sensitive
    (GTK_WIDGET (window->button_cleaner),
     gtk_check_button_get_active (window->check_cleaner));
  gtk_widget_hide (GTK_WIDGET (window->label_simulations));
  gtk_widget_hide (GTK_WIDGET (window->spin_simulations));
  gtk_widget_hide (GTK_WIDGET (window->label_iterations));
  gtk_widget_hide (GTK_WIDGET (window->spin_iterations));
  gtk_widget_hide (GTK_WIDGET (window->label_tolerance));
  gtk_widget_hide (GTK_WIDGET (window->spin_tolerance));
  gtk_widget_hide (GTK_WIDGET (window->label_bests));
  gtk_widget_hide (GTK_WIDGET (window->spin_bests));
  gtk_widget_hide (GTK_WIDGET (window->label_population));
  gtk_widget_hide (GTK_WIDGET (window->spin_population));
  gtk_widget_hide (GTK_WIDGET (window->label_generations));
  gtk_widget_hide (GTK_WIDGET (window->spin_generations));
  gtk_widget_hide (GTK_WIDGET (window->label_mutation));
  gtk_widget_hide (GTK_WIDGET (window->spin_mutation));
  gtk_widget_hide (GTK_WIDGET (window->label_reproduction));
  gtk_widget_hide (GTK_WIDGET (window->spin_reproduction));
  gtk_widget_hide (GTK_WIDGET (window->label_adaptation));
  gtk_widget_hide (GTK_WIDGET (window->spin_adaptation));
  gtk_widget_hide (GTK_WIDGET (window->label_sweeps));
  gtk_widget_hide (GTK_WIDGET (window->spin_sweeps));
  gtk_widget_hide (GTK_WIDGET (window->label_bits));
  gtk_widget_hide (GTK_WIDGET (window->spin_bits));
  gtk_widget_hide (GTK_WIDGET (window->check_climbing));
  gtk_widget_hide (GTK_WIDGET (window->grid_climbing));
  gtk_widget_hide (GTK_WIDGET (window->label_step));
  gtk_widget_hide (GTK_WIDGET (window->spin_step));
  gtk_widget_hide (GTK_WIDGET (window->label_p));
  gtk_widget_hide (GTK_WIDGET (window->spin_p));
  i = gtk_spin_button_get_value_as_int (window->spin_iterations);
  switch (window_get_algorithm ())
    {
    case ALGORITHM_MONTE_CARLO:
      gtk_widget_show (GTK_WIDGET (window->label_simulations));
      gtk_widget_show (GTK_WIDGET (window->spin_simulations));
      gtk_widget_show (GTK_WIDGET (window->label_iterations));
      gtk_widget_show (GTK_WIDGET (window->spin_iterations));
      if (i > 1)
        {
          gtk_widget_show (GTK_WIDGET (window->label_tolerance));
          gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
          gtk_widget_show (GTK_WIDGET (window->label_bests));
          gtk_widget_show (GTK_WIDGET (window->spin_bests));
        }
      window_update_climbing ();
      break;
    case ALGORITHM_SWEEP:
    case ALGORITHM_ORTHOGONAL:
      gtk_widget_show (GTK_WIDGET (window->label_iterations));
      gtk_widget_show (GTK_WIDGET (window->spin_iterations));
      if (i > 1)
        {
          gtk_widget_show (GTK_WIDGET (window->label_tolerance));
          gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
          gtk_widget_show (GTK_WIDGET (window->label_bests));
          gtk_widget_show (GTK_WIDGET (window->spin_bests));
        }
      gtk_widget_show (GTK_WIDGET (window->label_sweeps));
      gtk_widget_show (GTK_WIDGET (window->spin_sweeps));
      gtk_widget_show (GTK_WIDGET (window->check_climbing));
      window_update_climbing ();
      break;
    default:
      gtk_widget_show (GTK_WIDGET (window->label_population));
      gtk_widget_show (GTK_WIDGET (window->spin_population));
      gtk_widget_show (GTK_WIDGET (window->label_generations));
      gtk_widget_show (GTK_WIDGET (window->spin_generations));
      gtk_widget_show (GTK_WIDGET (window->label_mutation));
      gtk_widget_show (GTK_WIDGET (window->spin_mutation));
      gtk_widget_show (GTK_WIDGET (window->label_reproduction));
      gtk_widget_show (GTK_WIDGET (window->spin_reproduction));
      gtk_widget_show (GTK_WIDGET (window->label_adaptation));
      gtk_widget_show (GTK_WIDGET (window->spin_adaptation));
      gtk_widget_show (GTK_WIDGET (window->label_bits));
      gtk_widget_show (GTK_WIDGET (window->spin_bits));
    }
  gtk_widget_set_sensitive
    (GTK_WIDGET (window->button_remove_experiment), input->nexperiments > 1);
  gtk_widget_set_sensitive
    (GTK_WIDGET (window->button_remove_variable), input->nvariables > 1);
  for (i = 0; i < input->experiment->ninputs; ++i)
    {
      gtk_widget_show (GTK_WIDGET (window->check_template[i]));
      gtk_widget_show (GTK_WIDGET (window->button_template[i]));
      gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 0);
      gtk_widget_set_sensitive (GTK_WIDGET (window->button_template[i]), 1);
      g_signal_handler_block
        (window->check_template[i], window->id_template[i]);
      g_signal_handler_block (window->button_template[i], window->id_input[i]);
      gtk_check_button_set_active (window->check_template[i], 1);
      g_signal_handler_unblock (window->button_template[i],
                                window->id_input[i]);
      g_signal_handler_unblock (window->check_template[i],
                                window->id_template[i]);
    }
  if (i > 0)
    {
      gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i - 1]), 1);
      gtk_widget_set_sensitive (GTK_WIDGET (window->button_template[i - 1]),
                                gtk_check_button_get_active
                                (window->check_template[i - 1]));
    }
  if (i < MAX_NINPUTS)
    {
      gtk_widget_show (GTK_WIDGET (window->check_template[i]));
      gtk_widget_show (GTK_WIDGET (window->button_template[i]));
      gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 1);
      gtk_widget_set_sensitive
        (GTK_WIDGET (window->button_template[i]),
         gtk_check_button_get_active (window->check_template[i]));
      g_signal_handler_block
        (window->check_template[i], window->id_template[i]);
      g_signal_handler_block (window->button_template[i], window->id_input[i]);
      gtk_check_button_set_active (window->check_template[i], 0);
      g_signal_handler_unblock (window->button_template[i],
                                window->id_input[i]);
      g_signal_handler_unblock (window->check_template[i],
                                window->id_template[i]);
    }
  while (++i < MAX_NINPUTS)
    {
      gtk_widget_hide (GTK_WIDGET (window->check_template[i]));
      gtk_widget_hide (GTK_WIDGET (window->button_template[i]));
    }
  gtk_widget_set_sensitive
    (GTK_WIDGET (window->spin_minabs),
     gtk_check_button_get_active (window->check_minabs));
  gtk_widget_set_sensitive
    (GTK_WIDGET (window->spin_maxabs),
     gtk_check_button_get_active (window->check_maxabs));
  if (window_get_norm () == ERROR_NORM_P)
    {
      gtk_widget_show (GTK_WIDGET (window->label_p));
      gtk_widget_show (GTK_WIDGET (window->spin_p));
    }
#if DEBUG_INTERFACE
  fprintf (stderr, "window_update: end\n");
#endif
}

static void
window_set_algorithm ()
{
  int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_algorithm: start\n");
#endif
  i = window_get_algorithm ();
  switch (i)
    {
    case ALGORITHM_SWEEP:
    case ALGORITHM_ORTHOGONAL:
      i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
      if (i < 0)
        i = 0;
      gtk_spin_button_set_value (window->spin_sweeps,
                                 (gdouble) input->variable[i].nsweeps);
      break;
    case ALGORITHM_GENETIC:
      i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
      if (i < 0)
        i = 0;
      gtk_spin_button_set_value (window->spin_bits,
                                 (gdouble) input->variable[i].nbits);
    }
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_algorithm: end\n");
#endif
}

static void
window_set_experiment ()
{
  unsigned int i, j;
  char *buffer1;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_experiment: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
  gtk_spin_button_set_value (window->spin_weight, input->experiment[i].weight);
  buffer1 = gtk_combo_box_text_get_active_text (window->combo_experiment);
  gtk_button_set_label (window->button_experiment, buffer1);
  g_free (buffer1);
  for (j = 0; j < input->experiment->ninputs; ++j)
    {
      g_signal_handler_block (window->button_template[j], window->id_input[j]);
      gtk_button_set_label (window->button_template[j],
                            input->experiment[i].stencil[j]);
      g_signal_handler_unblock
        (window->button_template[j], window->id_input[j]);
    }
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_experiment: end\n");
#endif
}

static void
window_remove_experiment ()
{
  unsigned int i, j;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_remove_experiment: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
  g_signal_handler_block (window->combo_experiment, window->id_experiment);
  gtk_combo_box_text_remove (window->combo_experiment, i);
  g_signal_handler_unblock (window->combo_experiment, window->id_experiment);
  experiment_free (input->experiment + i, input->type);
  --input->nexperiments;
  for (j = i; j < input->nexperiments; ++j)
    memcpy (input->experiment + j, input->experiment + j + 1,
            sizeof (Experiment));
  j = input->nexperiments - 1;
  if (i > j)
    i = j;
  for (j = 0; j < input->experiment->ninputs; ++j)
    g_signal_handler_block (window->button_template[j], window->id_input[j]);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
  for (j = 0; j < input->experiment->ninputs; ++j)
    g_signal_handler_unblock (window->button_template[j], window->id_input[j]);
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_remove_experiment: end\n");
#endif
}

static void
window_add_experiment ()
{
  unsigned int i, j;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_add_experiment: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
  g_signal_handler_block (window->combo_experiment, window->id_experiment);
  gtk_combo_box_text_insert_text
    (window->combo_experiment, i, input->experiment[i].name);
  g_signal_handler_unblock (window->combo_experiment, window->id_experiment);
  input->experiment = (Experiment *) g_realloc
    (input->experiment, (input->nexperiments + 1) * sizeof (Experiment));
  for (j = input->nexperiments - 1; j > i; --j)
    memcpy (input->experiment + j + 1, input->experiment + j,
            sizeof (Experiment));
  input->experiment[j + 1].weight = input->experiment[j].weight;
  input->experiment[j + 1].ninputs = input->experiment[j].ninputs;
  if (input->type == INPUT_TYPE_XML)
    {
      input->experiment[j + 1].name
        = (char *) xmlStrdup ((xmlChar *) input->experiment[j].name);
      for (j = 0; j < input->experiment->ninputs; ++j)
        input->experiment[i + 1].stencil[j]
          = (char *) xmlStrdup ((xmlChar *) input->experiment[i].stencil[j]);
    }
  else
    {
      input->experiment[j + 1].name = g_strdup (input->experiment[j].name);
      for (j = 0; j < input->experiment->ninputs; ++j)
        input->experiment[i + 1].stencil[j]
          = g_strdup (input->experiment[i].stencil[j]);
    }
  ++input->nexperiments;
  for (j = 0; j < input->experiment->ninputs; ++j)
    g_signal_handler_block (window->button_template[j], window->id_input[j]);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i + 1);
  for (j = 0; j < input->experiment->ninputs; ++j)
    g_signal_handler_unblock (window->button_template[j], window->id_input[j]);
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_add_experiment: end\n");
#endif
}

static void
dialog_name_experiment_close (GtkFileChooserDialog * dlg,
                              int response_id,
                              void *data)
{
  char *buffer;
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_name_experiment_close: start\n");
#endif
  i = (size_t) data;
  if (response_id == GTK_RESPONSE_OK)
    {
      buffer = gtk_file_chooser_get_current_name (GTK_FILE_CHOOSER (dlg));
      g_signal_handler_block (window->combo_experiment, window->id_experiment);
      gtk_combo_box_text_remove (window->combo_experiment, i);
      gtk_combo_box_text_insert_text (window->combo_experiment, i, buffer);
      gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
      g_signal_handler_unblock (window->combo_experiment,
                                window->id_experiment);
      g_free (buffer);
    }
#if DEBUG_INTERFACE
```

```c
  fprintf (stderr, "window_name_experiment_close: end\n");
#endif
}

static void
window_name_experiment ()
{
  GtkFileChooserDialog *dlg;
  GMainLoop *loop;
  const char *buffer;
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_name_experiment: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
  buffer = gtk_button_get_label (window->button_experiment);
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Open experiment file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_OPEN,
                                 _("_Cancel"),
                                 GTK_RESPONSE_CANCEL,
                                 _("_Open"), GTK_RESPONSE_OK, NULL);
  gtk_file_chooser_set_current_name (GTK_FILE_CHOOSER (dlg), buffer);
  g_signal_connect (dlg, "response", G_CALLBACK (dialog_name_experiment_close),
                    (void *) (size_t) i);
  gtk_window_present (GTK_WINDOW (dlg));
  loop = g_main_loop_new (NULL, 0);
  g_signal_connect_swapped (dlg, "destroy", G_CALLBACK (g_main_loop_quit),
                            loop);
  g_main_loop_run (loop);
  g_main_loop_unref (loop);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_name_experiment: end\n");
#endif
}

static void
window_weight_experiment ()
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_weight_experiment: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
  input->experiment[i].weight = gtk_spin_button_get_value (window->spin_weight);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_weight_experiment: end\n");
#endif
}

static void
window_inputs_experiment ()
{
  unsigned int j;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_inputs_experiment: start\n");
#endif
  j = input->experiment->ninputs - 1;
  if (j && !gtk_check_button_get_active (window->check_template[j]))
    --input->experiment->ninputs;
  if (input->experiment->ninputs < MAX_NINPUTS
      && gtk_check_button_get_active (window->check_template[j]))
    ++input->experiment->ninputs;
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_inputs_experiment: end\n");
#endif
}

static void
window_template_experiment_close (GtkFileChooserDialog * dlg,
                                  int response_id,
                                  void *data)
{
  GFile *file1, *file2;
  char *buffer1, *buffer2;
  unsigned int i, j;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_template_experiment_close: start\n");
#endif
  if (response_id == GTK_RESPONSE_OK)
    {
      i = (size_t) data;
      j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
      buffer1 = gtk_file_chooser_get_current_name (GTK_FILE_CHOOSER (dlg));
      file1 = g_file_new_for_path (buffer1);
      file2 = g_file_new_for_path (input->directory);
      buffer2 = g_file_get_relative_path (file2, file1);
      if (input->type == INPUT_TYPE_XML)
        input->experiment[j].stencil[i]
          = (char *) xmlStrdup ((xmlChar *) buffer2);
      else
        input->experiment[j].stencil[i] = g_strdup (buffer2);
      g_free (buffer2);
      g_object_unref (file2);
      g_object_unref (file1);
      g_free (buffer1);
    }
  gtk_window_destroy (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "window_template_experiment_close: end\n");
#endif
}

static void
window_template_experiment (void *data)
{
  GtkFileChooserDialog *dlg;
  GMainLoop *loop;
  const char *buffer;
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_template_experiment: start\n");
#endif
  i = (size_t) data;
  buffer = gtk_button_get_label (window->button_template[i]);
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Open template file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_OPEN,
                                 _("_Cancel"),
                                 GTK_RESPONSE_CANCEL,
                                 _("_Open"), GTK_RESPONSE_ACCEPT, NULL);
  gtk_file_chooser_set_current_name (GTK_FILE_CHOOSER (dlg), buffer);
  g_signal_connect (dlg, "response",
                    G_CALLBACK (window_template_experiment_close), data);
  gtk_window_present (GTK_WINDOW (dlg));
  loop = g_main_loop_new (NULL, 0);
  g_signal_connect_swapped (dlg, "destroy", G_CALLBACK (g_main_loop_quit),
                            loop);
  g_main_loop_run (loop);
  g_main_loop_unref (loop);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_template_experiment: end\n");
#endif
}

static void
window_set_variable ()
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  g_signal_handler_block (window->entry_variable, window->id_variable_label);
  gtk_entry_set_text (window->entry_variable, input->variable[i].name);
  g_signal_handler_unblock (window->entry_variable, window->id_variable_label);
  gtk_spin_button_set_value (window->spin_min, input->variable[i].rangemin);
  gtk_spin_button_set_value (window->spin_max, input->variable[i].rangemax);
  if (input->variable[i].rangeminabs != -G_MAXDOUBLE)
    {
      gtk_spin_button_set_value (window->spin_minabs,
                                 input->variable[i].rangeminabs);
      gtk_check_button_set_active (window->check_minabs, 1);
    }
  else
    {
      gtk_spin_button_set_value (window->spin_minabs, -G_MAXDOUBLE);
      gtk_check_button_set_active (window->check_minabs, 0);
    }
  if (input->variable[i].rangemaxabs != G_MAXDOUBLE)
    {
      gtk_spin_button_set_value (window->spin_maxabs,
                                 input->variable[i].rangemaxabs);
      gtk_check_button_set_active (window->check_maxabs, 1);
    }
  else
    {
      gtk_spin_button_set_value (window->spin_maxabs, G_MAXDOUBLE);
      gtk_check_button_set_active (window->check_maxabs, 0);
    }
  gtk_spin_button_set_value (window->spin_precision,
                             input->variable[i].precision);
  gtk_spin_button_set_value (window->spin_steps, (gdouble) input->nsteps);
  gtk_spin_button_set_value (window->spin_final_steps,
                             (gdouble) input->nfinal_steps);
  if (input->nsteps)
    gtk_spin_button_set_value (window->spin_step, input->variable[i].step);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_variable: precision[%u]=%u\n", i,
           input->variable[i].precision);
#endif
  switch (window_get_algorithm ())
    {
    case ALGORITHM_SWEEP:
    case ALGORITHM_ORTHOGONAL:
      gtk_spin_button_set_value (window->spin_sweeps,
                                 (gdouble) input->variable[i].nsweeps);
#if DEBUG_INTERFACE
      fprintf (stderr, "window_set_variable: nsweeps[%u]=%u\n", i,
               input->variable[i].nsweeps);
#endif
      break;
    case ALGORITHM_GENETIC:
      gtk_spin_button_set_value (window->spin_bits,
                                 (gdouble) input->variable[i].nbits);
#if DEBUG_INTERFACE
      fprintf (stderr, "window_set_variable: nbits[%u]=%u\n", i,
               input->variable[i].nbits);
#endif
      break;
    }
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_set_variable: end\n");
#endif
}

static void
window_remove_variable ()
{
  unsigned int i, j;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_remove_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  g_signal_handler_block (window->combo_variable, window->id_variable);
  gtk_combo_box_text_remove (window->combo_variable, i);
  g_signal_handler_unblock (window->combo_variable, window->id_variable);
  xmlFree (input->variable[i].name);
  --input->nvariables;
  for (j = i; j < input->nvariables; ++j)
    memcpy (input->variable + j, input->variable + j + 1, sizeof (Variable));
  j = input->nvariables - 1;
  if (i > j)
    i = j;
  g_signal_handler_block (window->entry_variable, window->id_variable_label);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
  g_signal_handler_unblock (window->entry_variable, window->id_variable_label);
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_remove_variable: end\n");
#endif
}

static void
window_add_variable ()
{
  unsigned int i, j;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_add_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  g_signal_handler_block (window->combo_variable, window->id_variable);
  gtk_combo_box_text_insert_text (window->combo_variable, i,
                                  input->variable[i].name);
  g_signal_handler_unblock (window->combo_variable, window->id_variable);
  input->variable = (Variable *) g_realloc
    (input->variable, (input->nvariables + 1) * sizeof (Variable));
  for (j = input->nvariables - 1; j > i; --j)
    memcpy (input->variable + j + 1, input->variable + j, sizeof (Variable));
  memcpy (input->variable + j + 1, input->variable + j, sizeof (Variable));
  if (input->type == INPUT_TYPE_XML)
    input->variable[j + 1].name
      = (char *) xmlStrdup ((xmlChar *) input->variable[j].name);
  else
    input->variable[j + 1].name = g_strdup (input->variable[j].name);
  ++input->nvariables;
  g_signal_handler_block (window->entry_variable, window->id_variable_label);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i + 1);
  g_signal_handler_unblock (window->entry_variable, window->id_variable_label);
  window_update ();
#if DEBUG_INTERFACE
  fprintf (stderr, "window_add_variable: end\n");
#endif
}

static void
window_label_variable ()
{
  unsigned int i;
  const char *buffer;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_label_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  buffer = gtk_entry_get_text (window->entry_variable);
  g_signal_handler_block (window->combo_variable, window->id_variable);
  gtk_combo_box_text_remove (window->combo_variable, i);
  gtk_combo_box_text_insert_text (window->combo_variable, i, buffer);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
  g_signal_handler_unblock (window->combo_variable, window->id_variable);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_label_variable: end\n");
#endif
}

static void
window_precision_variable ()
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_precision_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  input->variable[i].precision
    = (unsigned int) gtk_spin_button_get_value_as_int (window->spin_precision);
  gtk_spin_button_set_digits (window->spin_min, input->variable[i].precision);
  gtk_spin_button_set_digits (window->spin_max, input->variable[i].precision);
  gtk_spin_button_set_digits (window->spin_minabs,
                              input->variable[i].precision);
  gtk_spin_button_set_digits (window->spin_maxabs,
                              input->variable[i].precision);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_precision_variable: end\n");
#endif
}

static void
window_rangemin_variable ()
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangemin_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  input->variable[i].rangemin = gtk_spin_button_get_value (window->spin_min);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangemin_variable: end\n");
#endif
}

static void
window_rangemax_variable ()
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangemax_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  input->variable[i].rangemax = gtk_spin_button_get_value (window->spin_max);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangemax_variable: end\n");
#endif
}

static void
window_rangeminabs_variable ()
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangeminabs_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  input->variable[i].rangeminabs
    = gtk_spin_button_get_value (window->spin_minabs);
```

```
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangeminabs_variable: end\n");
#endif
}

static void
window_rangemaxabs_variable ()
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangemaxabs_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  input->variable[i].rangemaxabs
    = gtk_spin_button_get_value (window->spin_maxabs);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_rangemaxabs_variable: end\n");
#endif
}

static void
window_step_variable ()
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_step_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  input->variable[i].step = gtk_spin_button_get_value (window->spin_step);
#if DEBUG_INTERFACE
  fprintf (stderr, "window_step_variable: end\n");
#endif
}

static void
window_update_variable ()
{
  int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_update_variable: start\n");
#endif
  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
  if (i < 0)
    i = 0;
  switch (window_get_algorithm ())
    {
    case ALGORITHM_SWEEP:
    case ALGORITHM_ORTHOGONAL:
      input->variable[i].nsweeps
        = gtk_spin_button_get_value_as_int (window->spin_sweeps);
#if DEBUG_INTERFACE
      fprintf (stderr, "window_update_variable: nsweeps[%d]=%u\n", i,
               input->variable[i].nsweeps);
#endif
      break;
    case ALGORITHM_GENETIC:
      input->variable[i].nbits
        = gtk_spin_button_get_value_as_int (window->spin_bits);
#if DEBUG_INTERFACE
      fprintf (stderr, "window_update_variable: nbits[%d]=%u\n", i,
               input->variable[i].nbits);
#endif
    }
#if DEBUG_INTERFACE
  fprintf (stderr, "window_update_variable: end\n");
#endif
}

static int
window_read (char *filename)
{
  unsigned int i;
#if DEBUG_INTERFACE
  fprintf (stderr, "window_read: start\n");
  fprintf (stderr, "window_read: file name=%s\n", filename);
#endif

  // Reading new input file
  input_free ();
  input->result = input->variables = NULL;
  if (!input_open (filename))
    {
#if DEBUG_INTERFACE
      fprintf (stderr, "window_read: end\n");
#endif
      return 0;
    }

  // Setting GTK+ widgets data
  gtk_entry_set_text (window->entry_result, input->result);
  gtk_entry_set_text (window->entry_variables, input->variables);
  gtk_button_set_label (window->button_simulator, input->simulator);
  gtk_check_button_set_active (window->check_evaluator,
                               (size_t) input->evaluator);
  if (input->evaluator)
    gtk_button_set_label (window->button_evaluator, input->evaluator);
  gtk_check_button_set_active (window->check_cleaner, (size_t) input->cleaner);
  if (input->cleaner)
    gtk_button_set_label (window->button_cleaner, input->cleaner);
  gtk_check_button_set_active (window->button_algorithm[input->algorithm],
                               TRUE);
  switch (input->algorithm)
    {
    case ALGORITHM_MONTE_CARLO:
      gtk_spin_button_set_value (window->spin_simulations,
                                 (gdouble) input->nsimulations);
      // fallthrough
    case ALGORITHM_SWEEP:
    case ALGORITHM_ORTHOGONAL:
      gtk_spin_button_set_value (window->spin_iterations,
                                 (gdouble) input->niterations);
      gtk_spin_button_set_value (window->spin_bests, (gdouble) input->nbest);
      gtk_spin_button_set_value (window->spin_tolerance, input->tolerance);
      gtk_check_button_set_active (window->check_climbing, input->nsteps);
      if (input->nsteps)
        {
          gtk_check_button_set_active
            (window->button_climbing[input->climbing], TRUE);
          gtk_spin_button_set_value (window->spin_steps,
                                     (gdouble) input->nsteps);
          gtk_spin_button_set_value (window->spin_final_steps,
                                     (gdouble) input->nfinal_steps);
          gtk_spin_button_set_value (window->spin_relaxation,
                                     (gdouble) input->relaxation);
          switch (input->climbing)
            {
            case CLIMBING_METHOD_RANDOM:
              gtk_spin_button_set_value (window->spin_estimates,
                                         (gdouble) input->nestimates);
            }
        }
      break;
    default:
      gtk_spin_button_set_value (window->spin_population,
                                 (gdouble) input->nsimulations);
      gtk_spin_button_set_value (window->spin_generations,
                                 (gdouble) input->niterations);
      gtk_spin_button_set_value (window->spin_mutation, input->mutation_ratio);
      gtk_spin_button_set_value (window->spin_reproduction,
                                 input->reproduction_ratio);
      gtk_spin_button_set_value (window->spin_adaptation,
                                 input->adaptation_ratio);
    }
  gtk_check_button_set_active (window->button_norm[input->norm], TRUE);
  gtk_spin_button_set_value (window->spin_p, input->p);
  gtk_spin_button_set_value (window->spin_threshold, input->threshold);
  g_signal_handler_block (window->combo_experiment, window->id_experiment);
  gtk_combo_box_text_remove_all (window->combo_experiment);
  for (i = 0; i < input->nexperiments; ++i)
    gtk_combo_box_text_append_text (window->combo_experiment,
                                    input->experiment[i].name);
  g_signal_handler_unblock (window->combo_experiment, window->id_experiment);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
  g_signal_handler_block (window->combo_variable, window->id_variable);
  g_signal_handler_block (window->entry_variable, window->id_variable_label);
  gtk_combo_box_text_remove_all (window->combo_variable);
  for (i = 0; i < input->nvariables; ++i)
    gtk_combo_box_text_append_text (window->combo_variable,
                                    input->variable[i].name);
  g_signal_handler_unblock (window->entry_variable, window->id_variable_label);
  g_signal_handler_unblock (window->combo_variable, window->id_variable);
  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
  window_set_variable ();
  window_update ();

#if DEBUG_INTERFACE
  fprintf (stderr, "window_read: end\n");
#endif
  return 1;
}

static void
dialog_open_close (GtkFileChooserDialog * dlg,
                   int response_id)
```

```
{
  char *buffer, *directory, *name;
  GFile *file;

#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_open_close: start\n");
#endif

  // Saving a backup of the current input file
  directory = g_strdup (input->directory);
  name = g_strdup (input->name);

  // If OK saving
  if (response_id == GTK_RESPONSE_OK)
    {

      // Traying to open the input file
      file = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (dlg));
      buffer = g_file_get_path (file);
#if DEBUG_INTERFACE
      fprintf (stderr, "dialog_open_close: file name=%s\n", buffer);
#endif
      if (!window_read (buffer))
        {
#if DEBUG_INTERFACE
          fprintf (stderr, "dialog_open_close: error reading input file\n");
#endif
          g_free (buffer);

          // Reading backup file on error
          buffer = g_build_filename (directory, name, NULL);
          input->result = input->variables = NULL;
          if (!input_open (buffer))
            {

              // Closing on backup file reading error
#if DEBUG_INTERFACE
              fprintf (stderr,
                       "dialog_open_close: error reading backup file\n");
#endif
            }
        }
      g_free (buffer);
      g_object_unref (file);
    }

  // Freeing and closing
  g_free (name);
  g_free (directory);
  gtk_window_destroy (GTK_WINDOW (dlg));

#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_open_close: end\n");
#endif

}

static void
window_open ()
{
  GtkFileChooserDialog *dlg;
  GtkFileFilter *filter;

#if DEBUG_INTERFACE
  fprintf (stderr, "window_open: start\n");
#endif

  // Opening dialog
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Open input file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_OPEN,
                                 _("_Cancel"), GTK_RESPONSE_CANCEL,
                                 _("_OK"), GTK_RESPONSE_OK, NULL);

  // Adding XML filter
  filter = (GtkFileFilter *) gtk_file_filter_new ();
  gtk_file_filter_set_name (filter, "XML");
  gtk_file_filter_add_pattern (filter, "*.xml");
  gtk_file_filter_add_pattern (filter, "*.XML");
  gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter);

  // Adding JSON filter
  filter = (GtkFileFilter *) gtk_file_filter_new ();
  gtk_file_filter_set_name (filter, "JSON");
  gtk_file_filter_add_pattern (filter, "*.json");
  gtk_file_filter_add_pattern (filter, "*.JSON");
  gtk_file_filter_add_pattern (filter, "*.js");
  gtk_file_filter_add_pattern (filter, "*.JS");
  gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter);

  // Connecting the close function
  g_signal_connect (dlg, "response", G_CALLBACK (dialog_open_close), NULL);

  // Showing modal dialog
  gtk_window_present (GTK_WINDOW (dlg));

#if DEBUG_INTERFACE
  fprintf (stderr, "window_open: end\n");
#endif
}

static void
dialog_simulator_close (GtkFileChooserDialog * dlg,
                        int response_id)
{
  GFile *file1, *file2;
  char *buffer1, *buffer2;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_simulator_close: start\n");
#endif
  if (response_id == GTK_RESPONSE_OK)
    {
      buffer1 = gtk_file_chooser_get_current_name (GTK_FILE_CHOOSER (dlg));
      file1 = g_file_new_for_path (buffer1);
      file2 = g_file_new_for_path (input->directory);
      buffer2 = g_file_get_relative_path (file2, file1);
      input->simulator = g_strdup (buffer2);
      g_free (buffer2);
      g_object_unref (file2);
      g_object_unref (file1);
      g_free (buffer1);
    }
  gtk_window_destroy (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_simulator_close: end\n");
#endif
}

static void
dialog_simulator ()
{
  GtkFileChooserDialog *dlg;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_simulator: start\n");
#endif
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Open simulator file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_OPEN,
                                 _("_Cancel"), GTK_RESPONSE_CANCEL,
                                 _("_Open"), GTK_RESPONSE_ACCEPT, NULL);
  g_signal_connect (dlg, "response", G_CALLBACK (dialog_simulator_close), NULL);
  gtk_window_present (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_simulator: end\n");
#endif
}

static void
dialog_evaluator_close (GtkFileChooserDialog * dlg,
                        int response_id)
{
  GFile *file1, *file2;
  char *buffer1, *buffer2;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_evaluator_close: start\n");
#endif
  if (response_id == GTK_RESPONSE_OK)
    {
      buffer1 = gtk_file_chooser_get_current_name (GTK_FILE_CHOOSER (dlg));
      file1 = g_file_new_for_path (buffer1);
      file2 = g_file_new_for_path (input->directory);
      buffer2 = g_file_get_relative_path (file2, file1);
      input->evaluator = g_strdup (buffer2);
      g_free (buffer2);
      g_object_unref (file2);
      g_object_unref (file1);
      g_free (buffer1);
    }
  gtk_window_destroy (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_evaluator_close: end\n");
#endif
```

```
}

static void
dialog_evaluator ()
{
  GtkFileChooserDialog *dlg;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_evaluator: start\n");
#endif
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Open evaluator file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_OPEN,
                                 _("_Cancel"), GTK_RESPONSE_CANCEL,
                                 _("_Open"), GTK_RESPONSE_ACCEPT, NULL);
  g_signal_connect (dlg, "response", G_CALLBACK (dialog_evaluator_close), NULL);
  gtk_window_present (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_evaluator: end\n");
#endif
}

static void
dialog_cleaner_close (GtkFileChooserDialog * dlg,
                      int response_id)
{
  GFile *file1, *file2;
  char *buffer1, *buffer2;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_cleaner_close: start\n");
#endif
  if (response_id == GTK_RESPONSE_OK)
    {
      buffer1 = gtk_file_chooser_get_current_name (GTK_FILE_CHOOSER (dlg));
      file1 = g_file_new_for_path (buffer1);
      file2 = g_file_new_for_path (input->directory);
      buffer2 = g_file_get_relative_path (file2, file1);
      input->cleaner = g_strdup (buffer2);
      g_free (buffer2);
      g_object_unref (file2);
      g_object_unref (file1);
      g_free (buffer1);
    }
  gtk_window_destroy (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_cleaner_close: end\n");
#endif
}

static void
dialog_cleaner ()
{
  GtkFileChooserDialog *dlg;
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_cleaner: start\n");
#endif
  dlg = (GtkFileChooserDialog *)
    gtk_file_chooser_dialog_new (_("Open cleaner file"),
                                 window->window,
                                 GTK_FILE_CHOOSER_ACTION_OPEN,
                                 _("_Cancel"), GTK_RESPONSE_CANCEL,
                                 _("_Open"), GTK_RESPONSE_ACCEPT, NULL);
  g_signal_connect (dlg, "response", G_CALLBACK (dialog_cleaner_close), NULL);
  gtk_window_present (GTK_WINDOW (dlg));
#if DEBUG_INTERFACE
  fprintf (stderr, "dialog_cleaner: end\n");
#endif
}

void
window_new (GtkApplication * application)
{
  unsigned int i;
  char *buffer, *buffer2, buffer3[64];
  const char *label_algorithm[NALGORITHMS] = {
    "_Monte-Carlo", _("_Sweep"), _("_Genetic"), _("_Orthogonal")
  };
  const char *tip_algorithm[NALGORITHMS] = {
    _("Monte-Carlo brute force algorithm"),
    _("Sweep brute force algorithm"),
    _("Genetic algorithm"),
    _("Orthogonal sampling brute force algorithm"),
  };
  const char *label_climbing[NCLIMBINGS] = {
    _("_Coordinates climbing"), _("_Random climbing")
  };
  const char *tip_climbing[NCLIMBINGS] = {
    _("Coordinates climbing estimate method"),
    _("Random climbing estimate method")
  };
  const char *label_norm[NNORMS] = { "L2", "L", "Lp", "L1" };
  const char *tip_norm[NNORMS] = {
    _("Euclidean error norm (L2)"),
    _("Maximum error norm (L)"),
    _("P error norm (Lp)"),
    _("Taxicab error norm (L1)")
  };
#if !GTK4
  const char *close = "delete-event";
#else
  const char *close = "close-request";
#endif

#if DEBUG_INTERFACE
  fprintf (stderr, "window_new: start\n");
#endif

  // Creating the window
  window->window = window_parent = main_window
    = (GtkWindow *) gtk_application_window_new (application);

  // Finish when closing the window
  g_signal_connect_swapped (window->window, close,
                            G_CALLBACK (g_application_quit),
                            G_APPLICATION (application));

  // Setting the window title
  gtk_window_set_title (window->window, "MPCOTool");

  // Creating the open button
  window->button_open = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("document-open", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("document-open");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_open),
                               _("Open a case"));
  g_signal_connect (window->button_open, "clicked", window_open, NULL);

  // Creating the save button
  window->button_save = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("document-save", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("document-save");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_save),
                               _("Save the case"));
  g_signal_connect (window->button_save, "clicked", (GCallback) window_save,
                    NULL);

  // Creating the run button
  window->button_run = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("system-run", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("system-run");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_run),
                               _("Run the optimization"));
  g_signal_connect (window->button_run, "clicked", window_run, NULL);

  // Creating the options button
  window->button_options = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("preferences-system", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("preferences-system");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_options),
                               _("Edit the case"));
  g_signal_connect (window->button_options, "clicked", options_new, NULL);

  // Creating the help button
  window->button_help = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("help-browser", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("help-browser");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_help), _("Help"));
  g_signal_connect (window->button_help, "clicked", window_help, NULL);

  // Creating the about button
  window->button_about = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("help-about", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("help-about");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_about), _("About"));
  g_signal_connect (window->button_about, "clicked", window_about, NULL);

  // Creating the exit button
  window->button_exit = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("application-exit", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("application-exit");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_exit), _("Exit"));
  g_signal_connect_swapped (window->button_exit, "clicked",
                            G_CALLBACK (g_application_quit),
                            G_APPLICATION (application));

  // Creating the buttons bar
  window->box_buttons = (GtkBox *) gtk_box_new (GTK_ORIENTATION_HORIZONTAL, 0);
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_open));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_save));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_run));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_options));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_help));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_about));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_exit));

  // Creating the simulator program label and entry
  window->label_simulator = (GtkLabel *) gtk_label_new (_("Simulator program"));
  window->button_simulator = (GtkButton *)
    gtk_button_new_with_mnemonic (_("Simulator program"));
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_simulator),
                               _("Simulator program executable file"));
  gtk_widget_set_hexpand (GTK_WIDGET (window->button_simulator), TRUE);
  g_signal_connect (window->button_simulator, "clicked",
                    G_CALLBACK (dialog_simulator), NULL);

  // Creating the evaluator program label and entry
  window->check_evaluator = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Evaluator program"));
  g_signal_connect (window->check_evaluator, "toggled", window_update, NULL);
  window->button_evaluator = (GtkButton *)
    gtk_button_new_with_mnemonic (_("Evaluator program"));
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->button_evaluator),
     _("Optional evaluator program executable file"));
  g_signal_connect (window->button_evaluator, "clicked",
                    G_CALLBACK (dialog_evaluator), NULL);

  // Creating the cleaner program label and entry
  window->check_cleaner = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Cleaner program"));
  g_signal_connect (window->check_cleaner, "toggled", window_update, NULL);
  window->button_cleaner = (GtkButton *)
    gtk_button_new_with_mnemonic (_("Cleaner program"));
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->button_cleaner),
     _("Optional cleaner program executable file"));
  g_signal_connect (window->button_cleaner, "clicked",
                    G_CALLBACK (dialog_cleaner), NULL);

  // Creating the results files labels and entries
  window->label_result = (GtkLabel *) gtk_label_new (_("Result file"));
  window->entry_result = (GtkEntry *) gtk_entry_new ();
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->entry_result), _("Best results file"));
  window->label_variables = (GtkLabel *) gtk_label_new (_("Variables file"));
  window->entry_variables = (GtkEntry *) gtk_entry_new ();
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->entry_variables), _("All simulated results file"));

  // Creating the files grid and attaching widgets
  window->grid_files = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->label_simulator),
                   0, 0, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->button_simulator),
                   1, 0, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->check_evaluator),
                   0, 1, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->button_evaluator),
                   1, 1, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->check_cleaner),
                        0, 2, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->button_cleaner),
                        1, 2, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->label_result),
                        0, 3, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->entry_result),
                        1, 3, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->label_variables),
                        0, 4, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->entry_variables),
                        1, 4, 1, 1);

  // Creating the algorithm properties
  window->label_simulations = (GtkLabel *) gtk_label_new
    (_("Simulations number"));
  window->spin_simulations
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_simulations),
     _("Number of simulations to perform for each iteration"));
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_simulations), TRUE);
  window->label_iterations = (GtkLabel *)
    gtk_label_new (_("Iterations number"));
  window->spin_iterations
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_iterations), _("Number of iterations"));
  g_signal_connect
    (window->spin_iterations, "value-changed", window_update, NULL);
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_iterations), TRUE);
  window->label_tolerance = (GtkLabel *) gtk_label_new (_("Tolerance"));
  window->spin_tolerance =
    (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_tolerance),
     _("Tolerance to set the variable interval on the next iteration"));
  window->label_bests = (GtkLabel *) gtk_label_new (_("Bests number"));
  window->spin_bests
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_bests),
     _("Number of best simulations used to set the variable interval "
       "on the next iteration"));
  window->label_population
    = (GtkLabel *) gtk_label_new (_("Population number"));
  window->spin_population
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_population),
     _("Number of population for the genetic algorithm"));
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_population), TRUE);
  window->label_generations
    = (GtkLabel *) gtk_label_new (_("Generations number"));
  window->spin_generations
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_generations),
     _("Number of generations for the genetic algorithm"));
  window->label_mutation = (GtkLabel *) gtk_label_new (_("Mutation ratio"));
  window->spin_mutation
    = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_mutation),
     _("Ratio of mutation for the genetic algorithm"));
  window->label_reproduction
    = (GtkLabel *) gtk_label_new (_("Reproduction ratio"));
  window->spin_reproduction
    = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_reproduction),
     _("Ratio of reproduction for the genetic algorithm"));
  window->label_adaptation = (GtkLabel *) gtk_label_new (_("Adaptation ratio"));
  window->spin_adaptation
    = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_adaptation),
     _("Ratio of adaptation for the genetic algorithm"));
  window->label_threshold = (GtkLabel *) gtk_label_new (_("Threshold"));
  window->spin_threshold = (GtkSpinButton *)
    gtk_spin_button_new_with_range (-G_MAXDOUBLE, G_MAXDOUBLE,
                                    precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_threshold),
     _("Threshold in the objective function to finish the simulations"));
  window->scrolled_threshold = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
```

```
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_threshold,
                                 GTK_WIDGET (window->spin_threshold));
//  gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_threshold), TRUE);
//  gtk_widget_set_halign (GTK_WIDGET (window->scrolled_threshold),
//                                 GTK_ALIGN_FILL);

  // Creating the hill climbing method properties
  window->check_climbing = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Hill climbing method"));
  g_signal_connect (window->check_climbing, "toggled", window_update, NULL);
  window->grid_climbing = (GtkGrid *) gtk_grid_new ();
#if !GTK4
  window->button_climbing[0] = (GtkRadioButton *)
    gtk_radio_button_new_with_mnemonic (NULL, label_climbing[0]);
#else
  window->button_climbing[0] = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (label_climbing[0]);
#endif
  gtk_grid_attach (window->grid_climbing,
                   GTK_WIDGET (window->button_climbing[0]), 0, 0, 1, 1);
  g_signal_connect (window->button_climbing[0], "toggled", window_update, NULL);
  for (i = 0; ++i < NCLIMBINGS;)
    {
#if !GTK4
      window->button_climbing[i] = (GtkRadioButton *)
        gtk_radio_button_new_with_mnemonic
        (gtk_radio_button_get_group (window->button_climbing[0]),
         label_climbing[i]);
#else
      window->button_climbing[i] = (GtkCheckButton *)
        gtk_check_button_new_with_mnemonic (label_climbing[i]);
      gtk_check_button_set_group (window->button_climbing[i],
                                  window->button_climbing[0]);
#endif
      gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_climbing[i]),
                                   tip_climbing[i]);
      gtk_grid_attach (window->grid_climbing,
                       GTK_WIDGET (window->button_climbing[i]), 0, i, 1, 1);
      g_signal_connect (window->button_climbing[i], "toggled", window_update,
                        NULL);
    }
  window->label_steps = (GtkLabel *) gtk_label_new (_("Steps number"));
  window->spin_steps = (GtkSpinButton *)
    gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_steps), TRUE);
  window->label_final_steps
    = (GtkLabel *) gtk_label_new (_("Final steps number"));
  window->spin_final_steps = (GtkSpinButton *)
    gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_final_steps), TRUE);
  window->label_estimates
    = (GtkLabel *) gtk_label_new (_("Climbing estimates number"));
  window->spin_estimates = (GtkSpinButton *)
    gtk_spin_button_new_with_range (1., 1.e3, 1.);
  window->label_relaxation
    = (GtkLabel *) gtk_label_new (_("Relaxation parameter"));
  window->spin_relaxation = (GtkSpinButton *)
    gtk_spin_button_new_with_range (0., 2., 0.001);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->label_steps),
                   0, NCLIMBINGS, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->spin_steps),
                   1, NCLIMBINGS, 1, 1);
  gtk_grid_attach (window->grid_climbing,
                   GTK_WIDGET (window->label_final_steps),
                   0, NCLIMBINGS + 1, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->spin_final_steps),
                   1, NCLIMBINGS + 1, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->label_estimates),
                   0, NCLIMBINGS + 2, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->spin_estimates),
                   1, NCLIMBINGS + 2, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->label_relaxation),
                   0, NCLIMBINGS + 3, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->spin_relaxation),
                   1, NCLIMBINGS + 3, 1, 1);

  // Creating the array of algorithms
  window->grid_algorithm = (GtkGrid *) gtk_grid_new ();
#if !GTK4
  window->button_algorithm[0] = (GtkRadioButton *)
    gtk_radio_button_new_with_mnemonic (NULL, label_algorithm[0]);
#else
  window->button_algorithm[0] = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (label_algorithm[0]);
```

```
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[0]),
                               tip_algorithm[0]);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->button_algorithm[0]), 0, 0, 1, 1);
  g_signal_connect (window->button_algorithm[0], "toggled",
                    window_set_algorithm, NULL);
  for (i = 0; ++i < NALGORITHMS;)
    {
#if !GTK4
      window->button_algorithm[i] = (GtkRadioButton *)
        gtk_radio_button_new_with_mnemonic
        (gtk_radio_button_get_group (window->button_algorithm[0]),
         label_algorithm[i]);
#else
      window->button_algorithm[i] = (GtkCheckButton *)
        gtk_check_button_new_with_mnemonic (label_algorithm[i]);
      gtk_check_button_set_group (window->button_algorithm[i],
                                  window->button_algorithm[0]);
#endif
        gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[i]),
                                     tip_algorithm[i]);
      gtk_grid_attach (window->grid_algorithm,
                       GTK_WIDGET (window->button_algorithm[i]), 0, i, 1, 1);
      g_signal_connect (window->button_algorithm[i], "toggled",
                        window_set_algorithm, NULL);
    }
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_simulations),
                   0, NALGORITHMS, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->spin_simulations), 1, NALGORITHMS, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_iterations),
                   0, NALGORITHMS + 1, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_iterations),
                   1, NALGORITHMS + 1, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->label_tolerance),
                   0, NALGORITHMS + 2, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_tolerance),
                   1, NALGORITHMS + 2, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->label_bests),
                   0, NALGORITHMS + 3, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_bests),
                   1, NALGORITHMS + 3, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_population),
                   0, NALGORITHMS + 4, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_population),
                   1, NALGORITHMS + 4, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_generations),
                   0, NALGORITHMS + 5, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->spin_generations),
                   1, NALGORITHMS + 5, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->label_mutation),
                   0, NALGORITHMS + 6, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_mutation),
                   1, NALGORITHMS + 6, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_reproduction),
                   0, NALGORITHMS + 7, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->spin_reproduction),
                   1, NALGORITHMS + 7, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_adaptation),
                   0, NALGORITHMS + 8, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_adaptation),
                   1, NALGORITHMS + 8, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->check_climbing),
                   0, NALGORITHMS + 9, 2, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->grid_climbing),
                   0, NALGORITHMS + 10, 2, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->label_threshold),
                   0, NALGORITHMS + 11, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->scrolled_threshold),
                   1, NALGORITHMS + 11, 1, 1);
  window->frame_algorithm = (GtkFrame *) gtk_frame_new (_("Algorithm"));
  gtk_frame_set_child (window->frame_algorithm,
                       GTK_WIDGET (window->grid_algorithm));

  // Creating the variable widgets
  window->combo_variable = (GtkComboBoxText *) gtk_combo_box_text_new ();
  gtk_widget_set_tooltip_text
```

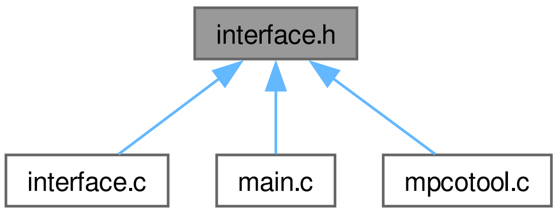
```
    (GTK_WIDGET (window->combo_variable), _("Variables selector"));
  window->id_variable = g_signal_connect
    (window->combo_variable, "changed", window_set_variable, NULL);
#if !GTK4
  window->button_add_variable = (GtkButton *)
    gtk_button_new_from_icon_name ("list-add", GTK_ICON_SIZE_BUTTON);
#else
  window->button_add_variable = (GtkButton *)
    gtk_button_new_from_icon_name ("list-add");
#endif
  g_signal_connect (window->button_add_variable, "clicked", window_add_variable,
                    NULL);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_variable),
                               _("Add variable"));
#if !GTK4
  window->button_remove_variable = (GtkButton *)
    gtk_button_new_from_icon_name ("list-remove", GTK_ICON_SIZE_BUTTON);
#else
  window->button_remove_variable = (GtkButton *)
    gtk_button_new_from_icon_name ("list-remove");
#endif
  g_signal_connect (window->button_remove_variable, "clicked",
                    window_remove_variable, NULL);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_remove_variable),
                               _("Remove variable"));
  window->label_variable = (GtkLabel *) gtk_label_new (_("Name"));
  window->entry_variable = (GtkEntry *) gtk_entry_new ();
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->entry_variable), _("Variable name"));
  gtk_widget_set_hexpand (GTK_WIDGET (window->entry_variable), TRUE);
  window->id_variable_label = g_signal_connect
    (window->entry_variable, "changed", window_label_variable, NULL);
  window->label_min = (GtkLabel *) gtk_label_new (_("Minimum"));
  window->spin_min = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_min), _("Minimum initial value of the variable"));
  window->scrolled_min = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_min,
                                 GTK_WIDGET (window->spin_min));
  g_signal_connect (window->spin_min, "value-changed",
                    window_rangemin_variable, NULL);
  window->label_max = (GtkLabel *) gtk_label_new (_("Maximum"));
  window->spin_max = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_max), _("Maximum initial value of the variable"));
  window->scrolled_max = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_max,
                                 GTK_WIDGET (window->spin_max));
  g_signal_connect (window->spin_max, "value-changed",
                    window_rangemax_variable, NULL);
  window->check_minabs = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Absolute minimum"));
  g_signal_connect (window->check_minabs, "toggled", window_update, NULL);
  window->spin_minabs = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_minabs),
     _("Minimum allowed value of the variable"));
  window->scrolled_minabs = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_minabs,
                                 GTK_WIDGET (window->spin_minabs));
  g_signal_connect (window->spin_minabs, "value-changed",
                    window_rangeminabs_variable, NULL);
  window->check_maxabs = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Absolute maximum"));
  g_signal_connect (window->check_maxabs, "toggled", window_update, NULL);
  window->spin_maxabs = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_maxabs),
      _("Maximum allowed value of the variable"));
  window->scrolled_maxabs = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_maxabs,
                                 GTK_WIDGET (window->spin_maxabs));
  g_signal_connect (window->spin_maxabs, "value-changed",
                    window_rangemaxabs_variable, NULL);
  window->label_precision = (GtkLabel *) gtk_label_new (_("Precision digits"));
  window->spin_precision = (GtkSpinButton *)
    gtk_spin_button_new_with_range (0., (gdouble) DEFAULT_PRECISION, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_precision),
     _("Number of precision floating point digits\n"
       "0 is for integer numbers"));
  g_signal_connect (window->spin_precision, "value-changed",
                    window_precision_variable, NULL);
  window->label_sweeps = (GtkLabel *) gtk_label_new (_("Sweeps number"));
  window->spin_sweeps =
    (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->spin_sweeps),
                               _("Number of steps sweeping the variable"));
  g_signal_connect (window->spin_sweeps, "value-changed",
                    window_update_variable, NULL);
  window->label_bits = (GtkLabel *) gtk_label_new (_("Bits number"));
  window->spin_bits
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_bits),
     _("Number of bits to encode the variable"));
  g_signal_connect
    (window->spin_bits, "value-changed", window_update_variable, NULL);
  window->label_step = (GtkLabel *) gtk_label_new (_("Step size"));
  window->spin_step = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_step),
     _("Initial step size for the hill climbing method"));
  window->scrolled_step = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_step,
                                 GTK_WIDGET (window->spin_step));
  g_signal_connect
    (window->spin_step, "value-changed", window_step_variable, NULL);
  window->grid_variable = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->combo_variable), 0, 0, 2, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->button_add_variable), 2, 0, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->button_remove_variable), 3, 0, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_variable), 0, 1, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->entry_variable), 1, 1, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_min), 0, 2, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_min), 1, 2, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_max), 0, 3, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_max), 1, 3, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->check_minabs), 0, 4, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_minabs), 1, 4, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->check_maxabs), 0, 5, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_maxabs), 1, 5, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_precision), 0, 6, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->spin_precision), 1, 6, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_sweeps), 0, 7, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->spin_sweeps), 1, 7, 3, 1);
  gtk_grid_attach (window->grid_variable,
                    GTK_WIDGET (window->label_bits), 0, 8, 1, 1);
  gtk_grid_attach (window->grid_variable,
                    GTK_WIDGET (window->spin_bits), 1, 8, 3, 1);
  gtk_grid_attach (window->grid_variable,
                    GTK_WIDGET (window->label_step), 0, 9, 1, 1);
  gtk_grid_attach (window->grid_variable,
                    GTK_WIDGET (window->scrolled_step), 1, 9, 3, 1);
  window->frame_variable = (GtkFrame *) gtk_frame_new (_("Variable"));
  gtk_frame_set_child (window->frame_variable,
                        GTK_WIDGET (window->grid_variable));

  // Creating the experiment widgets
  window->combo_experiment = (GtkComboBoxText *) gtk_combo_box_text_new ();
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->combo_experiment),
                               _("Experiment selector"));
  window->id_experiment = g_signal_connect
    (window->combo_experiment, "changed", window_set_experiment, NULL);
#if !GTK4
  window->button_add_experiment = (GtkButton *)
    gtk_button_new_from_icon_name ("list-add", GTK_ICON_SIZE_BUTTON);
#else
  window->button_add_experiment = (GtkButton *)
    gtk_button_new_from_icon_name ("list-add");
#endif
  g_signal_connect
    (window->button_add_experiment, "clicked", window_add_experiment, NULL);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_experiment),
                               _("Add experiment"));
#if !GTK4
  window->button_remove_experiment = (GtkButton *)
    gtk_button_new_from_icon_name ("list-remove", GTK_ICON_SIZE_BUTTON);
#else
  window->button_remove_experiment = (GtkButton *)
    gtk_button_new_from_icon_name ("list-remove");
#endif
  g_signal_connect (window->button_remove_experiment, "clicked",
                    window_remove_experiment, NULL);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_remove_experiment),
                               _("Remove experiment"));
  window->label_experiment
    = (GtkLabel *) gtk_label_new (_("Experimental data file"));
  window->button_experiment = (GtkButton *)
    gtk_button_new_with_mnemonic (_("Experimental data file"));
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_experiment),
                               _("Experimental data file"));
  g_signal_connect (window->button_experiment, "clicked",
                    window_name_experiment, NULL);
  gtk_widget_set_hexpand (GTK_WIDGET (window->button_experiment), TRUE);
  window->label_weight = (GtkLabel *) gtk_label_new (_("Weight"));
  window->spin_weight
    = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_weight),
     _("Weight factor to build the objective function"));
  g_signal_connect
    (window->spin_weight, "value-changed", window_weight_experiment, NULL);
  window->grid_experiment = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->combo_experiment), 0, 0, 2, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->button_add_experiment), 2, 0, 1, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->button_remove_experiment), 3, 0, 1, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->label_experiment), 0, 1, 1, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->button_experiment), 1, 1, 3, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->label_weight), 0, 2, 1, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->spin_weight), 1, 2, 3, 1);
  for (i = 0; i < MAX_NINPUTS; ++i)
    {
      snprintf (buffer3, 64, "%s %u", _("Input template"), i + 1);
      window->check_template[i] = (GtkCheckButton *)
        gtk_check_button_new_with_label (buffer3);
      window->id_template[i]
        = g_signal_connect (window->check_template[i], "toggled",
                            window_inputs_experiment, NULL);
      gtk_grid_attach (window->grid_experiment,
                        GTK_WIDGET (window->check_template[i]), 0, 3 + i, 1, 1);
      window->button_template[i] = (GtkButton *)
        gtk_button_new_with_mnemonic (_("Input template"));

      gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_template[i]),
                                   _("Experimental input template file"));
      window->id_input[i] =
        g_signal_connect_swapped (window->button_template[i], "clicked",
                                  (GCallback) window_template_experiment,
                                  (void *) (size_t) i);
      gtk_grid_attach (window->grid_experiment,
                       GTK_WIDGET (window->button_template[i]), 1, 3 + i, 3, 1);
    }
  window->frame_experiment = (GtkFrame *) gtk_frame_new (_("Experiment"));
  gtk_frame_set_child (window->frame_experiment,
                       GTK_WIDGET (window->grid_experiment));

  // Creating the error norm widgets
  window->frame_norm = (GtkFrame *) gtk_frame_new (_("Error norm"));
  window->grid_norm = (GtkGrid *) gtk_grid_new ();
  gtk_frame_set_child (window->frame_norm, GTK_WIDGET (window->grid_norm));
#if !GTK4
  window->button_norm[0] = (GtkRadioButton *)
    gtk_radio_button_new_with_mnemonic (NULL, label_norm[0]);
#else
  window->button_norm[0] = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (label_norm[0]);
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[0]),
                               tip_norm[0]);
  gtk_grid_attach (window->grid_norm,
                   GTK_WIDGET (window->button_norm[0]), 0, 0, 1, 1);
  g_signal_connect (window->button_norm[0], "toggled", window_update, NULL);
  for (i = 0; ++i < NNORMS;)
    {
#if !GTK4
      window->button_norm[i] = (GtkRadioButton *)
        gtk_radio_button_new_with_mnemonic
        (gtk_radio_button_get_group (window->button_norm[0]), label_norm[i]);
#else
      window->button_norm[i] = (GtkCheckButton *)
        gtk_check_button_new_with_mnemonic (label_norm[i]);
      gtk_check_button_set_group (window->button_norm[i],
                                  window->button_norm[0]);
#endif
      gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[i]),
                                   tip_norm[i]);
      gtk_grid_attach (window->grid_norm,
                       GTK_WIDGET (window->button_norm[i]), 0, i, 1, 1);
      g_signal_connect (window->button_norm[i], "toggled", window_update, NULL);
    }
  window->label_p = (GtkLabel *) gtk_label_new (_("P parameter"));
  gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->label_p), 1, 1, 1, 1);
  window->spin_p = (GtkSpinButton *)
    gtk_spin_button_new_with_range (-G_MAXDOUBLE, G_MAXDOUBLE, 0.01);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->spin_p),
                               _("P parameter for the P error norm"));
  window->scrolled_p = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_p,
                                 GTK_WIDGET (window->spin_p));
  gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_p), TRUE);
  gtk_widget_set_halign (GTK_WIDGET (window->scrolled_p), GTK_ALIGN_FILL);
  gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->scrolled_p),
                   1, 2, 1, 2);

  // Creating the grid and attaching the widgets to the grid
  window->grid = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (window->grid, GTK_WIDGET (window->box_buttons), 0, 0, 3, 1);
  gtk_grid_attach (window->grid, GTK_WIDGET (window->grid_files), 0, 1, 1, 1);
  gtk_grid_attach (window->grid,
                   GTK_WIDGET (window->frame_algorithm), 0, 2, 1, 1);
  gtk_grid_attach (window->grid,
                   GTK_WIDGET (window->frame_variable), 1, 2, 1, 1);
  gtk_grid_attach (window->grid,
                   GTK_WIDGET (window->frame_experiment), 2, 2, 1, 1);
  gtk_grid_attach (window->grid, GTK_WIDGET (window->frame_norm), 1, 1, 2, 1);
  gtk_window_set_child (window->window, GTK_WIDGET (window->grid));

  // Setting the window logo
  window->logo = gdk_pixbuf_new_from_xpm_data (logo);
#if !GTK4
  gtk_window_set_icon (window->window, window->logo);
#endif

  // Showing the window
#if !GTK4
  gtk_widget_show_all (GTK_WIDGET (window->window));
#else
  gtk_widget_show (GTK_WIDGET (window->window));
```

```
#endif

  // In GTK+ 3.16 and 3.18 the default scrolled size is wrong
#if GTK_MINOR_VERSION >= 16
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_min), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_max), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_minabs), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_maxabs), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_step), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_p), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_threshold), -1, 40);
#endif

  // Reading initial example
  input_new ();
  buffer2 = g_get_current_dir ();
  buffer = g_build_filename (buffer2, "..", "tests", "test1", INPUT_FILE, NULL);
  g_free (buffer2);
  window_read (buffer);
  g_free (buffer);

#if DEBUG_INTERFACE
  fprintf (stderr, "window_new: start\n");
#endif
}
```

4.13 interface.h File Reference

Header file to define the graphical interface functions.

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



Data Structures

- struct Options

  Struct to define the options dialog.
- struct Running

  Struct to define the running dialog.
- struct Window

  Struct to define the main window.

Macros

- #define MAX_LENGTH (DEFAULT_PRECISION + 8)

  Max length of texts allowed in GtkSpinButtons.

Functions

- void window_new (GtkApplication ∗application)

Variables

- Window window [1]

  Window struct to define the main interface window.

4.13.1 Detailed Description

Header file to define the graphical interface functions.

Authors

Javier Burguete.

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Definition in file interface.h.

4.13.2 Macro Definition Documentation

4.13.2.1 MAX_LENGTH

```
#define MAX_LENGTH (DEFAULT_PRECISION + 8)
```

Max length of texts allowed in GtkSpinButtons.

Definition at line 42 of file interface.h.

4.13.3 Function Documentation

4.13.3.1 window_new()

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

Function to open the main window.

Parameters

application	GtkApplication struct.

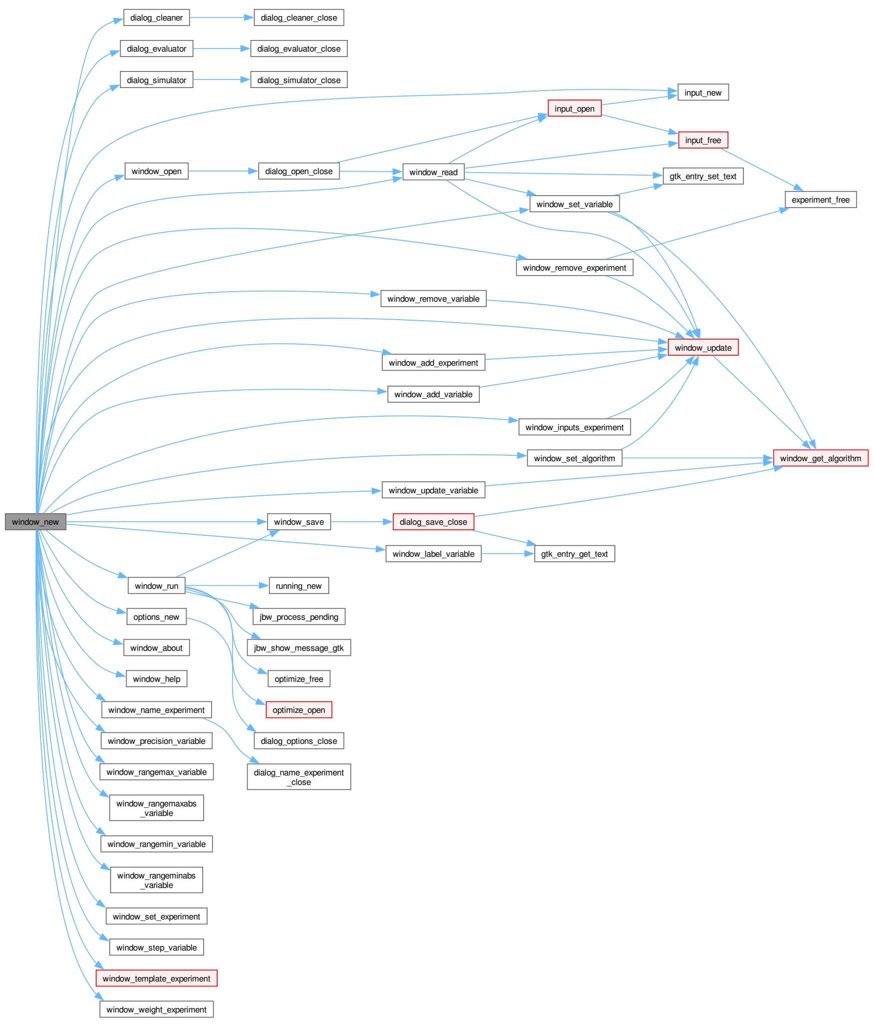
Definition at line 2363 of file interface.c.

```
{
  unsigned int i;
  char *buffer, *buffer2, buffer3[64];
  const char *label_algorithm[NALGORITHMS] = {
    "_Monte-Carlo", _("_Sweep"), _("_Genetic"), _("_Orthogonal")
  };
  const char *tip_algorithm[NALGORITHMS] = {
    _("Monte-Carlo brute force algorithm"),
    _("Sweep brute force algorithm"),
    _("Genetic algorithm"),
    _("Orthogonal sampling brute force algorithm"),
  };
  const char *label_climbing[NCLIMBINGS] = {
    _("_Coordinates climbing"), _("_Random climbing")
  };
  const char *tip_climbing[NCLIMBINGS] = {
    _("Coordinates climbing estimate method"),
    _("Random climbing estimate method")
  };
  const char *label_norm[NNORMS] = { "L2", "L", "Lp", "L1" };
  const char *tip_norm[NNORMS] = {
    _("Euclidean error norm (L2)"),
    _("Maximum error norm (L)"),
    _("P error norm (Lp)"),
    _("Taxicab error norm (L1)")
  };
#if !GTK4
  const char *close = "delete-event";
#else
  const char *close = "close-request";
#endif

#if DEBUG_INTERFACE
  fprintf (stderr, "window_new: start\n");
#endif

  // Creating the window
  window->window = window_parent = main_window
    = (GtkWindow *) gtk_application_window_new (application);

  // Finish when closing the window
  g_signal_connect_swapped (window->window, close,
                            G_CALLBACK (g_application_quit),
                            G_APPLICATION (application));

  // Setting the window title
  gtk_window_set_title (window->window, "MPCOTool");

  // Creating the open button
  window->button_open = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("document-open", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("document-open");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_open),
                               _("Open a case"));
  g_signal_connect (window->button_open, "clicked", window_open, NULL);

  // Creating the save button
  window->button_save = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("document-save", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("document-save");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_save),
                               _("Save the case"));
  g_signal_connect (window->button_save, "clicked", (GCallback) window_save,
                    NULL);

  // Creating the run button
  window->button_run = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("system-run", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("system-run");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_run),
                               _("Run the optimization"));
  g_signal_connect (window->button_run, "clicked", window_run, NULL);

  // Creating the options button
  window->button_options = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("preferences-system", GTK_ICON_SIZE_BUTTON);
```

```
#else
    gtk_button_new_from_icon_name ("preferences-system");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_options),
                               _("Edit the case"));
  g_signal_connect (window->button_options, "clicked", options_new, NULL);

  // Creating the help button
  window->button_help = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("help-browser", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("help-browser");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_help), _("Help"));
  g_signal_connect (window->button_help, "clicked", window_help, NULL);

  // Creating the about button
  window->button_about = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("help-about", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("help-about");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_about), _("About"));
  g_signal_connect (window->button_about, "clicked", window_about, NULL);

  // Creating the exit button
  window->button_exit = (GtkButton *)
#if !GTK4
    gtk_button_new_from_icon_name ("application-exit", GTK_ICON_SIZE_BUTTON);
#else
    gtk_button_new_from_icon_name ("application-exit");
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_exit), _("Exit"));
  g_signal_connect_swapped (window->button_exit, "clicked",
                            G_CALLBACK (g_application_quit),
                            G_APPLICATION (application));

  // Creating the buttons bar
  window->box_buttons = (GtkBox *) gtk_box_new (GTK_ORIENTATION_HORIZONTAL, 0);
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_open));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_save));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_run));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_options));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_help));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_about));
  gtk_box_append (window->box_buttons, GTK_WIDGET (window->button_exit));

  // Creating the simulator program label and entry
  window->label_simulator = (GtkLabel *) gtk_label_new (_("Simulator program"));
  window->button_simulator = (GtkButton *)
    gtk_button_new_with_mnemonic (_("Simulator program"));
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_simulator),
                               _("Simulator program executable file"));
  gtk_widget_set_hexpand (GTK_WIDGET (window->button_simulator), TRUE);
  g_signal_connect (window->button_simulator, "clicked",
                    G_CALLBACK (dialog_simulator), NULL);

  // Creating the evaluator program label and entry
  window->check_evaluator = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Evaluator program"));
  g_signal_connect (window->check_evaluator, "toggled", window_update, NULL);
  window->button_evaluator = (GtkButton *)
    gtk_button_new_with_mnemonic (_("Evaluator program"));
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->button_evaluator),
     _("Optional evaluator program executable file"));
  g_signal_connect (window->button_evaluator, "clicked",
                    G_CALLBACK (dialog_evaluator), NULL);

  // Creating the cleaner program label and entry
  window->check_cleaner = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Cleaner program"));
  g_signal_connect (window->check_cleaner, "toggled", window_update, NULL);
  window->button_cleaner = (GtkButton *)
    gtk_button_new_with_mnemonic (_("Cleaner program"));
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->button_cleaner),
     _("Optional cleaner program executable file"));
  g_signal_connect (window->button_cleaner, "clicked",
                    G_CALLBACK (dialog_cleaner), NULL);

  // Creating the results files labels and entries
  window->label_result = (GtkLabel *) gtk_label_new (_("Result file"));
  window->entry_result = (GtkEntry *) gtk_entry_new ();
  gtk_widget_set_tooltip_text
```

```
    (GTK_WIDGET (window->entry_result), _("Best results file"));
  window->label_variables = (GtkLabel *) gtk_label_new (_("Variables file"));
  window->entry_variables = (GtkEntry *) gtk_entry_new ();
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->entry_variables), _("All simulated results file"));

  // Creating the files grid and attaching widgets
  window->grid_files = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->label_simulator),
                   0, 0, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->button_simulator),
                   1, 0, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->check_evaluator),
                   0, 1, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->button_evaluator),
                   1, 1, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->check_cleaner),
                   0, 2, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->button_cleaner),
                   1, 2, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->label_result),
                   0, 3, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->entry_result),
                   1, 3, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->label_variables),
                   0, 4, 1, 1);
  gtk_grid_attach (window->grid_files, GTK_WIDGET (window->entry_variables),
                   1, 4, 1, 1);

  // Creating the algorithm properties
  window->label_simulations = (GtkLabel *) gtk_label_new
    (_("Simulations number"));
  window->spin_simulations
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_simulations),
     _("Number of simulations to perform for each iteration"));
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_simulations), TRUE);
  window->label_iterations = (GtkLabel *)
    gtk_label_new (_("Iterations number"));
  window->spin_iterations
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_iterations), _("Number of iterations"));
  g_signal_connect
    (window->spin_iterations, "value-changed", window_update, NULL);
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_iterations), TRUE);
  window->label_tolerance = (GtkLabel *) gtk_label_new (_("Tolerance"));
  window->spin_tolerance =
    (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_tolerance),
     _("Tolerance to set the variable interval on the next iteration"));
  window->label_bests = (GtkLabel *) gtk_label_new (_("Bests number"));
  window->spin_bests
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_bests),
     _("Number of best simulations used to set the variable interval "
       "on the next iteration"));
  window->label_population
    = (GtkLabel *) gtk_label_new (_("Population number"));
  window->spin_population
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_population),
     _("Number of population for the genetic algorithm"));
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_population), TRUE);
  window->label_generations
    = (GtkLabel *) gtk_label_new (_("Generations number"));
  window->spin_generations
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_generations),
     _("Number of generations for the genetic algorithm"));
  window->label_mutation = (GtkLabel *) gtk_label_new (_("Mutation ratio"));
  window->spin_mutation
    = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_mutation),
     _("Ratio of mutation for the genetic algorithm"));
  window->label_reproduction
    = (GtkLabel *) gtk_label_new (_("Reproduction ratio"));
  window->spin_reproduction
    = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_reproduction),
    _("Ratio of reproduction for the genetic algorithm"));
  window->label_adaptation = (GtkLabel *) gtk_label_new (_("Adaptation ratio"));
  window->spin_adaptation
    = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_adaptation),
     _("Ratio of adaptation for the genetic algorithm"));
  window->label_threshold = (GtkLabel *) gtk_label_new (_("Threshold"));
  window->spin_threshold = (GtkSpinButton *)
    gtk_spin_button_new_with_range (-G_MAXDOUBLE, G_MAXDOUBLE,
                                    precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_threshold),
     _("Threshold in the objective function to finish the simulations"));
  window->scrolled_threshold = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_threshold,
                                 GTK_WIDGET (window->spin_threshold));
//  gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_threshold), TRUE);
//  gtk_widget_set_halign (GTK_WIDGET (window->scrolled_threshold),
//                                 GTK_ALIGN_FILL);

  // Creating the hill climbing method properties
  window->check_climbing = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Hill climbing method"));
  g_signal_connect (window->check_climbing, "toggled", window_update, NULL);
  window->grid_climbing = (GtkGrid *) gtk_grid_new ();
#if !GTK4
  window->button_climbing[0] = (GtkRadioButton *)
    gtk_radio_button_new_with_mnemonic (NULL, label_climbing[0]);
#else
  window->button_climbing[0] = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (label_climbing[0]);
#endif
  gtk_grid_attach (window->grid_climbing,
                   GTK_WIDGET (window->button_climbing[0]), 0, 0, 1, 1);
  g_signal_connect (window->button_climbing[0], "toggled", window_update, NULL);
  for (i = 0; ++i < NCLIMBINGS;)
    {
#if !GTK4
      window->button_climbing[i] = (GtkRadioButton *)
        gtk_radio_button_new_with_mnemonic
        (gtk_radio_button_get_group (window->button_climbing[0]),
         label_climbing[i]);
#else
      window->button_climbing[i] = (GtkCheckButton *)
        gtk_check_button_new_with_mnemonic (label_climbing[i]);
      gtk_check_button_set_group (window->button_climbing[i],
                                  window->button_climbing[0]);
#endif
      gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_climbing[i]),
                                   tip_climbing[i]);
      gtk_grid_attach (window->grid_climbing,
                       GTK_WIDGET (window->button_climbing[i]), 0, i, 1, 1);
      g_signal_connect (window->button_climbing[i], "toggled", window_update,
                        NULL);
    }
  window->label_steps = (GtkLabel *) gtk_label_new (_("Steps number"));
  window->spin_steps = (GtkSpinButton *)
    gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_steps), TRUE);
  window->label_final_steps
    = (GtkLabel *) gtk_label_new (_("Final steps number"));
  window->spin_final_steps = (GtkSpinButton *)
    gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_hexpand (GTK_WIDGET (window->spin_final_steps), TRUE);
  window->label_estimates
    = (GtkLabel *) gtk_label_new (_("Climbing estimates number"));
  window->spin_estimates = (GtkSpinButton *)
    gtk_spin_button_new_with_range (1., 1.e3, 1.);
  window->label_relaxation
    = (GtkLabel *) gtk_label_new (_("Relaxation parameter"));
  window->spin_relaxation = (GtkSpinButton *)
    gtk_spin_button_new_with_range (0., 2., 0.001);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->label_steps),
                   0, NCLIMBINGS, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->spin_steps),
                   1, NCLIMBINGS, 1, 1);
  gtk_grid_attach (window->grid_climbing,
                   GTK_WIDGET (window->label_final_steps),
                   0, NCLIMBINGS + 1, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->spin_final_steps),
                   1, NCLIMBINGS + 1, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->label_estimates),
                   0, NCLIMBINGS + 2, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->spin_estimates),
                   1, NCLIMBINGS + 2, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->label_relaxation),
                   0, NCLIMBINGS + 3, 1, 1);
  gtk_grid_attach (window->grid_climbing, GTK_WIDGET (window->spin_relaxation),
                   1, NCLIMBINGS + 3, 1, 1);

  // Creating the array of algorithms
  window->grid_algorithm = (GtkGrid *) gtk_grid_new ();
#if !GTK4
  window->button_algorithm[0] = (GtkRadioButton *)
    gtk_radio_button_new_with_mnemonic (NULL, label_algorithm[0]);
#else
  window->button_algorithm[0] = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (label_algorithm[0]);
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[0]),
                               tip_algorithm[0]);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->button_algorithm[0]), 0, 0, 1, 1);
  g_signal_connect (window->button_algorithm[0], "toggled",
                    window_set_algorithm, NULL);
  for (i = 0; ++i < NALGORITHMS;)
    {
#if !GTK4
      window->button_algorithm[i] = (GtkRadioButton *)
        gtk_radio_button_new_with_mnemonic
        (gtk_radio_button_get_group (window->button_algorithm[0]),
         label_algorithm[i]);
#else
      window->button_algorithm[i] = (GtkCheckButton *)
        gtk_check_button_new_with_mnemonic (label_algorithm[i]);
      gtk_check_button_set_group (window->button_algorithm[i],
                                  window->button_algorithm[0]),
#endif
        gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[i]),
                                     tip_algorithm[i]);
      gtk_grid_attach (window->grid_algorithm,
                       GTK_WIDGET (window->button_algorithm[i]), 0, i, 1, 1);
      g_signal_connect (window->button_algorithm[i], "toggled",
                        window_set_algorithm, NULL);
    }
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_simulations),
                   0, NALGORITHMS, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->spin_simulations), 1, NALGORITHMS, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_iterations),
                   0, NALGORITHMS + 1, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_iterations),
                   1, NALGORITHMS + 1, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->label_tolerance),
                   0, NALGORITHMS + 2, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_tolerance),
                   1, NALGORITHMS + 2, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->label_bests),
                   0, NALGORITHMS + 3, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_bests),
                   1, NALGORITHMS + 3, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_population),
                   0, NALGORITHMS + 4, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_population),
                   1, NALGORITHMS + 4, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_generations),
                   0, NALGORITHMS + 5, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->spin_generations),
                   1, NALGORITHMS + 5, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->label_mutation),
                   0, NALGORITHMS + 6, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_mutation),
                   1, NALGORITHMS + 6, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_reproduction),
                   0, NALGORITHMS + 7, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->spin_reproduction),
                   1, NALGORITHMS + 7, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                   GTK_WIDGET (window->label_adaptation),
                   0, NALGORITHMS + 8, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->spin_adaptation),
                     1, NALGORITHMS + 8, 1, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->check_climbing),
                     0, NALGORITHMS + 9, 2, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->grid_climbing),
                     0, NALGORITHMS + 10, 2, 1);
  gtk_grid_attach (window->grid_algorithm, GTK_WIDGET (window->label_threshold),
                     0, NALGORITHMS + 11, 1, 1);
  gtk_grid_attach (window->grid_algorithm,
                     GTK_WIDGET (window->scrolled_threshold),
                     1, NALGORITHMS + 11, 1, 1);
  window->frame_algorithm = (GtkFrame *) gtk_frame_new (_("Algorithm"));
  gtk_frame_set_child (window->frame_algorithm,
                         GTK_WIDGET (window->grid_algorithm));

  // Creating the variable widgets
  window->combo_variable = (GtkComboBoxText *) gtk_combo_box_text_new ();
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->combo_variable), _("Variables selector"));
  window->id_variable = g_signal_connect
    (window->combo_variable, "changed", window_set_variable, NULL);
#if !GTK4
  window->button_add_variable = (GtkButton *)
    gtk_button_new_from_icon_name ("list-add", GTK_ICON_SIZE_BUTTON);
#else
  window->button_add_variable = (GtkButton *)
    gtk_button_new_from_icon_name ("list-add");
#endif
  g_signal_connect (window->button_add_variable, "clicked", window_add_variable,
                      NULL);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_variable),
                                _("Add variable"));
#if !GTK4
  window->button_remove_variable = (GtkButton *)
    gtk_button_new_from_icon_name ("list-remove", GTK_ICON_SIZE_BUTTON);
#else
  window->button_remove_variable = (GtkButton *)
    gtk_button_new_from_icon_name ("list-remove");
#endif
  g_signal_connect (window->button_remove_variable, "clicked",
                      window_remove_variable, NULL);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_remove_variable),
                                _("Remove variable"));
  window->label_variable = (GtkLabel *) gtk_label_new (_("Name"));
  window->entry_variable = (GtkEntry *) gtk_entry_new ();
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->entry_variable), _("Variable name"));
  gtk_widget_set_hexpand (GTK_WIDGET (window->entry_variable), TRUE);
  window->id_variable_label = g_signal_connect
    (window->entry_variable, "changed", window_label_variable, NULL);
  window->label_min = (GtkLabel *) gtk_label_new (_("Minimum"));
  window->spin_min = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_min), _("Minimum initial value of the variable"));
  window->scrolled_min = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_min,
                                   GTK_WIDGET (window->spin_min));
  g_signal_connect (window->spin_min, "value-changed",
                      window_rangemin_variable, NULL);
  window->label_max = (GtkLabel *) gtk_label_new (_("Maximum"));
  window->spin_max = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_max), _("Maximum initial value of the variable"));
  window->scrolled_max = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_max,
                                   GTK_WIDGET (window->spin_max));
  g_signal_connect (window->spin_max, "value-changed",
                      window_rangemax_variable, NULL);
  window->check_minabs = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Absolute minimum"));
  g_signal_connect (window->check_minabs, "toggled", window_update, NULL);
  window->spin_minabs = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_minabs),
     _("Minimum allowed value of the variable"));
  window->scrolled_minabs = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_minabs,
                                 GTK_WIDGET (window->spin_minabs));
  g_signal_connect (window->spin_minabs, "value-changed",
                    window_rangeminabs_variable, NULL);
  window->check_maxabs = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (_("_Absolute maximum"));
  g_signal_connect (window->check_maxabs, "toggled", window_update, NULL);
  window->spin_maxabs = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_maxabs),
     _("Maximum allowed value of the variable"));
  window->scrolled_maxabs = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_maxabs,
                                 GTK_WIDGET (window->spin_maxabs));
  g_signal_connect (window->spin_maxabs, "value-changed",
                    window_rangemaxabs_variable, NULL);
  window->label_precision = (GtkLabel *) gtk_label_new (_("Precision digits"));
  window->spin_precision = (GtkSpinButton *)
    gtk_spin_button_new_with_range (0., (gdouble) DEFAULT_PRECISION, 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_precision),
     _("Number of precision floating point digits\n"
       "0 is for integer numbers"));
  g_signal_connect (window->spin_precision, "value-changed",
                    window_precision_variable, NULL);
  window->label_sweeps = (GtkLabel *) gtk_label_new (_("Sweeps number"));
  window->spin_sweeps =
    (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->spin_sweeps),
                               _("Number of steps sweeping the variable"));
  g_signal_connect (window->spin_sweeps, "value-changed",
                    window_update_variable, NULL);
  window->label_bits = (GtkLabel *) gtk_label_new (_("Bits number"));
  window->spin_bits
    = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_bits),
     _("Number of bits to encode the variable"));
  g_signal_connect
    (window->spin_bits, "value-changed", window_update_variable, NULL);
  window->label_step = (GtkLabel *) gtk_label_new (_("Step size"));
  window->spin_step = (GtkSpinButton *) gtk_spin_button_new_with_range
    (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_step),
     _("Initial step size for the hill climbing method"));
  window->scrolled_step = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_step,
                                 GTK_WIDGET (window->spin_step));
  g_signal_connect
    (window->spin_step, "value-changed", window_step_variable, NULL);
  window->grid_variable = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->combo_variable), 0, 0, 2, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->button_add_variable), 2, 0, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->button_remove_variable), 3, 0, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_variable), 0, 1, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->entry_variable), 1, 1, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_min), 0, 2, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_min), 1, 2, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_max), 0, 3, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_max), 1, 3, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->check_minabs), 0, 4, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_minabs), 1, 4, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->check_maxabs), 0, 5, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_maxabs), 1, 5, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_precision), 0, 6, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->spin_precision), 1, 6, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_sweeps), 0, 7, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->spin_sweeps), 1, 7, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_bits), 0, 8, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->spin_bits), 1, 8, 3, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->label_step), 0, 9, 1, 1);
  gtk_grid_attach (window->grid_variable,
                   GTK_WIDGET (window->scrolled_step), 1, 9, 3, 1);
  window->frame_variable = (GtkFrame *) gtk_frame_new (_("Variable"));
  gtk_frame_set_child (window->frame_variable,
                       GTK_WIDGET (window->grid_variable));

  // Creating the experiment widgets
  window->combo_experiment = (GtkComboBoxText *) gtk_combo_box_text_new ();
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->combo_experiment),
                               _("Experiment selector"));
  window->id_experiment = g_signal_connect
    (window->combo_experiment, "changed", window_set_experiment, NULL);
#if !GTK4
  window->button_add_experiment = (GtkButton *)
    gtk_button_new_from_icon_name ("list-add", GTK_ICON_SIZE_BUTTON);
#else
  window->button_add_experiment = (GtkButton *)
    gtk_button_new_from_icon_name ("list-add");
#endif
  g_signal_connect
    (window->button_add_experiment, "clicked", window_add_experiment, NULL);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_experiment),
                               _("Add experiment"));
#if !GTK4
  window->button_remove_experiment = (GtkButton *)
    gtk_button_new_from_icon_name ("list-remove", GTK_ICON_SIZE_BUTTON);
#else
  window->button_remove_experiment = (GtkButton *)
    gtk_button_new_from_icon_name ("list-remove");
#endif
  g_signal_connect (window->button_remove_experiment, "clicked",
                    window_remove_experiment, NULL);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_remove_experiment),
                               _("Remove experiment"));
  window->label_experiment
    = (GtkLabel *) gtk_label_new (_("Experimental data file"));
  window->button_experiment = (GtkButton *)
    gtk_button_new_with_mnemonic (_("Experimental data file"));
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_experiment),
                               _("Experimental data file"));
  g_signal_connect (window->button_experiment, "clicked",
                    window_name_experiment, NULL);
  gtk_widget_set_hexpand (GTK_WIDGET (window->button_experiment), TRUE);
  window->label_weight = (GtkLabel *) gtk_label_new (_("Weight"));
  window->spin_weight
    = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
  gtk_widget_set_tooltip_text
    (GTK_WIDGET (window->spin_weight),
     _("Weight factor to build the objective function"));
  g_signal_connect
    (window->spin_weight, "value-changed", window_weight_experiment, NULL);
  window->grid_experiment = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (window->grid_experiment,
                   GTK_WIDGET (window->combo_experiment), 0, 0, 2, 1);
  gtk_grid_attach (window->grid_experiment,
                   GTK_WIDGET (window->button_add_experiment), 2, 0, 1, 1);
  gtk_grid_attach (window->grid_experiment,
                   GTK_WIDGET (window->button_remove_experiment), 3, 0, 1, 1);
  gtk_grid_attach (window->grid_experiment,
                   GTK_WIDGET (window->label_experiment), 0, 1, 1, 1);
  gtk_grid_attach (window->grid_experiment,
                   GTK_WIDGET (window->button_experiment), 1, 1, 3, 1);
  gtk_grid_attach (window->grid_experiment,
                   GTK_WIDGET (window->label_weight), 0, 2, 1, 1);
  gtk_grid_attach (window->grid_experiment,
                    GTK_WIDGET (window->spin_weight), 1, 2, 3, 1);
  for (i = 0; i < MAX_NINPUTS; ++i)
    {
      snprintf (buffer3, 64, "%s %u", _("Input template"), i + 1);
      window->check_template[i] = (GtkCheckButton *)
        gtk_check_button_new_with_label (buffer3);
      window->id_template[i]
        = g_signal_connect (window->check_template[i], "toggled",
                            window_inputs_experiment, NULL);
      gtk_grid_attach (window->grid_experiment,
                       GTK_WIDGET (window->check_template[i]), 0, 3 + i, 1, 1);
      window->button_template[i] = (GtkButton *)
        gtk_button_new_with_mnemonic (_("Input template"));

      gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_template[i]),
                                   _("Experimental input template file"));
      window->id_input[i] =
        g_signal_connect_swapped (window->button_template[i], "clicked",
                                  (GCallback) window_template_experiment,
                                  (void *) (size_t) i);
      gtk_grid_attach (window->grid_experiment,
                       GTK_WIDGET (window->button_template[i]), 1, 3 + i, 3, 1);
    }
  window->frame_experiment = (GtkFrame *) gtk_frame_new (_("Experiment"));
  gtk_frame_set_child (window->frame_experiment,
                       GTK_WIDGET (window->grid_experiment));

  // Creating the error norm widgets
  window->frame_norm = (GtkFrame *) gtk_frame_new (_("Error norm"));
  window->grid_norm = (GtkGrid *) gtk_grid_new ();
  gtk_frame_set_child (window->frame_norm, GTK_WIDGET (window->grid_norm));
#if !GTK4
  window->button_norm[0] = (GtkRadioButton *)
    gtk_radio_button_new_with_mnemonic (NULL, label_norm[0]);
#else
  window->button_norm[0] = (GtkCheckButton *)
    gtk_check_button_new_with_mnemonic (label_norm[0]);
#endif
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[0]),
                               tip_norm[0]);
  gtk_grid_attach (window->grid_norm,
                   GTK_WIDGET (window->button_norm[0]), 0, 0, 1, 1);
  g_signal_connect (window->button_norm[0], "toggled", window_update, NULL);
  for (i = 0; ++i < NNORMS;)
    {
#if !GTK4
      window->button_norm[i] = (GtkRadioButton *)
        gtk_radio_button_new_with_mnemonic
        (gtk_radio_button_get_group (window->button_norm[0]), label_norm[i]);
#else
      window->button_norm[i] = (GtkCheckButton *)
        gtk_check_button_new_with_mnemonic (label_norm[i]);
      gtk_check_button_set_group (window->button_norm[i],
                                  window->button_norm[0]);
#endif
      gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[i]),
                                   tip_norm[i]);
      gtk_grid_attach (window->grid_norm,
                       GTK_WIDGET (window->button_norm[i]), 0, i, 1, 1);
      g_signal_connect (window->button_norm[i], "toggled", window_update, NULL);
    }
  window->label_p = (GtkLabel *) gtk_label_new (_("P parameter"));
  gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->label_p), 1, 1, 1, 1);
  window->spin_p = (GtkSpinButton *)
    gtk_spin_button_new_with_range (-G_MAXDOUBLE, G_MAXDOUBLE, 0.01);
  gtk_widget_set_tooltip_text (GTK_WIDGET (window->spin_p),
                               _("P parameter for the P error norm"));
  window->scrolled_p = (GtkScrolledWindow *)
#if !GTK4
    gtk_scrolled_window_new (NULL, NULL);
#else
    gtk_scrolled_window_new ();
#endif
  gtk_scrolled_window_set_child (window->scrolled_p,
                                 GTK_WIDGET (window->spin_p));
  gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_p), TRUE);
  gtk_widget_set_halign (GTK_WIDGET (window->scrolled_p), GTK_ALIGN_FILL);
  gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->scrolled_p),
                   1, 2, 1, 2);

  // Creating the grid and attaching the widgets to the grid
  window->grid = (GtkGrid *) gtk_grid_new ();
  gtk_grid_attach (window->grid, GTK_WIDGET (window->box_buttons), 0, 0, 3, 1);
  gtk_grid_attach (window->grid, GTK_WIDGET (window->grid_files), 0, 1, 1, 1);
  gtk_grid_attach (window->grid,
                   GTK_WIDGET (window->frame_algorithm), 0, 2, 1, 1);
  gtk_grid_attach (window->grid,
                        GTK_WIDGET (window->frame_variable), 1, 2, 1, 1);
  gtk_grid_attach (window->grid,
                        GTK_WIDGET (window->frame_experiment), 2, 2, 1, 1);
  gtk_grid_attach (window->grid, GTK_WIDGET (window->frame_norm), 1, 1, 2, 1);
  gtk_window_set_child (window->window, GTK_WIDGET (window->grid));

  // Setting the window logo
  window->logo = gdk_pixbuf_new_from_xpm_data (logo);
#if !GTK4
  gtk_window_set_icon (window->window, window->logo);
#endif

  // Showing the window
#if !GTK4
  gtk_widget_show_all (GTK_WIDGET (window->window));
#else
  gtk_widget_show (GTK_WIDGET (window->window));
#endif

  // In GTK+ 3.16 and 3.18 the default scrolled size is wrong
#if GTK_MINOR_VERSION >= 16
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_min), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_max), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_minabs), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_maxabs), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_step), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_p), -1, 40);
  gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_threshold), -1, 40);
#endif

  // Reading initial example
  input_new ();
  buffer2 = g_get_current_dir ();
  buffer = g_build_filename (buffer2, "..", "tests", "test1", INPUT_FILE, NULL);
  g_free (buffer2);
  window_read (buffer);
  g_free (buffer);

#if DEBUG_INTERFACE
  fprintf (stderr, "window_new: start\n");
#endif
}
```

Here is the call graph for this function:



4.13.4 Variable Documentation

4.13.4.1 window

```
Window window[1] [extern]
```

Window struct to define the main interface window.

Definition at line 81 of file interface.c.

4.14 interface.h

Go to the documentation of this file.

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

```

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IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#ifndef INTERFACE__H
#define INTERFACE__H 1

#define MAX_LENGTH (DEFAULT_PRECISION + 8)

typedef struct
{
  GtkDialog *dialog;
  GtkGrid *grid;
  GtkLabel *label_seed;
  GtkSpinButton *spin_seed;
  GtkLabel *label_threads;
  GtkSpinButton *spin_threads;
  GtkLabel *label_climbing;
  GtkSpinButton *spin_climbing;
} Options;

typedef struct
{
  GtkDialog *dialog;
  GtkLabel *label;
  GtkSpinner *spinner;
  GtkGrid *grid;
} Running;

typedef struct
{
  GtkWindow *window;
  GtkGrid *grid;
  GtkBox *box_buttons;
  GtkButton *button_open;
  GtkButton *button_save;
  GtkButton *button_run;
  GtkButton *button_options;
  GtkButton *button_help;
  GtkButton *button_about;
  GtkButton *button_exit;
  GtkGrid *grid_files;
  GtkLabel *label_simulator;
  GtkButton *button_simulator;
  GtkCheckButton *check_evaluator;
  GtkButton *button_evaluator;
  GtkCheckButton *check_cleaner;
  GtkButton *button_cleaner;
  GtkLabel *label_result;
  GtkEntry *entry_result;
  GtkLabel *label_variables;
  GtkEntry *entry_variables;
  GtkFrame *frame_norm;
  GtkGrid *grid_norm;
#if !GTK4
  GtkRadioButton *button_norm[NNORMS];
#else
  GtkCheckButton *button_norm[NNORMS];
#endif
  GtkLabel *label_p;
  GtkSpinButton *spin_p;
  GtkScrolledWindow *scrolled_p;
  GtkFrame *frame_algorithm;
  GtkGrid *grid_algorithm;
```
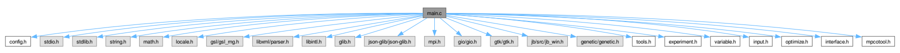

```
#if !GTK4
  GtkRadioButton *button_algorithm[NALGORITHMS];
#else
  GtkCheckButton *button_algorithm[NALGORITHMS];
#endif
  GtkLabel *label_simulations;
  GtkSpinButton *spin_simulations;
  GtkLabel *label_iterations;
  GtkSpinButton *spin_iterations;
  GtkLabel *label_tolerance;
  GtkSpinButton *spin_tolerance;
  GtkLabel *label_bests;
  GtkSpinButton *spin_bests;
  GtkLabel *label_population;
  GtkSpinButton *spin_population;
  GtkLabel *label_generations;
  GtkSpinButton *spin_generations;
  GtkLabel *label_mutation;
  GtkSpinButton *spin_mutation;
  GtkLabel *label_reproduction;
  GtkSpinButton *spin_reproduction;
  GtkLabel *label_adaptation;
  GtkSpinButton *spin_adaptation;
  GtkCheckButton *check_climbing;
  GtkGrid *grid_climbing;
#if !GTK4
  GtkRadioButton *button_climbing[NCLIMBINGS];
#else
  GtkCheckButton *button_climbing[NCLIMBINGS];
#endif
  GtkLabel *label_steps;
  GtkSpinButton *spin_steps;
  GtkLabel *label_final_steps;
  GtkSpinButton *spin_final_steps;
  GtkLabel *label_estimates;
  GtkSpinButton *spin_estimates;
  GtkLabel *label_relaxation;
  GtkSpinButton *spin_relaxation;
  GtkLabel *label_threshold;
  GtkSpinButton *spin_threshold;
  GtkScrolledWindow *scrolled_threshold;
  GtkFrame *frame_variable;
  GtkGrid *grid_variable;
  GtkComboBoxText *combo_variable;
  GtkButton *button_add_variable;
  GtkButton *button_remove_variable;
  GtkLabel *label_variable;
  GtkEntry *entry_variable;
  GtkLabel *label_min;
  GtkSpinButton *spin_min;
  GtkScrolledWindow *scrolled_min;
  GtkLabel *label_max;
  GtkSpinButton *spin_max;
  GtkScrolledWindow *scrolled_max;
  GtkCheckButton *check_minabs;
  GtkSpinButton *spin_minabs;
  GtkScrolledWindow *scrolled_minabs;
  GtkCheckButton *check_maxabs;
  GtkSpinButton *spin_maxabs;
  GtkScrolledWindow *scrolled_maxabs;
  GtkLabel *label_precision;
  GtkSpinButton *spin_precision;
  GtkLabel *label_sweeps;
  GtkSpinButton *spin_sweeps;
  GtkLabel *label_bits;
  GtkSpinButton *spin_bits;
  GtkLabel *label_step;
  GtkSpinButton *spin_step;
  GtkScrolledWindow *scrolled_step;
  GtkFrame *frame_experiment;
  GtkGrid *grid_experiment;
  GtkComboBoxText *combo_experiment;
  GtkButton *button_add_experiment;
  GtkButton *button_remove_experiment;
  GtkLabel *label_experiment;
  GtkButton *button_experiment;
  GtkLabel *label_weight;
  GtkSpinButton *spin_weight;
  GtkCheckButton *check_template[MAX_NINPUTS];
  GtkButton *button_template[MAX_NINPUTS];
  GdkPixbuf *logo;
  Experiment *experiment;
  Variable *variable;
  char *application_directory;
  gulong id_experiment;
  gulong id_experiment_name;
  gulong id_variable;
  gulong id_variable_label;
  gulong id_template[MAX_NINPUTS];
  gulong id_input[MAX_NINPUTS];
  unsigned int nexperiments;
  unsigned int nvariables;
} Window;

// Global variables
extern Window window[1];

// Public functions
void window_new (GtkApplication * application);

#endif
```

4.15 main.c File Reference

Main source file.

```
#include "config.h"
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <math.h>
#include <locale.h>
#include <gsl/gsl_rng.h>
#include <libxml/parser.h>
#include <libintl.h>
#include <glib.h>
#include <json-glib/json-glib.h>
#include <mpi.h>
#include <gio/gio.h>
#include <gtk/gtk.h>
#include "jb/src/jb_win.h"
#include "genetic/genetic.h"
#include "tools.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"
#include "optimize.h"
#include "interface.h"
#include "mpcotool.h"
```

Include dependency graph for main.c:



Macros

- #define JBW 2

Functions

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

4.15.1 Detailed Description

Main source file.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file main.c.

4.15.2 Macro Definition Documentation

4.15.2.1 JBW

```
#define JBW 2
```

Definition at line 59 of file main.c.

4.15.3 Function Documentation

4.15.3.1 main()

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

Main function

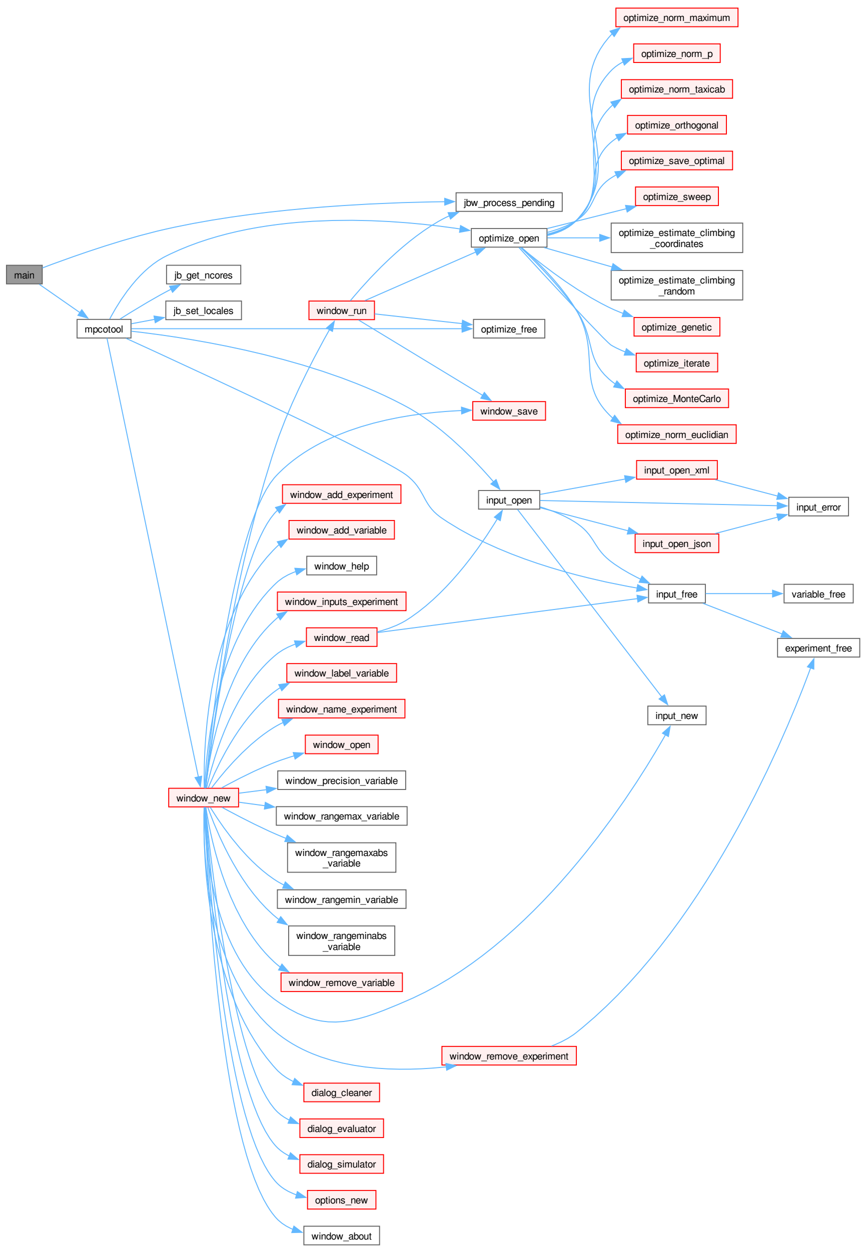
Returns

0 on succes, error code (>0) on error.

Definition at line 81 of file main.c.

```
{
#if HAVE_GTK
  show_pending = jbw_process_pending;
#endif
  jbw_init (&argn, &argc);
  return mpcotool (argn, argc);
}
```

Here is the call graph for this function:



4.16 main.c

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#define _GNU_SOURCE
#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>
#ifdef G_OS_WIN32
#include <windows.h>
#endif
#if HAVE_MPI
#include <mpi.h>
#endif
#if HAVE_GTK
#include <gio/gio.h>
#include <gtk/gtk.h>
#define JBW 2
#else
#define JBW 1
#endif
#include "jb/src/jb_win.h"
#include "genetic/genetic.h"
#include "tools.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"
#include "optimize.h"
#if HAVE_GTK
#include "interface.h"
#endif
#include "mpcotool.h"

int
main (int argn, char **argc)
{
#if HAVE_GTK
  show_pending = jbw_process_pending;
#endif
  jbw_init (&argn, &argc);
  return mpcotool (argn, argc);
}
```

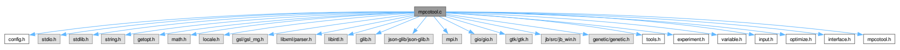
4.17 mpcotool.c File Reference

Main function source file.

```
#include "config.h"
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <getopt.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 "jb/src/jb_win.h"
#include "genetic/genetic.h"
#include "tools.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"
#include "optimize.h"
#include "interface.h"
#include "mpcotool.h"
```

Include dependency graph for mpcotool.c:



Macros

- #define DEBUG_MPCOTOOL 1

  Macro to debug main functions.

Functions

- int mpcotool (int argn, char ∗∗argc)

4.17.1 Detailed Description

Main function source file.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file mpcotool.c.

4.17.2 Macro Definition Documentation

4.17.2.1 DEBUG_MPCOTOOL

```
#define DEBUG_MPCOTOOL 1
```

Macro to debug main functions.

Definition at line 73 of file mpcotool.c.

4.17.3 Function Documentation

4.17.3.1 mpcotool()

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

Main function.

Returns

0 on success, >0 on error.

Parameters

argn	Arguments number.
argc	Arguments pointer.

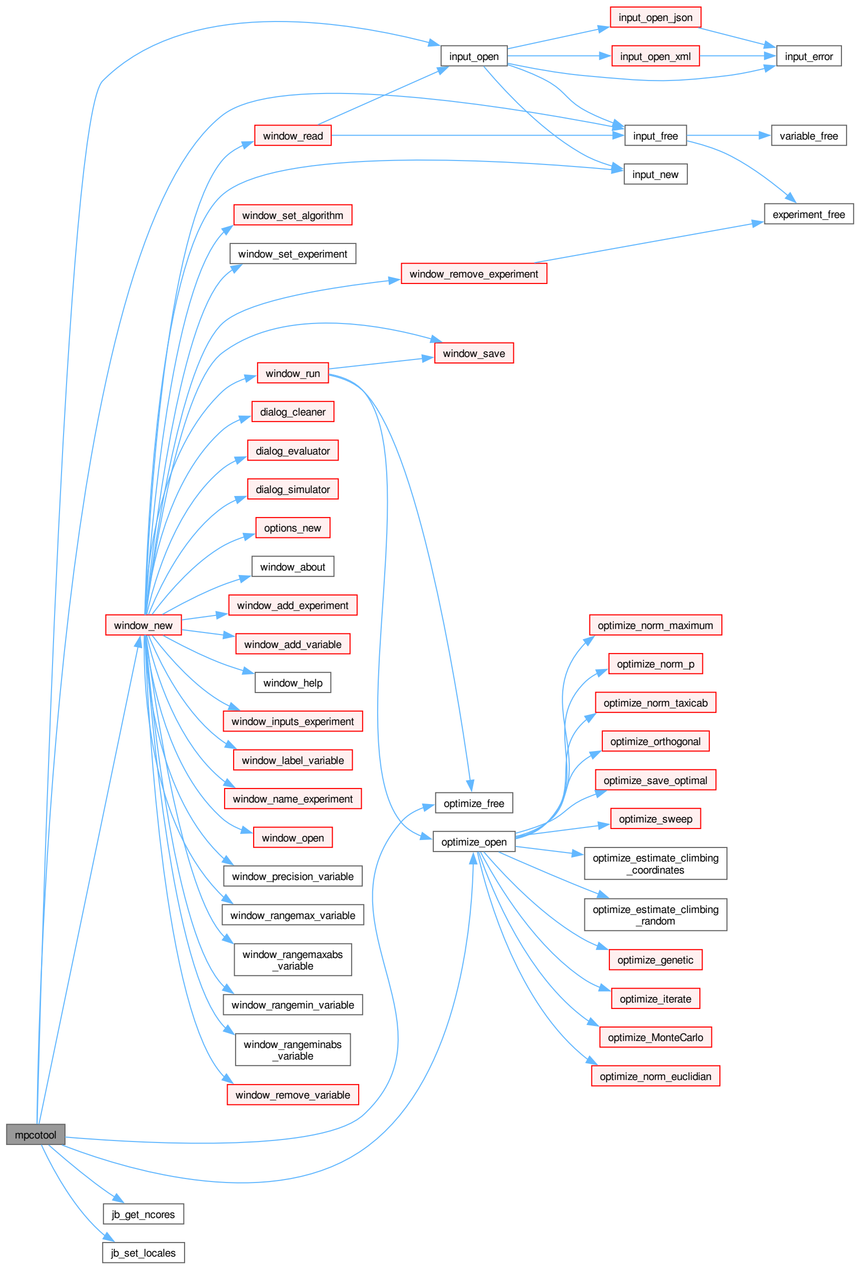
Definition at line 81 of file mpcotool.c.

```
{
  const struct option options[] = {
    {"seed", required_argument, NULL, 's'},
    {"nthreads", required_argument, NULL, 't'},
    {NULL, 0, NULL, 0}
  };
#if HAVE_GTK
  GtkApplication *application;
#endif
  int o, option_index;

  // Starting pseudo-random numbers generator
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: starting pseudo-random numbers generator\n");
#endif
  optimize->rng = gsl_rng_alloc (gsl_rng_taus2);

  // Allowing spaces in the XML data file
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: allowing spaces in the XML data file\n");
#endif
  xmlKeepBlanksDefault (0);

  // Starting MPI
#if HAVE_MPI
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: starting MPI\n");
#endif
  MPI_Init (&argn, &argc);
  MPI_Comm_size (MPI_COMM_WORLD, &ntasks);
  MPI_Comm_rank (MPI_COMM_WORLD, &optimize->mpi_rank);
  printf ("rank=%d tasks=%d\n", optimize->mpi_rank, ntasks);
#else
```

```
  ntasks = 1;
#endif

  // Getting threads number and pseudo-random numbers generator seed
  nthreads_climbing = nthreads = jb_get_ncores ();
  optimize->seed = DEFAULT_RANDOM_SEED;

  // Parsing command line arguments
  while (1)
    {
      o = getopt_long (argn, argc, "s:t:", options, &option_index);
      if (o == -1)
        break;
      switch (o)
        {
        case 's':
          optimize->seed = atol (optarg);
          break;
        case 't':
          nthreads_climbing = nthreads = atoi (optarg);
          break;
        default:
          printf ("%s\n%s\n", _("ERROR!"), _("Unknown option"));
          return 1;
        }
    }
  argn -= optind;

  // Resetting result and variables file names
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: resetting result and variables file names\n");
#endif
  input->result = input->variables = NULL;

#if HAVE_GTK

  // Setting local language and international floating point numbers notation
  jb_set_locales (PROGRAM_INTERFACE, LOCALE_DIR, "", "C");

  // Initing GTK+
  window->application_directory = g_get_current_dir ();
  gtk_disable_setlocale ();
  application = gtk_application_new ("es.csic.eead.auladei.sprinkler",
                                     G_APPLICATION_DEFAULT_FLAGS);
  g_signal_connect (application, "activate", G_CALLBACK (window_new), NULL);

  // Opening the main window
  g_application_run (G_APPLICATION (application), 0, NULL);

  // Freeing memory
  input_free ();
  gtk_window_destroy (window->window);
  g_object_unref (application);
  g_free (window->application_directory);

#else

  // Checking syntax
  if (argn < 1 || argn > 3)
    {
      printf ("The syntax is:\n"
              "./mpcotoolbin [-nthreads x] [-seed s] data_file [result_file] "
              "[variables_file]\n");
      return 2;
    }
  if (argn > 1)
    input->result = (char *) xmlStrdup ((xmlChar *) argc[optind + 1]);
  if (argn == 2)
    input->variables = (char *) xmlStrdup ((xmlChar *) argc[optind + 2]);

  // Making optimization
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: making optimization\n");
#endif
  if (input_open (argc[optind]))
    optimize_open ();

  // Freeing memory
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: freeing memory and closing\n");
#endif
  optimize_free ();

#endif

  // Closing MPI
#if HAVE_MPI
```

```
  MPI_Finalize ();
#endif

  // Freeing memory
  gsl_rng_free (optimize->rng);

  // Closing
  return 0;
}
```

Here is the call graph for this function:



4.18 mpcotool.c

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#define _GNU_SOURCE
#include "config.h"
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <getopt.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>
#ifdef G_OS_WIN32
#include <windows.h>
#endif
#if HAVE_MPI
#include <mpi.h>
#endif
#if HAVE_GTK
#include <gio/gio.h>
#include <gtk/gtk.h>
#endif
#include "jb/src/jb_win.h"
#include "genetic/genetic.h"
#include "tools.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"
#include "optimize.h"
#if HAVE_GTK
#include "interface.h"
#endif
#include "mpcotool.h"

#define DEBUG_MPCOTOOL 1

int
mpcotool (int argn,
          char **argc)
{
  const struct option options[] = {
    {"seed", required_argument, NULL, 's'},
    {"nthreads", required_argument, NULL, 't'},
    {NULL, 0, NULL, 0}
  };
#if HAVE_GTK
  GtkApplication *application;
#endif
  int o, option_index;

  // Starting pseudo-random numbers generator
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: starting pseudo-random numbers generator\n");
#endif
  optimize->rng = gsl_rng_alloc (gsl_rng_taus2);

  // Allowing spaces in the XML data file
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: allowing spaces in the XML data file\n");
#endif
  xmlKeepBlanksDefault (0);

  // Starting MPI
#if HAVE_MPI
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: starting MPI\n");
#endif
  MPI_Init (&argn, &argc);
  MPI_Comm_size (MPI_COMM_WORLD, &ntasks);
  MPI_Comm_rank (MPI_COMM_WORLD, &optimize->mpi_rank);
  printf ("rank=%d tasks=%d\n", optimize->mpi_rank, ntasks);
#else
  ntasks = 1;
#endif

  // Getting threads number and pseudo-random numbers generator seed
  nthreads_climbing = nthreads = jb_get_ncores ();
  optimize->seed = DEFAULT_RANDOM_SEED;

  // Parsing command line arguments
  while (1)
    {
      o = getopt_long (argn, argc, "s:t:", options, &option_index);
      if (o == -1)
        break;
      switch (o)
        {
        case 's':
          optimize->seed = atol (optarg);
          break;
        case 't':
          nthreads_climbing = nthreads = atoi (optarg);
          break;
        default:
          printf ("%s\n%s\n", _("ERROR!"), _("Unknown option"));
          return 1;
        }
    }
  argn -= optind;

  // Resetting result and variables file names
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: resetting result and variables file names\n");
#endif
  input->result = input->variables = NULL;

#if HAVE_GTK

  // Setting local language and international floating point numbers notation
  jb_set_locales (PROGRAM_INTERFACE, LOCALE_DIR, "", "C");

  // Initing GTK+
  window->application_directory = g_get_current_dir ();
  gtk_disable_setlocale ();
  application = gtk_application_new ("es.csic.eead.auladei.sprinkler",
                                     G_APPLICATION_DEFAULT_FLAGS);
  g_signal_connect (application, "activate", G_CALLBACK (window_new), NULL);

  // Opening the main window
  g_application_run (G_APPLICATION (application), 0, NULL);

  // Freeing memory
  input_free ();
  gtk_window_destroy (window->window);
  g_object_unref (application);
  g_free (window->application_directory);

#else

  // Checking syntax
  if (argn < 1 || argn > 3)
    {
      printf ("The syntax is:\n"
              "./mpcotoolbin [-nthreads x] [-seed s] data_file [result_file] "
              "[variables_file]\n");
      return 2;
    }
  if (argn > 1)
    input->result = (char *) xmlStrdup ((xmlChar *) argc[optind + 1]);
  if (argn == 2)
    input->variables = (char *) xmlStrdup ((xmlChar *) argc[optind + 2]);

  // Making optimization
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: making optimization\n");
#endif
  if (input_open (argc[optind]))
    optimize_open ();

  // Freeing memory
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: freeing memory and closing\n");
#endif
  optimize_free ();

#endif

  // Closing MPI
#if HAVE_MPI
  MPI_Finalize ();
#endif

  // Freeing memory
  gsl_rng_free (optimize->rng);

  // Closing
  return 0;
}
```
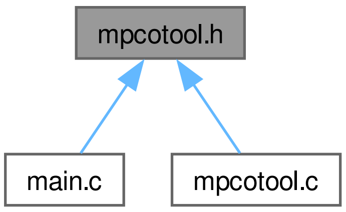

4.19 mpcotool.h File Reference

Main function header file.

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



Functions

- int mpcotool (int argn, char ∗∗argc)

4.19.1 Detailed Description

Main function header file.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file mpcotool.h.

4.19.2 Function Documentation

4.19.2.1 mpcotool()

```
int mpcotool (
              int argn,
              char ** argc )  [extern]
```

Main function.

Returns

0 on success, >0 on error.

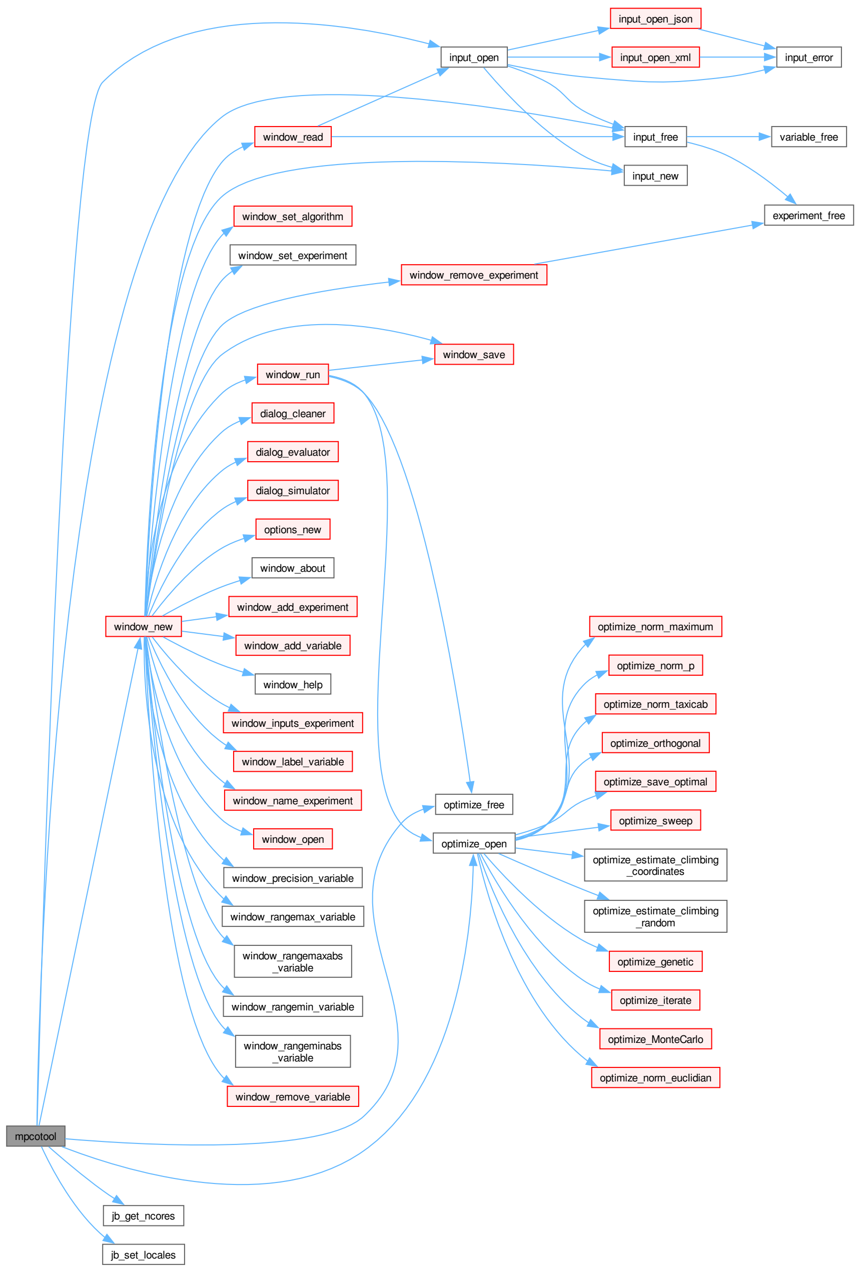
Parameters

argn	Arguments number.
argc	Arguments pointer.

Definition at line 81 of file mpcotool.c.

```
{
  const struct option options[] = {
    {"seed", required_argument, NULL, 's'},
    {"nthreads", required_argument, NULL, 't'},
    {NULL, 0, NULL, 0}
  };
#if HAVE_GTK
  GtkApplication *application;
#endif
  int o, option_index;

  // Starting pseudo-random numbers generator
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: starting pseudo-random numbers generator\n");
#endif
  optimize->rng = gsl_rng_alloc (gsl_rng_taus2);

  // Allowing spaces in the XML data file
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: allowing spaces in the XML data file\n");
#endif
  xmlKeepBlanksDefault (0);

  // Starting MPI
#if HAVE_MPI
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: starting MPI\n");
#endif
  MPI_Init (&argn, &argc);
  MPI_Comm_size (MPI_COMM_WORLD, &ntasks);
  MPI_Comm_rank (MPI_COMM_WORLD, &optimize->mpi_rank);
  printf ("rank=%d tasks=%d\n", optimize->mpi_rank, ntasks);
#else
  ntasks = 1;
#endif

  // Getting threads number and pseudo-random numbers generator seed
  nthreads_climbing = nthreads = jb_get_ncores ();
  optimize->seed = DEFAULT_RANDOM_SEED;

  // Parsing command line arguments
  while (1)
    {
      o = getopt_long (argn, argc, "s:t:", options, &option_index);
      if (o == -1)
        break;
      switch (o)
        {
        case 's':
          optimize->seed = atol (optarg);
          break;
        case 't':
          nthreads_climbing = nthreads = atoi (optarg);
          break;
        default:
          printf ("%s\n%s\n", _("ERROR!"), _("Unknown option"));
          return 1;
        }
    }
  argn -= optind;

  // Resetting result and variables file names
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: resetting result and variables file names\n");
#endif
  input->result = input->variables = NULL;

#if HAVE_GTK

  // Setting local language and international floating point numbers notation
  jb_set_locales (PROGRAM_INTERFACE, LOCALE_DIR, "", "C");

  // Initing GTK+
  window->application_directory = g_get_current_dir ();
  gtk_disable_setlocale ();
  application = gtk_application_new ("es.csic.eead.auladei.sprinkler",
                                     G_APPLICATION_DEFAULT_FLAGS);
  g_signal_connect (application, "activate", G_CALLBACK (window_new), NULL);

  // Opening the main window
  g_application_run (G_APPLICATION (application), 0, NULL);

  // Freeing memory
  input_free ();
  gtk_window_destroy (window->window);
  g_object_unref (application);
  g_free (window->application_directory);

#else

  // Checking syntax
  if (argn < 1 || argn > 3)
    {
      printf ("The syntax is:\n"
              "./mpcotoolbin [-nthreads x] [-seed s] data_file [result_file] "
              "[variables_file]\n");
      return 2;
    }
  if (argn > 1)
    input->result = (char *) xmlStrdup ((xmlChar *) argc[optind + 1]);
  if (argn == 2)
    input->variables = (char *) xmlStrdup ((xmlChar *) argc[optind + 2]);

  // Making optimization
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: making optimization\n");
#endif
  if (input_open (argc[optind]))
    optimize_open ();

  // Freeing memory
#if DEBUG_MPCOTOOL
  fprintf (stderr, "mpcotool: freeing memory and closing\n");
#endif
  optimize_free ();

#endif

  // Closing MPI
#if HAVE_MPI
  MPI_Finalize ();
#endif

  // Freeing memory
  gsl_rng_free (optimize->rng);

  // Closing
  return 0;
}
```

Here is the call graph for this function:



4.20 mpcotool.h

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#ifndef MPCOTOOL__H
#define MPCOTOOL__H 1

extern int mpcotool (int argn, char **argc);

#endif
```
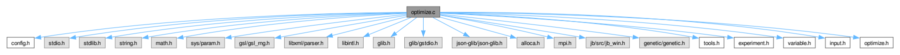

4.21 optimize.c File Reference

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 "jb/src/jb_win.h"
#include "genetic/genetic.h"
#include "tools.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"
#include "optimize.h"
```

Include dependency graph for optimize.c:



Macros

- #define DEBUG_OPTIMIZE 0

Macro to debug optimize functions.

- #define CP "cp"

  Macro to define the shell copy command.

- #define RM "rm"

  Macro to define the shell remove command.

Functions

- static void optimize_input (unsigned int simulation, char ∗input, GMappedFile ∗stencil)
- static double optimize_parse (unsigned int simulation, unsigned int experiment)
- static double optimize_norm_euclidian (unsigned int simulation)
- static double optimize_norm_maximum (unsigned int simulation)
- static double optimize_norm_p (unsigned int simulation)
- static double optimize_norm_taxicab (unsigned int simulation)
- static void optimize_print ()
- static void optimize_save_variables (unsigned int simulation, double error)
- static void optimize_best (unsigned int simulation, double value)
- static void optimize_sequential ()
- static void ∗ optimize_thread (ParallelData ∗data)
- static void optimize_merge (unsigned int nsaveds, unsigned int ∗simulation_best, double ∗error_best)
- static void optimize_synchronise ()
- static void optimize_sweep ()
- static void optimize_MonteCarlo ()
- static void optimize_orthogonal ()
- static void optimize_best_climbing (unsigned int simulation, double value)
- static void optimize_climbing_sequential (unsigned int simulation)
- static void ∗ optimize_climbing_thread (ParallelData ∗data)
- static double optimize_estimate_climbing_random (unsigned int variable, unsigned int estimate)
- static double optimize_estimate_climbing_coordinates (unsigned int variable, unsigned int estimate)
- static void optimize_step_climbing (unsigned int simulation)
- static void optimize_climbing_best ()
- static void optimize_climbing (unsigned int nsteps)
- static double optimize_genetic_objective (**Entity** ∗entity)
- static void optimize_genetic ()
- static void optimize_save_old ()
- static void optimize_merge_old ()
- static void optimize_refine ()
- static void optimize_step ()
- static void optimize_iterate ()
- static void optimize_save_optimal ()
- void optimize_free ()
- void optimize_open ()

Variables

- Optimize optimize [1]

  Optimization data.

- unsigned int nthreads_climbing

  Number of threads for the hill climbing method.

- static void(∗ optimize_algorithm)()

  Pointer to the function to perform a optimization algorithm step.

- static double(∗ optimize_estimate_climbing)(unsigned int variable, unsigned int estimate)

  Pointer to the function to estimate the climbing.

- static double(∗ optimize_norm)(unsigned int simulation)

  Pointer to the error norm function.

4.21.1 Detailed Description

Source file to define the optimization functions.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file optimize.c.

4.21.2 Macro Definition Documentation

4.21.2.1 CP

```
#define CP "cp"
```

Macro to define the shell copy command.

Definition at line 79 of file optimize.c.

4.21.2.2 DEBUG_OPTIMIZE

```
#define DEBUG_OPTIMIZE 0
```

Macro to debug optimize functions.

Definition at line 67 of file optimize.c.

4.21.2.3 RM

```
#define RM "rm"
```

Macro to define the shell remove command.

Definition at line 80 of file optimize.c.

4.21.3 Function Documentation

4.21.3.1 optimize_best()

```
static void optimize_best (
             unsigned int simulation,
             double value )  [static]
```

Function to save the best simulations.

Parameters

simulation	Simulation number.
value	Objective function value.

Definition at line 478 of file optimize.c.

```
{
  unsigned int i, j;
  double e;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_best: start\n");
  fprintf (stderr, "optimize_best: nsaveds=%u nbest=%u\n",
           optimize->nsaveds, optimize->nbest);
#endif
  if (optimize->nsaveds < optimize->nbest
      || value < optimize->error_best[optimize->nsaveds - 1])
    {
      if (optimize->nsaveds < optimize->nbest)
        ++optimize->nsaveds;
      optimize->error_best[optimize->nsaveds - 1] = value;
      optimize->simulation_best[optimize->nsaveds - 1] = simulation;
      for (i = optimize->nsaveds; --i;)
        {
          if (optimize->error_best[i] < optimize->error_best[i - 1])
            {
              j = optimize->simulation_best[i];
              e = optimize->error_best[i];
              optimize->simulation_best[i] = optimize->simulation_best[i - 1];
              optimize->error_best[i] = optimize->error_best[i - 1];
              optimize->simulation_best[i - 1] = j;
              optimize->error_best[i - 1] = e;
            }
          else
            break;
        }
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_best: end\n");
#endif
}
```

4.21.3.2 optimize_best_climbing()

```
static void optimize_best_climbing (
               unsigned int simulation,
               double value )  [static]
```

Function to save the best simulation in a hill climbing method.

Parameters

simulation	Simulation number.
value	Objective function value.

Definition at line 847 of file optimize.c.

```
{
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_best_climbing: start\n");
  fprintf (stderr,
           "optimize_best_climbing: simulation=%u value=%.14le best=%.14le\n",
           simulation, value, optimize->error_best[0]);
#endif
  if (value < optimize->error_best[0])
    {
      optimize->error_best[0] = value;
      optimize->simulation_best[0] = simulation;
#if DEBUG_OPTIMIZE
      fprintf (stderr,
               "optimize_best_climbing: BEST simulation=%u value=%.14le\n",
               simulation, value);
#endif
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_best_climbing: end\n");
#endif
}
```

4.21.3.3 optimize_climbing()

```
static void optimize_climbing (
               unsigned int nsteps )  [inline], [static]
```

Function to optimize with a hill climbing method.

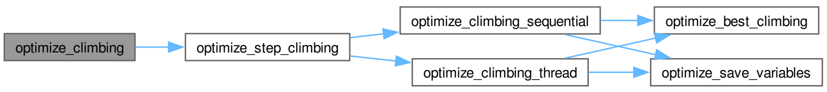
Parameters

nsteps	Number of steps.

Definition at line 1092 of file optimize.c.

```
{
  unsigned int i, j, k, b, s, adjust;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing: start\n");
#endif
  for (i = 0; i < optimize->nvariables; ++i)
    optimize->climbing[i] = 0.;
  b = optimize->simulation_best[0] * optimize->nvariables;
  s = optimize->nsimulations;
  adjust = 1;
  for (i = 0; i < nsteps; ++i, s += optimize->nestimates, b = k)
    {
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_climbing: step=%u old_best=%u\n",
               i, optimize->simulation_best[0]);
#endif
      optimize_step_climbing (s);
      k = optimize->simulation_best[0] * optimize->nvariables;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_climbing: step=%u best=%u\n",
               i, optimize->simulation_best[0]);
#endif
      if (k == b)
        {
          if (adjust)
            for (j = 0; j < optimize->nvariables; ++j)
              optimize->step[j] *= 0.5;
          for (j = 0; j < optimize->nvariables; ++j)
            optimize->climbing[j] = 0.;
          adjust = 1;
        }
      else
        {
          for (j = 0; j < optimize->nvariables; ++j)
            {
#if DEBUG_OPTIMIZE
              fprintf (stderr,
                       "optimize_climbing: best%u=%.14le old%u=%.14le\n",
                       j, optimize->value[k + j], j, optimize->value[b + j]);
#endif
              optimize->climbing[j]
                = (1. - optimize->relaxation) * optimize->climbing[j]
                + optimize->relaxation
                * (optimize->value[k + j] - optimize->value[b + j]);
#if DEBUG_OPTIMIZE
              fprintf (stderr, "optimize_climbing: climbing%u=%.14le\n",
                       j, optimize->climbing[j]);
#endif
            }
          adjust = 0;
        }
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing: end\n");
#endif
}
```

Here is the call graph for this function:



4.21.3.4 optimize_climbing_best()

```
static void optimize_climbing_best ( )  [inline], [static]
```

Function to select the best simulation to start the hill climbing method.

Definition at line 1075 of file optimize.c.

```
{
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_best: start\n");
#endif
  optimize->simulation_best[0] = 0;
  memcpy (optimize->value, optimize->value_old,
          optimize->nvariables * sizeof (double));
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_best: end\n");
#endif
}
```

4.21.3.5 optimize_climbing_sequential()

```
static void optimize_climbing_sequential (
               unsigned int simulation )  [inline], [static]
```

Function to estimate the hill climbing sequentially.

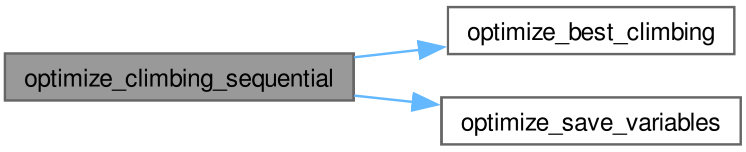
Parameters

simulation	Simulation number.

Definition at line 875 of file optimize.c.

```
{
  double e;
  unsigned int i, j;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_sequential: start\n");
  fprintf (stderr, "optimize_climbing_sequential: nstart_climbing=%u "
           "nend_climbing=%u\n",
           optimize->nstart_climbing, optimize->nend_climbing);
#endif
  for (i = optimize->nstart_climbing; i < optimize->nend_climbing; ++i)
    {
      j = simulation + i;
      e = optimize_norm (j);
      optimize_best_climbing (j, e);
      optimize_save_variables (j, e);
      if (e < optimize->threshold)
        {
          optimize->stop = 1;
          break;
        }
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_climbing_sequential: i=%u e=%lg\n", i, e);
#endif
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_sequential: end\n");
#endif
}
```

Here is the call graph for this function:



4.21.3.6 optimize_climbing_thread()

```
static void * optimize_climbing_thread (
            ParallelData * data )  [static]
```

Function to estimate the hill climbing on a thread.

Returns

NULL

Parameters

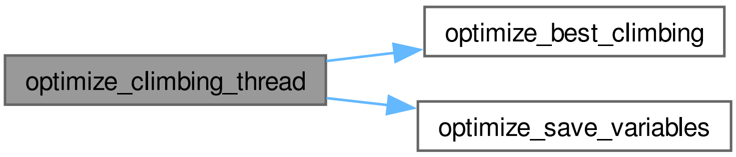
data	Function data.

Definition at line 911 of file optimize.c.

```
{
  unsigned int i, thread;
  double e;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_thread: start\n");
#endif
  thread = data->thread;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_thread: thread=%u start=%u end=%u\n",
           thread,
           optimize->thread_climbing[thread],
           optimize->thread_climbing[thread + 1]);
#endif
  for (i = optimize->thread_climbing[thread];
       i < optimize->thread_climbing[thread + 1]; ++i)
    {
      e = optimize_norm (i);
      g_mutex_lock (mutex);
      optimize_best_climbing (i, e);
      optimize_save_variables (i, e);
      if (e < optimize->threshold)
        optimize->stop = 1;
      g_mutex_unlock (mutex);
      if (optimize->stop)
        break;
#if DEBUG_OPTIMIZE
```

```
      fprintf (stderr, "optimize_climbing_thread: i=%u e=%lg\n", i, e);
#endif
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_thread: end\n");
#endif
  g_thread_exit (NULL);
  return NULL;
}
```

Here is the call graph for this function:



4.21.3.7 optimize_estimate_climbing_coordinates()

```
static double optimize_estimate_climbing_coordinates (
              unsigned int variable,
              unsigned int estimate )  [static]
```

Function to estimate a component of the hill climbing vector.

Parameters

variable	Variable number.
estimate	Estimate number.

Definition at line 976 of file optimize.c.

```
{
  double x;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_estimate_climbing_coordinates: start\n");
#endif
  x = optimize->climbing[variable];
  if (estimate >= (2 * variable) && estimate < (2 * variable + 2))
    {
      if (estimate & 1)
        x += optimize->step[variable];
      else
        x -= optimize->step[variable];
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr,
           "optimize_estimate_climbing_coordinates: climbing%u=%lg\n",
           variable, x);
  fprintf (stderr, "optimize_estimate_climbing_coordinates: end\n");
#endif
  return x;
}
```

4.21.3.8 optimize_estimate_climbing_random()

```
static double optimize_estimate_climbing_random (
            unsigned int variable,
            unsigned int estimate )  [static]
```

Function to estimate a component of the hill climbing vector.

Parameters

variable	Variable number.
estimate	Estimate number.

Definition at line 952 of file optimize.c.

```
{
  double x;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_estimate_climbing_random: start\n");
#endif
  x = optimize->climbing[variable]
    + (1. - 2. * gsl_rng_uniform (optimize->rng)) * optimize->step[variable];
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_estimate_climbing_random: climbing%u=%lg\n",
           variable, x);
  fprintf (stderr, "optimize_estimate_climbing_random: end\n");
#endif
  return x;
}
```

4.21.3.9 optimize_free()

```
void optimize_free ( )
```

Function to free the memory used by the Optimize struct.

Definition at line 1487 of file optimize.c.

```
{
  unsigned int i, j;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_free: start\n");
#endif
  for (j = 0; j < optimize->ninputs; ++j)
    {
      for (i = 0; i < optimize->nexperiments; ++i)
        g_mapped_file_unref (optimize->file[j][i]);
      g_free (optimize->file[j]);
    }
  g_free (optimize->error_old);
  g_free (optimize->value_old);
  g_free (optimize->value);
  g_free (optimize->genetic_variable);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_free: end\n");
#endif
}
```

4.21.3.10 optimize_genetic()

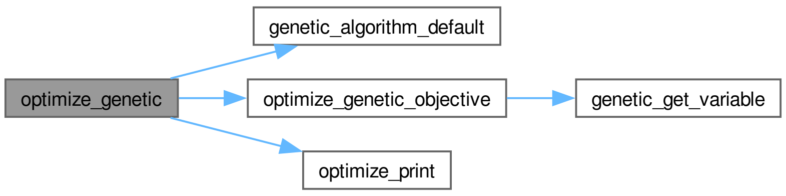
```
static void optimize_genetic ( )  [static]
```

Function to optimize with the genetic algorithm.

Definition at line 1189 of file optimize.c.

```
{
  double *best_variable = NULL;
  char *best_genome = NULL;
  double best_objective = 0.;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_genetic: start\n");
  fprintf (stderr, "optimize_genetic: ntasks=%u nthreads=%u\n", ntasks,
               nthreads);
  fprintf (stderr,
           "optimize_genetic: nvariables=%u population=%u generations=%u\n",
           optimize->nvariables, optimize->nsimulations, optimize->niterations);
  fprintf (stderr,
           "optimize_genetic: mutation=%lg reproduction=%lg adaptation=%lg\n",
           optimize->mutation_ratio, optimize->reproduction_ratio,
           optimize->adaptation_ratio);
#endif
  genetic_algorithm_default (optimize->nvariables,
                             optimize->genetic_variable,
                             optimize->nsimulations,
                             optimize->niterations,
                             optimize->mutation_ratio,
                             optimize->reproduction_ratio,
                             optimize->adaptation_ratio,
                             optimize->seed,
                             optimize->threshold,
                             &optimize_genetic_objective,
                             &best_genome, &best_variable, &best_objective);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_genetic: the best\n");
#endif
  optimize->error_old = (double *) g_malloc (sizeof (double));
  optimize->value_old
    = (double *) g_malloc (optimize->nvariables * sizeof (double));
  optimize->error_old[0] = best_objective;
  memcpy (optimize->value_old, best_variable,
          optimize->nvariables * sizeof (double));
  g_free (best_genome);
  g_free (best_variable);
  optimize_print ();
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_genetic: end\n");
#endif
}
```

Here is the call graph for this function:



4.21.3.11 optimize_genetic_objective()

```
static double optimize_genetic_objective (
              Entity * entity )  [static]
```

Function to calculate the objective function of an entity.

Returns

objective function value.

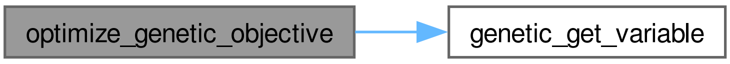
Parameters

entity	entity data.

Definition at line 1156 of file optimize.c.

```
{
  unsigned int j;
  double objective;
  char buffer[64];
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_genetic_objective: start\n");
#endif
  for (j = 0; j < optimize->nvariables; ++j)
    {
      optimize->value[entity->id * optimize->nvariables + j]
        = genetic_get_variable (entity, optimize->genetic_variable + j);
    }
  objective = optimize_norm (entity->id);
  g_mutex_lock (mutex);
  for (j = 0; j < optimize->nvariables; ++j)
    {
      snprintf (buffer, 64, "%s ", format[optimize->precision[j]]);
      fprintf (optimize->file_variables, buffer,
               genetic_get_variable (entity, optimize->genetic_variable + j));
    }
  fprintf (optimize->file_variables, "%.14le\n", objective);
  g_mutex_unlock (mutex);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_genetic_objective: end\n");
#endif
  return objective;
}
```

Here is the call graph for this function:



4.21.3.12 optimize_input()

```
static void optimize_input (
            unsigned int simulation,
            char * input,
            GMappedFile * stencil ) [inline], [static]
```

Function to write the simulation input file.

Parameters

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

Definition at line 99 of file optimize.c.

```
{
  char buffer[256], value[32];
  GRegex *regex;
  FILE *file;
  char *buffer2, *buffer3 = NULL, *content;
  gsize length;
  unsigned int i;

#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_input: start\n");
#endif

  // Checking the file
  if (!stencil)
    goto optimize_input_end;

  // Opening stencil
  content = g_mapped_file_get_contents (stencil);
  length = g_mapped_file_get_length (stencil);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_input: length=%lu\ncontent:\n%s", length, content);
#endif
  file = g_fopen (input, "w");

  // Parsing stencil
  for (i = 0; i < optimize->nvariables; ++i)
    {
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_input: variable=%u\n", i);
#endif
      snprintf (buffer, 32, "@variable%u@", i + 1);
      regex = g_regex_new (buffer, (GRegexCompileFlags) 0, (GRegexMatchFlags) 0,
                           NULL);
      if (i == 0)
        {
          buffer2 = g_regex_replace_literal (regex, content, length, 0,
                                             optimize->label[i],
                                             (GRegexMatchFlags) 0, NULL);
#if DEBUG_OPTIMIZE
          fprintf (stderr, "optimize_input: buffer2\n%s", buffer2);
#endif
        }
      else
        {
          length = strlen (buffer3);
          buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
                                             optimize->label[i],
                                             (GRegexMatchFlags) 0, NULL);
          g_free (buffer3);
        }
      g_regex_unref (regex);
      length = strlen (buffer2);
      snprintf (buffer, 32, "@value%u@", i + 1);
      regex = g_regex_new (buffer, (GRegexCompileFlags) 0, (GRegexMatchFlags) 0,
                           NULL);
      snprintf (value, 32, format[optimize->precision[i]],
                optimize->value[simulation * optimize->nvariables + i]);

#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_input: value=%s\n", value);
#endif
      buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
                                         (GRegexMatchFlags) 0, NULL);
      g_free (buffer2);
      g_regex_unref (regex);
    }

  // Saving input file
  fwrite (buffer3, strlen (buffer3), sizeof (char), file);
  g_free (buffer3);
  fclose (file);

optimize_input_end:
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_input: end\n");
#endif
  return;
}
```

4.21.3.13 optimize_iterate()

```
static void optimize_iterate ( )  [inline], [static]
```

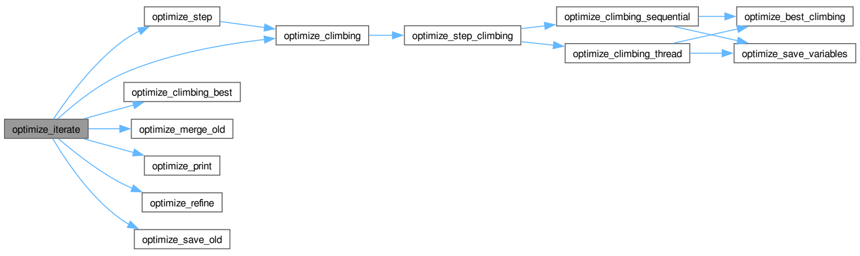
Function to iterate the algorithm.

Definition at line 1420 of file optimize.c.

```
{
  unsigned int i;
#if DEBUG_OPTIMIZE
```

```
  fprintf (stderr, "optimize_iterate: start\n");
#endif
  optimize->error_old = (double *) g_malloc (optimize->nbest * sizeof (double));
  optimize->value_old =
    (double *) g_malloc (optimize->nbest * optimize->nvariables *
                         sizeof (double));
  optimize_step ();
  optimize_save_old ();
  optimize_refine ();
  optimize_print ();
  for (i = 1; i < optimize->niterations && !optimize->stop; ++i)
    {
      optimize_step ();
      optimize_merge_old ();
      optimize_refine ();
      optimize_print ();
    }
  if (optimize->nfinal_steps && !optimize->stop)
    {
      optimize_climbing_best ();
      optimize_climbing (optimize->nfinal_steps);
      optimize_merge_old ();
      optimize_print ();
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_iterate: end\n");
#endif
}
```

Here is the call graph for this function:



4.21.3.14 optimize_merge()

```
static void optimize_merge (
              unsigned int nsaveds,
              unsigned int * simulation_best,
              double * error_best )  [inline], [static]
```

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 591 of file optimize.c.

```
{
  unsigned int i, j, k, s[optimize->nbest];
  double e[optimize->nbest];
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_merge: start\n");
#endif
  i = j = k = 0;
  do
    {
      if (i == optimize->nsaveds)
        {
          s[k] = simulation_best[j];
          e[k] = error_best[j];
          ++j;
          ++k;
          if (j == nsaveds)
            break;
        }
      else if (j == nsaveds)
        {
          s[k] = optimize->simulation_best[i];
          e[k] = optimize->error_best[i];
          ++i;
          ++k;
          if (i == optimize->nsaveds)
            break;
        }
      else if (optimize->error_best[i] > error_best[j])
        {
          s[k] = simulation_best[j];
          e[k] = error_best[j];
          ++j;
          ++k;
        }
      else
        {
          s[k] = optimize->simulation_best[i];
          e[k] = optimize->error_best[i];
          ++i;
          ++k;
        }
    }
  while (k < optimize->nbest);
  optimize->nsaveds = k;
  memcpy (optimize->simulation_best, s, k * sizeof (unsigned int));
  memcpy (optimize->error_best, e, k * sizeof (double));
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_merge: end\n");
#endif
}
```

4.21.3.15 optimize_merge_old()

```
static void optimize_merge_old ( )  [inline], [static]
```

Function to merge the best results with the previous step best results on iterative methods.

Definition at line 1270 of file optimize.c.

```
{
  unsigned int i, j, k;
  double v[optimize->nbest * optimize->nvariables], e[optimize->nbest],
    *enew, *eold;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_merge_old: start\n");
#endif
  enew = optimize->error_best;
  eold = optimize->error_old;
  i = j = k = 0;
  do
    {
      if (*enew < *eold)
        {
          memcpy (v + k * optimize->nvariables,
                  optimize->value
                  + optimize->simulation_best[i] * optimize->nvariables,
                  optimize->nvariables * sizeof (double));
          e[k] = *enew;
          ++k;
          ++enew;
          ++i;
        }
      else
        {
          memcpy (v + k * optimize->nvariables,
                  optimize->value_old + j * optimize->nvariables,
                  optimize->nvariables * sizeof (double));
          e[k] = *eold;
          ++k;
          ++eold;
          ++j;
        }
    }
  while (k < optimize->nbest);
  memcpy (optimize->value_old, v, k * optimize->nvariables * sizeof (double));
  memcpy (optimize->error_old, e, k * sizeof (double));
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_merge_old: end\n");
#endif
}
```

4.21.3.16 optimize_MonteCarlo()

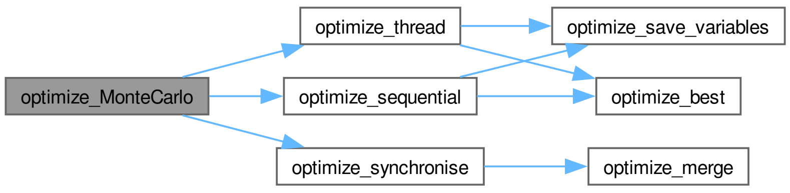
```
static void optimize_MonteCarlo ( )  [static]
```

Function to optimize with the Monte-Carlo algorithm.

Definition at line 752 of file optimize.c.

```
{
  ParallelData data[nthreads];
  GThread *thread[nthreads];
  double range[optimize->nvariables];
  unsigned int i, j;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_MonteCarlo: start\n");
#endif
  for (j = 0; j < optimize->nvariables; ++j)
    range[j] = optimize->rangemax[j] - optimize->rangemin[j];
  for (i = 0; i < optimize->nsimulations; ++i)
    for (j = 0; j < optimize->nvariables; ++j)
      optimize->value[i * optimize->nvariables + j]
        = optimize->rangemin[j] + gsl_rng_uniform (optimize->rng) * range[j];
  optimize->nsaveds = 0;
  if (nthreads <= 1)
    optimize_sequential ();
  else
    {
      for (i = 0; i < nthreads; ++i)
        {
          data[i].thread = i;
          thread[i]
            = g_thread_new (NULL, (GThreadFunc) optimize_thread, &data[i]);
        }
      for (i = 0; i < nthreads; ++i)
        g_thread_join (thread[i]);
    }
#if HAVE_MPI
  // Communicating tasks results
  optimize_synchronise ();
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_MonteCarlo: end\n");
#endif
}
```

Here is the call graph for this function:



4.21.3.17 optimize_norm_euclidian()

```
static double optimize_norm_euclidian (
             unsigned int simulation )  [static]
```

Function to calculate the Euclidian error norm.

Returns

Euclidian error norm.

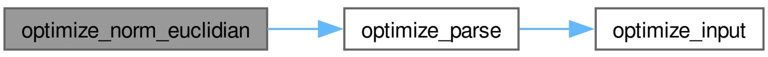
Parameters

simulation	simulation number.

Definition at line 326 of file optimize.c.

```
{
  double e, ei;
  unsigned int i;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_euclidian: start\n");
#endif
  e = 0.;
  for (i = 0; i < optimize->nexperiments; ++i)
    {
      ei = optimize_parse (simulation, i);
      e += ei * ei;
    }
  e = sqrt (e);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_euclidian: error=%lg\n", e);
  fprintf (stderr, "optimize_norm_euclidian: end\n");
#endif
  return e;
}
```

Here is the call graph for this function:



4.21.3.18 optimize_norm_maximum()

```
static double optimize_norm_maximum (
             unsigned int simulation )  [static]
```

Function to calculate the maximum error norm.

Returns

Maximum error norm.

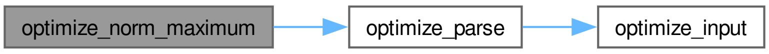
Parameters

simulation	simulation number.

Definition at line 353 of file optimize.c.

```
{
  double e, ei;
  unsigned int i;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_maximum: start\n");
#endif
  e = 0.;
  for (i = 0; i < optimize->nexperiments; ++i)
    {
      ei = fabs (optimize_parse (simulation, i));
      e = fmax (e, ei);
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_maximum: error=%lg\n", e);
  fprintf (stderr, "optimize_norm_maximum: end\n");
#endif
  return e;
}
```

Here is the call graph for this function:



4.21.3.19 optimize_norm_p()

```
static double optimize_norm_p (
              unsigned int simulation )  [static]
```

Function to calculate the P error norm.

Returns

P error norm.

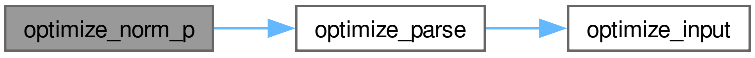
Parameters

simulation	simulation number.

Definition at line 379 of file optimize.c.

```
{
  double e, ei;
  unsigned int i;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_p: start\n");
#endif
  e = 0.;
  for (i = 0; i < optimize->nexperiments; ++i)
    {
      ei = fabs (optimize_parse (simulation, i));
      e += pow (ei, optimize->p);
    }
  e = pow (e, 1. / optimize->p);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_p: error=%lg\n", e);
  fprintf (stderr, "optimize_norm_p: end\n");
#endif
  return e;
}
```

Here is the call graph for this function:



4.21.3.20 optimize_norm_taxicab()

```
static double optimize_norm_taxicab (
            unsigned int simulation )  [static]
```

Function to calculate the taxicab error norm.

Returns

Taxicab error norm.

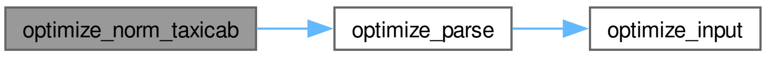
Parameters

simulation	simulation number.

Definition at line 406 of file optimize.c.

```
{
  double e;
  unsigned int i;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_taxicab: start\n");
#endif
  e = 0.;
  for (i = 0; i < optimize->nexperiments; ++i)
    e += fabs (optimize_parse (simulation, i));
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_taxicab: error=%lg\n", e);
  fprintf (stderr, "optimize_norm_taxicab: end\n");
#endif
  return e;
}
```

Here is the call graph for this function:



4.21.3.21 optimize_open()

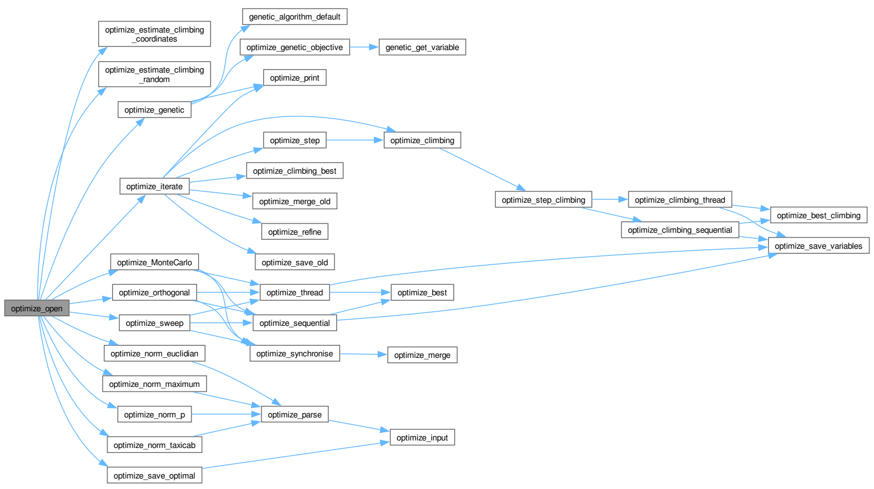
```
void optimize_open ( )
```

Function to open and perform a optimization.

Definition at line 1512 of file optimize.c.

```
{
  GTimeZone *tz;
  GDateTime *t0, *t;
  unsigned int i, j, nsteps;

#if DEBUG_OPTIMIZE
  char *buffer;
  fprintf (stderr, "optimize_open: start\n");
#endif

  // Getting initial time
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: getting initial time\n");
#endif
  tz = g_time_zone_new_utc ();
  t0 = g_date_time_new_now (tz);

  // Obtaining and initing the pseudo-random numbers generator seed
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: getting initial seed\n");
#endif
  if (optimize->seed == DEFAULT_RANDOM_SEED)
    optimize->seed = input->seed;
  gsl_rng_set (optimize->rng, optimize->seed);

  // Obtaining template flags
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: getting template flags\n");
#endif
  optimize->template_flags = input->template_flags;

  // Replacing the working directory
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: replacing the working directory\n");
#endif
  g_chdir (input->directory);

  // Getting results file names
  optimize->result = input->result;
  optimize->variables = input->variables;

  // Obtaining the simulator file
  optimize->simulator = input->simulator;

  // Obtaining the evaluator file
  optimize->evaluator = input->evaluator;

  // Obtaining the cleaner file
  optimize->cleaner = input->cleaner;

  // Reading the algorithm
  optimize->algorithm = input->algorithm;
  switch (optimize->algorithm)
    {
    case ALGORITHM_MONTE_CARLO:
      optimize_algorithm = optimize_MonteCarlo;
      break;
    case ALGORITHM_SWEEP:
      optimize_algorithm = optimize_sweep;
      break;
    case ALGORITHM_ORTHOGONAL:
      optimize_algorithm = optimize_orthogonal;
      break;
    default:
      optimize_algorithm = optimize_genetic;
      optimize->mutation_ratio = input->mutation_ratio;
      optimize->reproduction_ratio = input->reproduction_ratio;
      optimize->adaptation_ratio = input->adaptation_ratio;
    }
  optimize->nvariables = input->nvariables;
  optimize->nsimulations = input->nsimulations;
  optimize->niterations = input->niterations;
  optimize->nbest = input->nbest;
  optimize->tolerance = input->tolerance;
  optimize->nsteps = input->nsteps;
  optimize->nfinal_steps = input->nfinal_steps;
  nsteps = JBM_MAX (optimize->nsteps, optimize->nfinal_steps);
  optimize->nestimates = 0;
  optimize->threshold = input->threshold;
  optimize->stop = 0;
  if (nsteps)
    {
      optimize->relaxation = input->relaxation;
      switch (input->climbing)
        {
        case CLIMBING_METHOD_COORDINATES:
          optimize->nestimates = 2 * optimize->nvariables;
          optimize_estimate_climbing = optimize_estimate_climbing_coordinates;
          break;
        default:
          optimize->nestimates = input->nestimates;
          optimize_estimate_climbing = optimize_estimate_climbing_random;
        }
    }

#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: nbest=%u\n", optimize->nbest);
#endif
  optimize->simulation_best
    = (unsigned int *) alloca (optimize->nbest * sizeof (unsigned int));
  optimize->error_best = (double *) alloca (optimize->nbest * sizeof (double));

  // Reading the experimental data
#if DEBUG_OPTIMIZE
  buffer = g_get_current_dir ();
  fprintf (stderr, "optimize_open: current directory=%s\n", buffer);
  g_free (buffer);
#endif
  optimize->nexperiments = input->nexperiments;
  optimize->ninputs = input->experiment->ninputs;
  optimize->experiment
    = (char **) alloca (input->nexperiments * sizeof (char *));
  optimize->weight = (double *) alloca (input->nexperiments * sizeof (double));
  for (i = 0; i < input->experiment->ninputs; ++i)
    optimize->file[i] = (GMappedFile **)
      g_malloc (input->nexperiments * sizeof (GMappedFile *));
  for (i = 0; i < input->nexperiments; ++i)
    {
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_open: i=%u\n", i);
#endif
      optimize->experiment[i] = input->experiment[i].name;
      optimize->weight[i] = input->experiment[i].weight;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_open: experiment=%s weight=%lg\n",
               optimize->experiment[i], optimize->weight[i]);
#endif
      for (j = 0; j < input->experiment->ninputs; ++j)
        {
#if DEBUG_OPTIMIZE
          fprintf (stderr, "optimize_open: stencil%u\n", j + 1);
#endif
          optimize->file[j][i]
            = g_mapped_file_new (input->experiment[i].stencil[j], 0, NULL);
        }
    }

  // Reading the variables data
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: reading variables\n");
#endif
  optimize->label = (char **) alloca (input->nvariables * sizeof (char *));
  j = input->nvariables * sizeof (double);
  optimize->rangemin = (double *) alloca (j);
  optimize->rangeminabs = (double *) alloca (j);
  optimize->rangemax = (double *) alloca (j);
  optimize->rangemaxabs = (double *) alloca (j);
  optimize->step = (double *) alloca (j);
  j = input->nvariables * sizeof (unsigned int);
  optimize->precision = (unsigned int *) alloca (j);
  optimize->nsweeps = (unsigned int *) alloca (j);
  optimize->nbits = (unsigned int *) alloca (j);
  for (i = 0; i < input->nvariables; ++i)
    {
      optimize->label[i] = input->variable[i].name;
      optimize->rangemin[i] = input->variable[i].rangemin;
      optimize->rangeminabs[i] = input->variable[i].rangeminabs;
      optimize->rangemax[i] = input->variable[i].rangemax;
      optimize->rangemaxabs[i] = input->variable[i].rangemaxabs;
      optimize->precision[i] = input->variable[i].precision;
      optimize->step[i] = input->variable[i].step;
      optimize->nsweeps[i] = input->variable[i].nsweeps;
      optimize->nbits[i] = input->variable[i].nbits;
    }
  if (input->algorithm == ALGORITHM_SWEEP
      || input->algorithm == ALGORITHM_ORTHOGONAL)
    {
      optimize->nsimulations = 1;
      for (i = 0; i < input->nvariables; ++i)
        {
          optimize->nsimulations *= optimize->nsweeps[i];
#if DEBUG_OPTIMIZE
          fprintf (stderr, "optimize_open: nsweeps=%u nsimulations=%u\n",
                   optimize->nsweeps[i], optimize->nsimulations);
#endif
        }
    }
  if (nsteps)
    optimize->climbing
      = (double *) alloca (optimize->nvariables * sizeof (double));

  // Setting error norm
  switch (input->norm)
    {
    case ERROR_NORM_EUCLIDIAN:
      optimize_norm = optimize_norm_euclidian;
      break;
    case ERROR_NORM_MAXIMUM:
      optimize_norm = optimize_norm_maximum;
      break;
    case ERROR_NORM_P:
      optimize_norm = optimize_norm_p;
      optimize->p = input->p;
      break;
    default:
      optimize_norm = optimize_norm_taxicab;
    }

  // Allocating values
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: allocating variables\n");
  fprintf (stderr, "optimize_open: nvariables=%u algorithm=%u\n",
           optimize->nvariables, optimize->algorithm);
#endif
  optimize->genetic_variable = NULL;
  if (optimize->algorithm == ALGORITHM_GENETIC)
    {
      optimize->genetic_variable = (GeneticVariable *)
        g_malloc (optimize->nvariables * sizeof (GeneticVariable));
      for (i = 0; i < optimize->nvariables; ++i)
        {
#if DEBUG_OPTIMIZE
          fprintf (stderr, "optimize_open: i=%u min=%lg max=%lg nbits=%u\n",
                   i, optimize->rangemin[i], optimize->rangemax[i],
                   optimize->nbits[i]);
#endif
          optimize->genetic_variable[i].minimum = optimize->rangemin[i];
          optimize->genetic_variable[i].maximum = optimize->rangemax[i];
          optimize->genetic_variable[i].nbits = optimize->nbits[i];
        }
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: nvariables=%u nsimulations=%u\n",
           optimize->nvariables, optimize->nsimulations);
#endif
  optimize->value = (double *)
    g_malloc ((optimize->nsimulations + optimize->nestimates * nsteps)
              * optimize->nvariables * sizeof (double));

  // Calculating simulations to perform for each task
#if HAVE_MPI
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: rank=%u ntasks=%u\n",
           optimize->mpi_rank, ntasks);
#endif
  optimize->nstart = optimize->mpi_rank * optimize->nsimulations / ntasks;
  optimize->nend = (1 + optimize->mpi_rank) * optimize->nsimulations / ntasks;
  if (nsteps)
    {
      optimize->nstart_climbing
        = optimize->mpi_rank * optimize->nestimates / ntasks;
      optimize->nend_climbing
        = (1 + optimize->mpi_rank) * optimize->nestimates / ntasks;
    }
#else
  optimize->nstart = 0;
  optimize->nend = optimize->nsimulations;
  if (nsteps)
    {
      optimize->nstart_climbing = 0;
      optimize->nend_climbing = optimize->nestimates;
    }
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: nstart=%u nend=%u\n", optimize->nstart,
           optimize->nend);
#endif

  // Calculating simulations to perform for each thread
  optimize->thread
    = (unsigned int *) alloca ((1 + nthreads) * sizeof (unsigned int));
  for (i = 0; i <= nthreads; ++i)
    {
      optimize->thread[i] = optimize->nstart
        + i * (optimize->nend - optimize->nstart) / nthreads;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_open: i=%u thread=%u\n", i,
               optimize->thread[i]);
#endif
    }
  if (nsteps)
    optimize->thread_climbing = (unsigned int *)
      alloca ((1 + nthreads_climbing) * sizeof (unsigned int));

  // Opening result files
  optimize->file_result = g_fopen (optimize->result, "w");
  optimize->file_variables = g_fopen (optimize->variables, "w");

  // Performing the algorithm
  switch (optimize->algorithm)
    {
      // Genetic algorithm
    case ALGORITHM_GENETIC:
      optimize_genetic ();
      break;

      // Iterative algorithm
    default:
      optimize_iterate ();
    }

  // Getting calculation time
  t = g_date_time_new_now (tz);
  optimize->calculation_time = 0.000001 * g_date_time_difference (t, t0);
  g_date_time_unref (t);
  g_date_time_unref (t0);
  g_time_zone_unref (tz);
  printf ("%s = %.6lg s\n", _("Calculation time"), optimize->calculation_time);
  fprintf (optimize->file_result, "%s = %.6lg s\n",
           _("Calculation time"), optimize->calculation_time);

  // Closing result files
  optimize_save_optimal ();
  fclose (optimize->file_variables);
  fclose (optimize->file_result);

#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: end\n");
#endif
}
```

Here is the call graph for this function:



4.21.3.22 optimize_orthogonal()

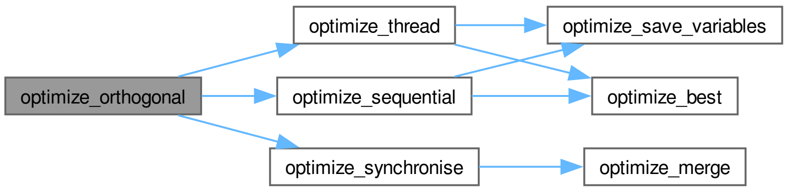
```
static void optimize_orthogonal ( )  [static]
```

Function to optimize with the orthogonal sampling algorithm.

Definition at line 794 of file optimize.c.

```
{
  ParallelData data[nthreads];
  GThread *thread[nthreads];
  double range[optimize->nvariables];
  double e;
  unsigned int i, j, k, l;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_orthogonal: start\n");
#endif
  for (j = 0; j < optimize->nvariables; ++j)
    range[j] = (optimize->rangemax[j] - optimize->rangemin[j])
      / optimize->nsweeps[j];
  for (i = 0; i < optimize->nsimulations; ++i)
    {
      k = i;
      for (j = 0; j < optimize->nvariables; ++j)
        {
          l = k % optimize->nsweeps[j];
          k /= optimize->nsweeps[j];
          e = optimize->rangemin[j];
          if (optimize->nsweeps[j] > 1)
            e += (l + gsl_rng_uniform (optimize->rng)) * range[j];
          optimize->value[i * optimize->nvariables + j] = e;
        }
    }
  optimize->nsaveds = 0;
  if (nthreads <= 1)
    optimize_sequential ();
  else
    {
      for (i = 0; i < nthreads; ++i)
        {
          data[i].thread = i;
          thread[i]
            = g_thread_new (NULL, (GThreadFunc) optimize_thread, &data[i]);
        }
      for (i = 0; i < nthreads; ++i)
        g_thread_join (thread[i]);
    }
#if HAVE_MPI
  // Communicating tasks results
  optimize_synchronise ();
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_orthogonal: end\n");
#endif
}
```

Here is the call graph for this function:



4.21.3.23 optimize_parse()

```
static double optimize_parse (
            unsigned int simulation,
            unsigned int experiment )  [static]
```

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

Returns

Objective function value.

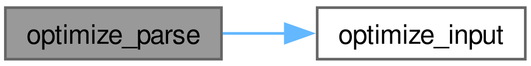
Parameters

simulation	Simulation number.
experiment	Experiment number.

Definition at line 188 of file optimize.c.

```
{
  char buffer[512], cinput[MAX_NINPUTS][32], output[32], result[32], *buffer2,
    *buffer3, *buffer4;
  FILE *file_result;
  double e;
  unsigned int i;
  unsigned int flags = 1;

#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_parse: start\n");
  fprintf (stderr, "optimize_parse: simulation=%u experiment=%u\n",
           simulation, experiment);
#endif

  // Opening input files
  for (i = 0; i < optimize->ninputs; ++i)
    {
      snprintf (&cinput[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_parse: i=%u input=%s\n", i, &cinput[i][0]);
#endif
      // Checking simple copy
      if (optimize->template_flags & flags)
        optimize_input (simulation, &cinput[i][0],
                          optimize->file[i][experiment]);
      else
        {
          buffer2 = input->experiment[experiment].stencil[i];
          snprintf (buffer, 512, CP " %s %s", buffer2, &cinput[i][0]);
          if (system (buffer) == -1)
            error_message = g_strdup (buffer);
        }
      flags «= 1;
    }
  for (; i < MAX_NINPUTS; ++i)
    strcpy (&cinput[i][0], "");
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_parse: parsing end\n");
#endif

  // Performing the simulation
  snprintf (output, 32, "output-%u-%u", simulation, experiment);
  buffer2 = g_path_get_dirname (optimize->simulator);
  buffer3 = g_path_get_basename (optimize->simulator);
  buffer4 = g_build_filename (buffer2, buffer3, NULL);
  snprintf (buffer, 512, "\"%s\" %s %s %s %s %s %s %s %s %s",
            buffer4, cinput[0], cinput[1], cinput[2], cinput[3], cinput[4],
            cinput[5], cinput[6], cinput[7], output);
  g_free (buffer4);
  g_free (buffer3);
  g_free (buffer2);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_parse: %s\n", buffer);
#endif
  if (system (buffer) == -1)
    error_message = g_strdup (buffer);

  // Checking the objective value function
  if (optimize->evaluator)
    {
      snprintf (result, 32, "result-%u-%u", simulation, experiment);
      buffer2 = g_path_get_dirname (optimize->evaluator);
      buffer3 = g_path_get_basename (optimize->evaluator);
      buffer4 = g_build_filename (buffer2, buffer3, NULL);
      snprintf (buffer, 512, "\"%s\" %s %s %s",
                buffer4, output, optimize->experiment[experiment], result);
      g_free (buffer4);
      g_free (buffer3);
      g_free (buffer2);
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_parse: %s\n", buffer);
      fprintf (stderr, "optimize_parse: result=%s\n", result);
#endif
      if (system (buffer) == -1)
        error_message = g_strdup (buffer);
      file_result = g_fopen (result, "r");
      e = atof (fgets (buffer, 512, file_result));
      fclose (file_result);
    }
  else
    {
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_parse: output=%s\n", output);
#endif
      strcpy (result, "");
      file_result = g_fopen (output, "r");
      e = atof (fgets (buffer, 512, file_result));
      fclose (file_result);
    }

  // Removing files
  if (optimize->cleaner)
    {
      buffer2 = g_path_get_dirname (optimize->cleaner);
      buffer3 = g_path_get_basename (optimize->cleaner);
      buffer4 = g_build_filename (buffer2, buffer3, NULL);
      snprintf (buffer, 512, "\"%s\"", buffer4);
      g_free (buffer4);
      g_free (buffer3);
      g_free (buffer2);
      if (system (buffer) == -1)
        error_message = g_strdup (buffer);
    }
#if !DEBUG_OPTIMIZE
  for (i = 0; i < optimize->ninputs; ++i)
    {
      if (optimize->file[i][0])
        {
          snprintf (buffer, 512, RM " %s", &cinput[i][0]);
          if (system (buffer) == -1)
            error_message = g_strdup (buffer);
      }
    }
  snprintf (buffer, 512, RM " %s %s", output, result);
  if (system (buffer) == -1)
    error_message = g_strdup (buffer);
#endif

  // Processing pending events
  if (show_pending)
    show_pending ();

#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_parse: end\n");
#endif

  // Returning the objective function
  return e * optimize->weight[experiment];
}
```

Here is the call graph for this function:



4.21.3.24 optimize_print()

```
static void optimize_print ( )  [static]
```

Function to print the results.

Definition at line 427 of file optimize.c.

```
{
  unsigned int i;
  char buffer[512];
#if HAVE_MPI
  if (optimize->mpi_rank)
    return;
#endif
  printf ("%s\n", _("Best result"));
  fprintf (optimize->file_result, "%s\n", _("Best result"));
  printf ("error = %.15le\n", optimize->error_old[0]);
  fprintf (optimize->file_result, "error = %.15le\n", optimize->error_old[0]);
  for (i = 0; i < optimize->nvariables; ++i)
    {
      snprintf (buffer, 512, "%s = %s\n",
                optimize->label[i], format[optimize->precision[i]]);
      printf (buffer, optimize->value_old[i]);
      fprintf (optimize->file_result, buffer, optimize->value_old[i]);
    }
  fflush (optimize->file_result);
}
```

4.21.3.25 optimize_refine()

```
static void optimize_refine ( )  [inline], [static]
```

Function to refine the search ranges of the variables in iterative algorithms.

Definition at line 1318 of file optimize.c.

```
{
  unsigned int i, j;
  double d;
#if HAVE_MPI
  MPI_Status mpi_stat;
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_refine: start\n");
#endif
#if HAVE_MPI
  if (!optimize->mpi_rank)
    {
#endif
      for (j = 0; j < optimize->nvariables; ++j)
        {
          optimize->rangemin[j] = optimize->rangemax[j]
            = optimize->value_old[j];
          optimize->step[j] = input->variable[j].step;
        }
      for (i = 0; ++i < optimize->nbest;)
        {
          for (j = 0; j < optimize->nvariables; ++j)
            {
              optimize->rangemin[j]
                = fmin (optimize->rangemin[j],
                        optimize->value_old[i * optimize->nvariables + j]);
              optimize->rangemax[j]
                = fmax (optimize->rangemax[j],
                        optimize->value_old[i * optimize->nvariables + j]);
            }
        }
      for (j = 0; j < optimize->nvariables; ++j)
        {
          d = optimize->tolerance
            * (optimize->rangemax[j] - optimize->rangemin[j]);
          switch (optimize->algorithm)
            {
            case ALGORITHM_MONTE_CARLO:
              d *= 0.5;
              break;
            default:
              if (optimize->nsweeps[j] > 1)
                d /= optimize->nsweeps[j] - 1;
              else
                d = 0.;
            }
          optimize->rangemin[j] -= d;
          optimize->rangemin[j]
            = fmax (optimize->rangemin[j], optimize->rangeminabs[j]);
          optimize->rangemax[j] += d;
          optimize->rangemax[j]
            = fmin (optimize->rangemax[j], optimize->rangemaxabs[j]);
          printf ("%s min=%lg max=%lg\n", optimize->label[j],
                  optimize->rangemin[j], optimize->rangemax[j]);
          fprintf (optimize->file_result, "%s min=%lg max=%lg\n",
                   optimize->label[j], optimize->rangemin[j],
                   optimize->rangemax[j]);
        }
#if HAVE_MPI
      for (i = 1; (int) i < ntasks; ++i)
        {
          MPI_Send (optimize->rangemin, optimize->nvariables, MPI_DOUBLE, i,
                    1, MPI_COMM_WORLD);
          MPI_Send (optimize->rangemax, optimize->nvariables, MPI_DOUBLE, i,
                    1, MPI_COMM_WORLD);
        }
    }
  else
    {
      MPI_Recv (optimize->rangemin, optimize->nvariables, MPI_DOUBLE, 0, 1,
                MPI_COMM_WORLD, &mpi_stat);
      MPI_Recv (optimize->rangemax, optimize->nvariables, MPI_DOUBLE, 0, 1,
                MPI_COMM_WORLD, &mpi_stat);
    }
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_refine: end\n");
#endif
}
```

4.21.3.26 optimize_save_old()

```
static void optimize_save_old ( )  [inline], [static]
```

Function to save the best results on iterative methods.

Definition at line 1238 of file optimize.c.

```
{
  unsigned int i, j;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_save_old: start\n");
  fprintf (stderr, "optimize_save_old: nsaveds=%u\n", optimize->nsaveds);
#endif
  memcpy (optimize->error_old, optimize->error_best,
          optimize->nbest * sizeof (double));
  for (i = 0; i < optimize->nbest; ++i)
    {
      j = optimize->simulation_best[i];
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_save_old: i=%u j=%u\n", i, j);
#endif
      memcpy (optimize->value_old + i * optimize->nvariables,
              optimize->value + j * optimize->nvariables,
              optimize->nvariables * sizeof (double));
    }
#if DEBUG_OPTIMIZE
  for (i = 0; i < optimize->nvariables; ++i)
    fprintf (stderr, "optimize_save_old: best variable %u=%lg\n",
             i, optimize->value_old[i]);
  fprintf (stderr, "optimize_save_old: end\n");
#endif
}
```

4.21.3.27 optimize_save_optimal()

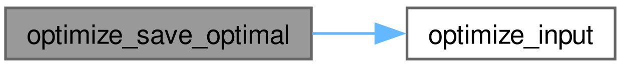
```
static void optimize_save_optimal ( )  [inline], [static]
```

Function to save the optimal input files.

Definition at line 1457 of file optimize.c.

```
{
  char cinput[32];
  unsigned int i, j;
  unsigned int flags = 1;

  // Getting optimal values
  memcpy (optimize->value, optimize->value_old,
          optimize->nvariables * sizeof (double));

  // Saving optimal input files
  for (i = 0; i < optimize->ninputs; ++i)
    for (j = 0; j < optimize->nexperiments; ++j)
      {
        snprintf (cinput, 32, "optimal-%u-%u", i, j);
#if DEBUG_OPTIMIZE
        fprintf (stderr, "optimize_save_optimal: i=%u j=%u input=%s\n",
                 i, j, cinput);
#endif
        // Checking templates
        if (optimize->template_flags & flags)
          optimize_input (0, cinput, optimize->file[i][j]);
        flags «= 1;
      }
}
```

Here is the call graph for this function:



4.21.3.28 optimize_save_variables()

```
static void optimize_save_variables (
            unsigned int simulation,
            double error )  [static]
```

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

Parameters

simulation	Simulation number.
error	Error value.

Definition at line 453 of file optimize.c.

```
{
  unsigned int i;
  char buffer[64];
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_save_variables: start\n");
#endif
  for (i = 0; i < optimize->nvariables; ++i)
    {
      snprintf (buffer, 64, "%s ", format[optimize->precision[i]]);
      fprintf (optimize->file_variables, buffer,
               optimize->value[simulation * optimize->nvariables + i]);
    }
  fprintf (optimize->file_variables, "%.14le\n", error);
  fflush (optimize->file_variables);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_save_variables: end\n");
#endif
}
```

4.21.3.29 optimize_sequential()

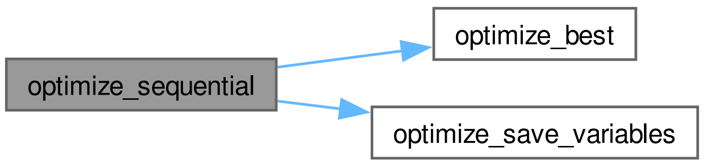
```
static void optimize_sequential ( )  [static]
```

Function to optimize sequentially.

Definition at line 519 of file optimize.c.

```
{
  unsigned int i;
  double e;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_sequential: start\n");
  fprintf (stderr, "optimize_sequential: nstart=%u nend=%u\n",
           optimize->nstart, optimize->nend);
#endif
  for (i = optimize->nstart; i < optimize->nend; ++i)
    {
      e = optimize_norm (i);
      optimize_best (i, e);
      optimize_save_variables (i, e);
      if (e < optimize->threshold)
        {
          optimize->stop = 1;
          break;
        }
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_sequential: i=%u e=%lg\n", i, e);
#endif
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_sequential: end\n");
#endif
}
```

Here is the call graph for this function:



4.21.3.30 optimize_step()

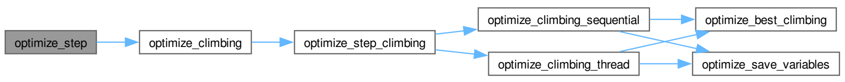
```
static void optimize_step ( ) [static]
```

Function to do a step of the iterative algorithm.

Definition at line 1403 of file optimize.c.

```
{
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_step: start\n");
#endif
  optimize_algorithm ();
  if (optimize->nsteps)
    optimize_climbing (optimize->nsteps);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_step: end\n");
#endif
}
```

Here is the call graph for this function:



4.21.3.31 optimize_step_climbing()

```
static void optimize_step_climbing (
            unsigned int simulation ) [inline], [static]
```

Function to do a step of the hill climbing method.

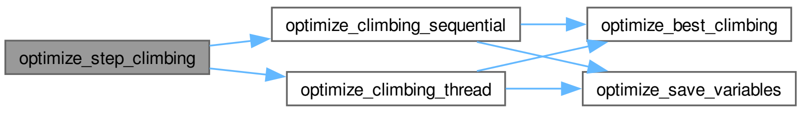
Parameters

simulation	Simulation number.

Definition at line 1006 of file optimize.c.

```
{
  GThread *thread[nthreads_climbing];
  ParallelData data[nthreads_climbing];
  unsigned int i, j, k, b;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_step_climbing: start\n");
#endif
  for (i = 0; i < optimize->nestimates; ++i)
    {
      k = (simulation + i) * optimize->nvariables;
      b = optimize->simulation_best[0] * optimize->nvariables;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_step_climbing: simulation=%u best=%u\n",
               simulation + i, optimize->simulation_best[0]);
#endif
      for (j = 0; j < optimize->nvariables; ++j, ++k, ++b)
        {
#if DEBUG_OPTIMIZE
          fprintf (stderr,
                   "optimize_step_climbing: estimate=%u best%u=%.14le\n",
                   i, j, optimize->value[b]);
#endif
          optimize->value[k]
            = optimize->value[b] + optimize_estimate_climbing (j, i);
          optimize->value[k] = fmin (fmax (optimize->value[k],
                                           optimize->rangeminabs[j]),
                                     optimize->rangemaxabs[j]);
#if DEBUG_OPTIMIZE
          fprintf (stderr,
                   "optimize_step_climbing: estimate=%u variable%u=%.14le\n",
                   i, j, optimize->value[k]);
#endif
        }
    }
  if (nthreads_climbing == 1)
    optimize_climbing_sequential (simulation);
  else
    {
      for (i = 0; i <= nthreads_climbing; ++i)
        {
          optimize->thread_climbing[i]
            = simulation + optimize->nstart_climbing
            + i * (optimize->nend_climbing - optimize->nstart_climbing)
            / nthreads_climbing;
#if DEBUG_OPTIMIZE
          fprintf (stderr,
                   "optimize_step_climbing: i=%u thread_climbing=%u\n",
                   i, optimize->thread_climbing[i]);
#endif
        }
      for (i = 0; i < nthreads_climbing; ++i)
        {
          data[i].thread = i;
          thread[i] = g_thread_new
            (NULL, (GThreadFunc) optimize_climbing_thread, &data[i]);
        }
      for (i = 0; i < nthreads_climbing; ++i)
        g_thread_join (thread[i]);
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_step_climbing: end\n");
#endif
}
```

Here is the call graph for this function:



4.21.3.32 optimize_sweep()

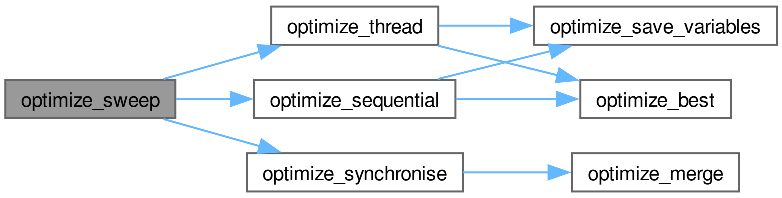
```
static void optimize_sweep ( ) [static]
```

Function to optimize with the sweep algorithm.

Definition at line 699 of file optimize.c.

```
{
  ParallelData data[nthreads];
  GThread *thread[nthreads];
  double range[optimize->nvariables];
  double e;
  unsigned int i, j, k, l;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_sweep: start\n");
#endif
  for (j = 0; j < optimize->nvariables; ++j)
    range[j] = (optimize->rangemax[j] - optimize->rangemin[j])
      / (optimize->nsweeps[j] - 1);
  for (i = 0; i < optimize->nsimulations; ++i)
    {
      k = i;
      for (j = 0; j < optimize->nvariables; ++j)
        {
          l = k % optimize->nsweeps[j];
          k /= optimize->nsweeps[j];
          e = optimize->rangemin[j];
          if (optimize->nsweeps[j] > 1)
            e += l * range[j];
          optimize->value[i * optimize->nvariables + j] = e;
        }
    }
  optimize->nsaveds = 0;
  if (nthreads <= 1)
    optimize_sequential ();
  else
    {
      for (i = 0; i < nthreads; ++i)
        {
          data[i].thread = i;
          thread[i]
            = g_thread_new (NULL, (GThreadFunc) optimize_thread, &data[i]);
        }
      for (i = 0; i < nthreads; ++i)
        g_thread_join (thread[i]);
    }
#if HAVE_MPI
  // Communicating tasks results
  optimize_synchronise ();
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_sweep: end\n");
#endif
}
```

Here is the call graph for this function:



4.21.3.33 optimize_synchronise()

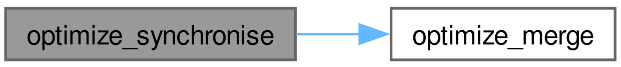
```
static void optimize_synchronise ( )  [static]
```

Function to synchronise the optimization results of MPI tasks.

Definition at line 652 of file optimize.c.

```
{
  unsigned int i, nsaveds, simulation_best[optimize->nbest], stop;
  double error_best[optimize->nbest];
  MPI_Status mpi_stat;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_synchronise: start\n");
#endif
  if (optimize->mpi_rank == 0)
    {
      for (i = 1; (int) i < ntasks; ++i)
        {
          MPI_Recv (&nsaveds, 1, MPI_INT, i, 1, MPI_COMM_WORLD, &mpi_stat);
          MPI_Recv (simulation_best, nsaveds, MPI_INT, i, 1,
                    MPI_COMM_WORLD, &mpi_stat);
          MPI_Recv (error_best, nsaveds, MPI_DOUBLE, i, 1,
                    MPI_COMM_WORLD, &mpi_stat);
          optimize_merge (nsaveds, simulation_best, error_best);
          MPI_Recv (&stop, 1, MPI_UNSIGNED, i, 1, MPI_COMM_WORLD, &mpi_stat);
          if (stop)
            optimize->stop = 1;
        }
      for (i = 1; (int) i < ntasks; ++i)
        MPI_Send (&optimize->stop, 1, MPI_UNSIGNED, i, 1, MPI_COMM_WORLD);
    }
  else
    {
      MPI_Send (&optimize->nsaveds, 1, MPI_INT, 0, 1, MPI_COMM_WORLD);
      MPI_Send (optimize->simulation_best, optimize->nsaveds, MPI_INT, 0, 1,
                MPI_COMM_WORLD);
      MPI_Send (optimize->error_best, optimize->nsaveds, MPI_DOUBLE, 0, 1,
                MPI_COMM_WORLD);
      MPI_Send (&optimize->stop, 1, MPI_UNSIGNED, 0, 1, MPI_COMM_WORLD);
      MPI_Recv (&stop, 1, MPI_UNSIGNED, 0, 1, MPI_COMM_WORLD, &mpi_stat);
      if (stop)
        optimize->stop = 1;
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_synchronise: end\n");
#endif
}
```

Here is the call graph for this function:



4.21.3.34 optimize_thread()

```
static void * optimize_thread (
            ParallelData * data )  [static]
```

Function to optimize on a thread.

Returns

NULL.

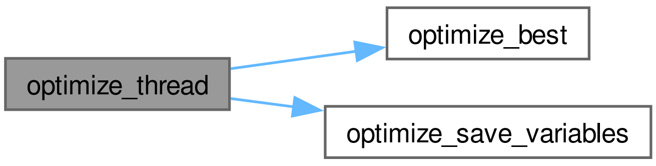
Parameters

data	Function data.

Definition at line 553 of file optimize.c.

```
{
  unsigned int i, thread;
  double e;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_thread: start\n");
#endif
  thread = data->thread;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_thread: thread=%u start=%u end=%u\n", thread,
           optimize->thread[thread], optimize->thread[thread + 1]);
#endif
  for (i = optimize->thread[thread]; i < optimize->thread[thread + 1]; ++i)
    {
      e = optimize_norm (i);
      g_mutex_lock (mutex);
      optimize_best (i, e);
      optimize_save_variables (i, e);
      if (e < optimize->threshold)
        optimize->stop = 1;
      g_mutex_unlock (mutex);
      if (optimize->stop)
        break;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_thread: i=%u e=%lg\n", i, e);
#endif
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_thread: end\n");
#endif
  g_thread_exit (NULL);
  return NULL;
}
```

Here is the call graph for this function:



4.21.4 Variable Documentation

4.21.4.1 nthreads_climbing

```
unsigned int nthreads_climbing
```

Number of threads for the hill climbing method.

Definition at line 84 of file optimize.c.

4.21.4.2 optimize

```
Optimize optimize[1]
```

Optimization data.

Definition at line 83 of file optimize.c.

4.21.4.3 optimize_algorithm

```
void(* optimize_algorithm) () ( )  [static]
```

Pointer to the function to perform a optimization algorithm step.

Definition at line 87 of file optimize.c.

4.21.4.4 optimize_estimate_climbing

```
double(* optimize_estimate_climbing) (unsigned int variable, unsigned int estimate) (
             unsigned int variable,
             unsigned int estimate )  [static]
```

Pointer to the function to estimate the climbing.

Definition at line 89 of file optimize.c.

4.21.4.5 optimize_norm

```
double(* optimize_norm) (unsigned int simulation) (
             unsigned int simulation )  [static]
```

Pointer to the error norm function.

Definition at line 92 of file optimize.c.

4.22 optimize.c

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#define _GNU_SOURCE
#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>
#ifdef G_OS_WIN32
#include <windows.h>
#elif !defined(__BSD_VISIBLE) && !defined(NetBSD)
#include <alloca.h>
#endif
#if HAVE_MPI
#include <mpi.h>
#endif
#include "jb/src/jb_win.h"
#include "genetic/genetic.h"
#include "tools.h"
#include "experiment.h"
#include "variable.h"
#include "input.h"
#include "optimize.h"

#define DEBUG_OPTIMIZE 0

#ifdef G_OS_WIN32
#define CP "copy"
#define RM "del"
#else
#define CP "cp"
#define RM "rm"
#endif

Optimize optimize[1];
unsigned int nthreads_climbing;

static void (*optimize_algorithm) ();
static double (*optimize_estimate_climbing) (unsigned int variable,
                                             unsigned int estimate);
static double (*optimize_norm) (unsigned int simulation);

static inline void
optimize_input (unsigned int simulation,
                char *input,
                GMappedFile * stencil)
{
  char buffer[256], value[32];
  GRegex *regex;
  FILE *file;
  char *buffer2, *buffer3 = NULL, *content;
  gsize length;
  unsigned int i;

#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_input: start\n");
#endif

  // Checking the file
  if (!stencil)
    goto optimize_input_end;

  // Opening stencil
  content = g_mapped_file_get_contents (stencil);
  length = g_mapped_file_get_length (stencil);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_input: length=%lu\ncontent:\n%s", length, content);
#endif
  file = g_fopen (input, "w");

  // Parsing stencil
  for (i = 0; i < optimize->nvariables; ++i)
    {
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_input: variable=%u\n", i);
#endif
      snprintf (buffer, 32, "@variable%u@", i + 1);
      regex = g_regex_new (buffer, (GRegexCompileFlags) 0, (GRegexMatchFlags) 0,
                           NULL);
      if (i == 0)
        {
          buffer2 = g_regex_replace_literal (regex, content, length, 0,
                                             optimize->label[i],
                                             (GRegexMatchFlags) 0, NULL);
#if DEBUG_OPTIMIZE
          fprintf (stderr, "optimize_input: buffer2\n%s", buffer2);
#endif
        }
      else
        {
          length = strlen (buffer3);
          buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
                                             optimize->label[i],
                                             (GRegexMatchFlags) 0, NULL);
          g_free (buffer3);
        }
      g_regex_unref (regex);
      length = strlen (buffer2);
      snprintf (buffer, 32, "@value%u@", i + 1);
      regex = g_regex_new (buffer, (GRegexCompileFlags) 0, (GRegexMatchFlags) 0,
                           NULL);
      snprintf (value, 32, format[optimize->precision[i]],
                optimize->value[simulation * optimize->nvariables + i]);

#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_input: value=%s\n", value);
#endif
      buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
                                         (GRegexMatchFlags) 0, NULL);
      g_free (buffer2);
      g_regex_unref (regex);
    }

  // Saving input file
  fwrite (buffer3, strlen (buffer3), sizeof (char), file);
  g_free (buffer3);
  fclose (file);

optimize_input_end:
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_input: end\n");
#endif
  return;
}

static double
optimize_parse (unsigned int simulation,
                unsigned int experiment)
{
  char buffer[512], cinput[MAX_NINPUTS][32], output[32], result[32], *buffer2,
    *buffer3, *buffer4;
  FILE *file_result;
  double e;
  unsigned int i;
  unsigned int flags = 1;

#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_parse: start\n");
  fprintf (stderr, "optimize_parse: simulation=%u experiment=%u\n",
           simulation, experiment);
#endif

  // Opening input files
  for (i = 0; i < optimize->ninputs; ++i)
    {
      snprintf (&cinput[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_parse: i=%u input=%s\n", i, &cinput[i][0]);
#endif
      // Checking simple copy
      if (optimize->template_flags & flags)
        optimize_input (simulation, &cinput[i][0],
                        optimize->file[i][experiment]);
      else
        {
          buffer2 = input->experiment[experiment].stencil[i];
          snprintf (buffer, 512, CP " %s %s", buffer2, &cinput[i][0]);
          if (system (buffer) == -1)
            error_message = g_strdup (buffer);
        }
      flags «= 1;
    }
  for (; i < MAX_NINPUTS; ++i)
    strcpy (&cinput[i][0], "");
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_parse: parsing end\n");
#endif

  // Performing the simulation
  snprintf (output, 32, "output-%u-%u", simulation, experiment);
  buffer2 = g_path_get_dirname (optimize->simulator);
  buffer3 = g_path_get_basename (optimize->simulator);
  buffer4 = g_build_filename (buffer2, buffer3, NULL);
  snprintf (buffer, 512, "\"%s\" %s %s %s %s %s %s %s %s %s",
            buffer4, cinput[0], cinput[1], cinput[2], cinput[3], cinput[4],
            cinput[5], cinput[6], cinput[7], output);
  g_free (buffer4);
  g_free (buffer3);
  g_free (buffer2);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_parse: %s\n", buffer);
#endif
  if (system (buffer) == -1)
    error_message = g_strdup (buffer);

  // Checking the objective value function
  if (optimize->evaluator)
    {
      snprintf (result, 32, "result-%u-%u", simulation, experiment);
      buffer2 = g_path_get_dirname (optimize->evaluator);
      buffer3 = g_path_get_basename (optimize->evaluator);
      buffer4 = g_build_filename (buffer2, buffer3, NULL);
      snprintf (buffer, 512, "\"%s\" %s %s %s",
                buffer4, output, optimize->experiment[experiment], result);
      g_free (buffer4);
      g_free (buffer3);
      g_free (buffer2);
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_parse: %s\n", buffer);
      fprintf (stderr, "optimize_parse: result=%s\n", result);
#endif
      if (system (buffer) == -1)
        error_message = g_strdup (buffer);
      file_result = g_fopen (result, "r");
      e = atof (fgets (buffer, 512, file_result));
      fclose (file_result);
    }
  else
    {
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_parse: output=%s\n", output);
#endif
      strcpy (result, "");
      file_result = g_fopen (output, "r");
      e = atof (fgets (buffer, 512, file_result));
      fclose (file_result);
    }

  // Removing files
  if (optimize->cleaner)
    {
      buffer2 = g_path_get_dirname (optimize->cleaner);
      buffer3 = g_path_get_basename (optimize->cleaner);
      buffer4 = g_build_filename (buffer2, buffer3, NULL);
      snprintf (buffer, 512, "\"%s\"", buffer4);
      g_free (buffer4);
      g_free (buffer3);
      g_free (buffer2);
      if (system (buffer) == -1)
        error_message = g_strdup (buffer);
    }
#if !DEBUG_OPTIMIZE
  for (i = 0; i < optimize->ninputs; ++i)
    {
      if (optimize->file[i][0])
        {
          snprintf (buffer, 512, RM " %s", &cinput[i][0]);
          if (system (buffer) == -1)
            error_message = g_strdup (buffer);
        }
    }
  snprintf (buffer, 512, RM " %s %s", output, result);
  if (system (buffer) == -1)
    error_message = g_strdup (buffer);
#endif

  // Processing pending events
  if (show_pending)
    show_pending ();

#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_parse: end\n");
#endif

  // Returning the objective function
  return e * optimize->weight[experiment];
}

```

```
static double
optimize_norm_euclidian (unsigned int simulation)
{
  double e, ei;
  unsigned int i;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_euclidian: start\n");
#endif
  e = 0.;
  for (i = 0; i < optimize->nexperiments; ++i)
    {
      ei = optimize_parse (simulation, i);
      e += ei * ei;
    }
  e = sqrt (e);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_euclidian: error=%lg\n", e);
  fprintf (stderr, "optimize_norm_euclidian: end\n");
#endif
  return e;
}

static double
optimize_norm_maximum (unsigned int simulation)
{
  double e, ei;
  unsigned int i;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_maximum: start\n");
#endif
  e = 0.;
  for (i = 0; i < optimize->nexperiments; ++i)
    {
      ei = fabs (optimize_parse (simulation, i));
      e = fmax (e, ei);
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_maximum: error=%lg\n", e);
  fprintf (stderr, "optimize_norm_maximum: end\n");
#endif
  return e;
}

static double
optimize_norm_p (unsigned int simulation)
{
  double e, ei;
  unsigned int i;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_p: start\n");
#endif
  e = 0.;
  for (i = 0; i < optimize->nexperiments; ++i)
    {
      ei = fabs (optimize_parse (simulation, i));
      e += pow (ei, optimize->p);
    }
  e = pow (e, 1. / optimize->p);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_p: error=%lg\n", e);
  fprintf (stderr, "optimize_norm_p: end\n");
#endif
  return e;
}

static double
optimize_norm_taxicab (unsigned int simulation)
{
  double e;
  unsigned int i;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_taxicab: start\n");
#endif
  e = 0.;
  for (i = 0; i < optimize->nexperiments; ++i)
    e += fabs (optimize_parse (simulation, i));
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_norm_taxicab: error=%lg\n", e);
  fprintf (stderr, "optimize_norm_taxicab: end\n");
#endif
  return e;
}

static void
optimize_print ()
{
  unsigned int i;
  char buffer[512];
#if HAVE_MPI
  if (optimize->mpi_rank)
    return;
#endif
  printf ("%s\n", _("Best result"));
  fprintf (optimize->file_result, "%s\n", _("Best result"));
  printf ("error = %.15le\n", optimize->error_old[0]);
  fprintf (optimize->file_result, "error = %.15le\n", optimize->error_old[0]);
  for (i = 0; i < optimize->nvariables; ++i)
    {
      snprintf (buffer, 512, "%s = %s\n",
                optimize->label[i], format[optimize->precision[i]]);
      printf (buffer, optimize->value_old[i]);
      fprintf (optimize->file_result, buffer, optimize->value_old[i]);
    }
  fflush (optimize->file_result);
}

static void
optimize_save_variables (unsigned int simulation,
                         double error)
{
  unsigned int i;
  char buffer[64];
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_save_variables: start\n");
#endif
  for (i = 0; i < optimize->nvariables; ++i)
    {
      snprintf (buffer, 64, "%s ", format[optimize->precision[i]]);
      fprintf (optimize->file_variables, buffer,
               optimize->value[simulation * optimize->nvariables + i]);
    }
  fprintf (optimize->file_variables, "%.14le\n", error);
  fflush (optimize->file_variables);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_save_variables: end\n");
#endif
}

static void
optimize_best (unsigned int simulation,
               double value)
{
  unsigned int i, j;
  double e;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_best: start\n");
  fprintf (stderr, "optimize_best: nsaveds=%u nbest=%u\n",
           optimize->nsaveds, optimize->nbest);
#endif
  if (optimize->nsaveds < optimize->nbest
      || value < optimize->error_best[optimize->nsaveds - 1])
    {
      if (optimize->nsaveds < optimize->nbest)
        ++optimize->nsaveds;
      optimize->error_best[optimize->nsaveds - 1] = value;
      optimize->simulation_best[optimize->nsaveds - 1] = simulation;
      for (i = optimize->nsaveds; --i;)
        {
          if (optimize->error_best[i] < optimize->error_best[i - 1])
            {
              j = optimize->simulation_best[i];
              e = optimize->error_best[i];
              optimize->simulation_best[i] = optimize->simulation_best[i - 1];
              optimize->error_best[i] = optimize->error_best[i - 1];
              optimize->simulation_best[i - 1] = j;
              optimize->error_best[i - 1] = e;
            }
          else
            break;
        }
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_best: end\n");
#endif
}

static void
optimize_sequential ()
{
  unsigned int i;
  double e;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_sequential: start\n");
  fprintf (stderr, "optimize_sequential: nstart=%u nend=%u\n",
           optimize->nstart, optimize->nend);
#endif
  for (i = optimize->nstart; i < optimize->nend; ++i)
    {
      e = optimize_norm (i);
      optimize_best (i, e);
      optimize_save_variables (i, e);
      if (e < optimize->threshold)
        {
          optimize->stop = 1;
          break;
        }
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_sequential: i=%u e=%lg\n", i, e);
#endif
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_sequential: end\n");
#endif
}

static void *
optimize_thread (ParallelData * data)
{
  unsigned int i, thread;
  double e;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_thread: start\n");
#endif
  thread = data->thread;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_thread: thread=%u start=%u end=%u\n", thread,
           optimize->thread[thread], optimize->thread[thread + 1]);
#endif
  for (i = optimize->thread[thread]; i < optimize->thread[thread + 1]; ++i)
    {
      e = optimize_norm (i);
      g_mutex_lock (mutex);
      optimize_best (i, e);
      optimize_save_variables (i, e);
      if (e < optimize->threshold)
        optimize->stop = 1;
      g_mutex_unlock (mutex);
      if (optimize->stop)
        break;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_thread: i=%u e=%lg\n", i, e);
#endif
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_thread: end\n");
#endif
  g_thread_exit (NULL);
  return NULL;
}

static inline void
optimize_merge (unsigned int nsaveds,
                unsigned int *simulation_best,
                double *error_best)
{
  unsigned int i, j, k, s[optimize->nbest];
  double e[optimize->nbest];
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_merge: start\n");
#endif
  i = j = k = 0;
  do
    {
      if (i == optimize->nsaveds)
        {
          s[k] = simulation_best[j];
          e[k] = error_best[j];
          ++j;
          ++k;
          if (j == nsaveds)
            break;
        }
      else if (j == nsaveds)
        {
          s[k] = optimize->simulation_best[i];
          e[k] = optimize->error_best[i];
          ++i;
          ++k;
          if (i == optimize->nsaveds)
            break;
        }
      else if (optimize->error_best[i] > error_best[j])
        {
          s[k] = simulation_best[j];
          e[k] = error_best[j];
          ++j;
          ++k;
        }
      else
        {
          s[k] = optimize->simulation_best[i];
          e[k] = optimize->error_best[i];
          ++i;
          ++k;
        }
    }
  while (k < optimize->nbest);
  optimize->nsaveds = k;
  memcpy (optimize->simulation_best, s, k * sizeof (unsigned int));
  memcpy (optimize->error_best, e, k * sizeof (double));
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_merge: end\n");
#endif
}

#if HAVE_MPI
static void
optimize_synchronise ()
{
  unsigned int i, nsaveds, simulation_best[optimize->nbest], stop;
  double error_best[optimize->nbest];
  MPI_Status mpi_stat;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_synchronise: start\n");
#endif
  if (optimize->mpi_rank == 0)
    {
      for (i = 1; (int) i < ntasks; ++i)
        {
          MPI_Recv (&nsaveds, 1, MPI_INT, i, 1, MPI_COMM_WORLD, &mpi_stat);
          MPI_Recv (simulation_best, nsaveds, MPI_INT, i, 1,
                    MPI_COMM_WORLD, &mpi_stat);
          MPI_Recv (error_best, nsaveds, MPI_DOUBLE, i, 1,
                    MPI_COMM_WORLD, &mpi_stat);
          optimize_merge (nsaveds, simulation_best, error_best);
          MPI_Recv (&stop, 1, MPI_UNSIGNED, i, 1, MPI_COMM_WORLD, &mpi_stat);
          if (stop)
            optimize->stop = 1;
        }
      for (i = 1; (int) i < ntasks; ++i)
        MPI_Send (&optimize->stop, 1, MPI_UNSIGNED, i, 1, MPI_COMM_WORLD);
    }
  else
    {
      MPI_Send (&optimize->nsaveds, 1, MPI_INT, 0, 1, MPI_COMM_WORLD);
      MPI_Send (optimize->simulation_best, optimize->nsaveds, MPI_INT, 0, 1,
                MPI_COMM_WORLD);
      MPI_Send (optimize->error_best, optimize->nsaveds, MPI_DOUBLE, 0, 1,
                MPI_COMM_WORLD);
      MPI_Send (&optimize->stop, 1, MPI_UNSIGNED, 0, 1, MPI_COMM_WORLD);
      MPI_Recv (&stop, 1, MPI_UNSIGNED, 0, 1, MPI_COMM_WORLD, &mpi_stat);
      if (stop)
        optimize->stop = 1;
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_synchronise: end\n");
#endif
}
#endif

static void
optimize_sweep ()
{
  ParallelData data[nthreads];
  GThread *thread[nthreads];
  double range[optimize->nvariables];
  double e;
  unsigned int i, j, k, l;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_sweep: start\n");
#endif
  for (j = 0; j < optimize->nvariables; ++j)
    range[j] = (optimize->rangemax[j] - optimize->rangemin[j])
      / (optimize->nsweeps[j] - 1);
  for (i = 0; i < optimize->nsimulations; ++i)
    {
      k = i;
      for (j = 0; j < optimize->nvariables; ++j)
```

```
        {
          l = k % optimize->nsweeps[j];
          k /= optimize->nsweeps[j];
          e = optimize->rangemin[j];
          if (optimize->nsweeps[j] > 1)
            e += l * range[j];
          optimize->value[i * optimize->nvariables + j] = e;
        }
    }
  optimize->nsaveds = 0;
  if (nthreads <= 1)
    optimize_sequential ();
  else
    {
      for (i = 0; i < nthreads; ++i)
        {
          data[i].thread = i;
          thread[i]
            = g_thread_new (NULL, (GThreadFunc) optimize_thread, &data[i]);
        }
      for (i = 0; i < nthreads; ++i)
        g_thread_join (thread[i]);
    }
#if HAVE_MPI
  // Communicating tasks results
  optimize_synchronise ();
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_sweep: end\n");
#endif
}

static void
optimize_MonteCarlo ()
{
  ParallelData data[nthreads];
  GThread *thread[nthreads];
  double range[optimize->nvariables];
  unsigned int i, j;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_MonteCarlo: start\n");
#endif
  for (j = 0; j < optimize->nvariables; ++j)
    range[j] = optimize->rangemax[j] - optimize->rangemin[j];
  for (i = 0; i < optimize->nsimulations; ++i)
    for (j = 0; j < optimize->nvariables; ++j)
      optimize->value[i * optimize->nvariables + j]
        = optimize->rangemin[j] + gsl_rng_uniform (optimize->rng) * range[j];
  optimize->nsaveds = 0;
  if (nthreads <= 1)
    optimize_sequential ();
  else
    {
      for (i = 0; i < nthreads; ++i)
        {
          data[i].thread = i;
          thread[i]
            = g_thread_new (NULL, (GThreadFunc) optimize_thread, &data[i]);
        }
      for (i = 0; i < nthreads; ++i)
        g_thread_join (thread[i]);
    }
#if HAVE_MPI
  // Communicating tasks results
  optimize_synchronise ();
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_MonteCarlo: end\n");
#endif
}

static void
optimize_orthogonal ()
{
  ParallelData data[nthreads];
  GThread *thread[nthreads];
  double range[optimize->nvariables];
  double e;
  unsigned int i, j, k, l;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_orthogonal: start\n");
#endif
  for (j = 0; j < optimize->nvariables; ++j)
    range[j] = (optimize->rangemax[j] - optimize->rangemin[j])
      / optimize->nsweeps[j];
  for (i = 0; i < optimize->nsimulations; ++i)
    {
      k = i;
      for (j = 0; j < optimize->nvariables; ++j)
        {
          l = k % optimize->nsweeps[j];
          k /= optimize->nsweeps[j];
          e = optimize->rangemin[j];
          if (optimize->nsweeps[j] > 1)
            e += (l + gsl_rng_uniform (optimize->rng)) * range[j];
          optimize->value[i * optimize->nvariables + j] = e;
        }
    }
  optimize->nsaveds = 0;
  if (nthreads <= 1)
    optimize_sequential ();
  else
    {
      for (i = 0; i < nthreads; ++i)
        {
          data[i].thread = i;
          thread[i]
            = g_thread_new (NULL, (GThreadFunc) optimize_thread, &data[i]);
        }
      for (i = 0; i < nthreads; ++i)
        g_thread_join (thread[i]);
    }
#if HAVE_MPI
  // Communicating tasks results
  optimize_synchronise ();
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_orthogonal: end\n");
#endif
}

static void
optimize_best_climbing (unsigned int simulation,
                        double value)
{
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_best_climbing: start\n");
  fprintf (stderr,
           "optimize_best_climbing: simulation=%u value=%.14le best=%.14le\n",
           simulation, value, optimize->error_best[0]);
#endif
  if (value < optimize->error_best[0])
    {
      optimize->error_best[0] = value;
      optimize->simulation_best[0] = simulation;
#if DEBUG_OPTIMIZE
      fprintf (stderr,
               "optimize_best_climbing: BEST simulation=%u value=%.14le\n",
               simulation, value);
#endif
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_best_climbing: end\n");
#endif
}

static inline void
optimize_climbing_sequential (unsigned int simulation)
{
  double e;
  unsigned int i, j;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_sequential: start\n");
  fprintf (stderr, "optimize_climbing_sequential: nstart_climbing=%u "
           "nend_climbing=%u\n",
           optimize->nstart_climbing, optimize->nend_climbing);
#endif
  for (i = optimize->nstart_climbing; i < optimize->nend_climbing; ++i)
    {
      j = simulation + i;
      e = optimize_norm (j);
      optimize_best_climbing (j, e);
      optimize_save_variables (j, e);
      if (e < optimize->threshold)
        {
          optimize->stop = 1;
          break;
        }
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_climbing_sequential: i=%u e=%lg\n", i, e);
#endif
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_sequential: end\n");
```

```
#endif
}

static void *
optimize_climbing_thread (ParallelData * data)
{
  unsigned int i, thread;
  double e;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_thread: start\n");
#endif
  thread = data->thread;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_thread: thread=%u start=%u end=%u\n",
           thread,
           optimize->thread_climbing[thread],
           optimize->thread_climbing[thread + 1]);
#endif
  for (i = optimize->thread_climbing[thread];
       i < optimize->thread_climbing[thread + 1]; ++i)
    {
      e = optimize_norm (i);
      g_mutex_lock (mutex);
      optimize_best_climbing (i, e);
      optimize_save_variables (i, e);
      if (e < optimize->threshold)
        optimize->stop = 1;
      g_mutex_unlock (mutex);
      if (optimize->stop)
        break;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_climbing_thread: i=%u e=%lg\n", i, e);
#endif
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_thread: end\n");
#endif
  g_thread_exit (NULL);
  return NULL;
}

static double
optimize_estimate_climbing_random (unsigned int variable,
                                    unsigned int estimate
                                    __attribute__((unused)))
{
  double x;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_estimate_climbing_random: start\n");
#endif
  x = optimize->climbing[variable]
    + (1. - 2. * gsl_rng_uniform (optimize->rng)) * optimize->step[variable];
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_estimate_climbing_random: climbing%u=%lg\n",
           variable, x);
  fprintf (stderr, "optimize_estimate_climbing_random: end\n");
#endif
  return x;
}

static double
optimize_estimate_climbing_coordinates (unsigned int variable,
                                         unsigned int estimate)
{
  double x;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_estimate_climbing_coordinates: start\n");
#endif
  x = optimize->climbing[variable];
  if (estimate >= (2 * variable) && estimate < (2 * variable + 2))
    {
      if (estimate & 1)
        x += optimize->step[variable];
      else
        x -= optimize->step[variable];
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr,
           "optimize_estimate_climbing_coordinates: climbing%u=%lg\n",
           variable, x);
  fprintf (stderr, "optimize_estimate_climbing_coordinates: end\n");
#endif
  return x;
}

static inline void
optimize_step_climbing (unsigned int simulation)
```

```
{
  GThread *thread[nthreads_climbing];
  ParallelData data[nthreads_climbing];
  unsigned int i, j, k, b;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_step_climbing: start\n");
#endif
  for (i = 0; i < optimize->nestimates; ++i)
    {
      k = (simulation + i) * optimize->nvariables;
      b = optimize->simulation_best[0] * optimize->nvariables;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_step_climbing: simulation=%u best=%u\n",
               simulation + i, optimize->simulation_best[0]);
#endif
      for (j = 0; j < optimize->nvariables; ++j, ++k, ++b)
        {
#if DEBUG_OPTIMIZE
          fprintf (stderr,
                   "optimize_step_climbing: estimate=%u best%u=%.14le\n",
                   i, j, optimize->value[b]);
#endif
          optimize->value[k]
            = optimize->value[b] + optimize_estimate_climbing (j, i);
          optimize->value[k] = fmin (fmax (optimize->value[k],
                                           optimize->rangeminabs[j]),
                                     optimize->rangemaxabs[j]);
#if DEBUG_OPTIMIZE
          fprintf (stderr,
                   "optimize_step_climbing: estimate=%u variable%u=%.14le\n",
                   i, j, optimize->value[k]);
#endif
        }
    }
  if (nthreads_climbing == 1)
    optimize_climbing_sequential (simulation);
  else
    {
      for (i = 0; i <= nthreads_climbing; ++i)
        {
          optimize->thread_climbing[i]
            = simulation + optimize->nstart_climbing
            + i * (optimize->nend_climbing - optimize->nstart_climbing)
            / nthreads_climbing;
#if DEBUG_OPTIMIZE
          fprintf (stderr,
                   "optimize_step_climbing: i=%u thread_climbing=%u\n",
                   i, optimize->thread_climbing[i]);
#endif
        }
      for (i = 0; i < nthreads_climbing; ++i)
        {
          data[i].thread = i;
          thread[i] = g_thread_new
            (NULL, (GThreadFunc) optimize_climbing_thread, &data[i]);
        }
      for (i = 0; i < nthreads_climbing; ++i)
        g_thread_join (thread[i]);
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_step_climbing: end\n");
#endif
}

static inline void
optimize_climbing_best ()
{
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_best: start\n");
#endif
  optimize->simulation_best[0] = 0;
  memcpy (optimize->value, optimize->value_old,
          optimize->nvariables * sizeof (double));
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing_best: end\n");
#endif
}

static inline void
optimize_climbing (unsigned int nsteps)
{
  unsigned int i, j, k, b, s, adjust;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing: start\n");
#endif
  for (i = 0; i < optimize->nvariables; ++i)
    optimize->climbing[i] = 0.;
  b = optimize->simulation_best[0] * optimize->nvariables;
  s = optimize->nsimulations;
  adjust = 1;
  for (i = 0; i < nsteps; ++i, s += optimize->nestimates, b = k)
    {
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_climbing: step=%u old_best=%u\n",
               i, optimize->simulation_best[0]);
#endif
      optimize_step_climbing (s);
      k = optimize->simulation_best[0] * optimize->nvariables;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_climbing: step=%u best=%u\n",
               i, optimize->simulation_best[0]);
#endif
      if (k == b)
        {
          if (adjust)
            for (j = 0; j < optimize->nvariables; ++j)
              optimize->step[j] *= 0.5;
          for (j = 0; j < optimize->nvariables; ++j)
            optimize->climbing[j] = 0.;
          adjust = 1;
        }
      else
        {
          for (j = 0; j < optimize->nvariables; ++j)
            {
#if DEBUG_OPTIMIZE
              fprintf (stderr,
                       "optimize_climbing: best%u=%.14le old%u=%.14le\n",
                       j, optimize->value[k + j], j, optimize->value[b + j]);
#endif
              optimize->climbing[j]
                = (1. - optimize->relaxation) * optimize->climbing[j]
                + optimize->relaxation
                * (optimize->value[k + j] - optimize->value[b + j]);
#if DEBUG_OPTIMIZE
              fprintf (stderr, "optimize_climbing: climbing%u=%.14le\n",
                       j, optimize->climbing[j]);
#endif
            }
          adjust = 0;
        }
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_climbing: end\n");
#endif
}

static double
optimize_genetic_objective (Entity * entity)
{
  unsigned int j;
  double objective;
  char buffer[64];
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_genetic_objective: start\n");
#endif
  for (j = 0; j < optimize->nvariables; ++j)
    {
      optimize->value[entity->id * optimize->nvariables + j]
        = genetic_get_variable (entity, optimize->genetic_variable + j);
    }
  objective = optimize_norm (entity->id);
  g_mutex_lock (mutex);
  for (j = 0; j < optimize->nvariables; ++j)
    {
      snprintf (buffer, 64, "%s ", format[optimize->precision[j]]);
      fprintf (optimize->file_variables, buffer,
               genetic_get_variable (entity, optimize->genetic_variable + j));
    }
  fprintf (optimize->file_variables, "%.14le\n", objective);
  g_mutex_unlock (mutex);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_genetic_objective: end\n");
#endif
  return objective;
}

static void
optimize_genetic ()
{
  double *best_variable = NULL;
  char *best_genome = NULL;
  double best_objective = 0.;
#if DEBUG_OPTIMIZE
```

```
  fprintf (stderr, "optimize_genetic: start\n");
  fprintf (stderr, "optimize_genetic: ntasks=%u nthreads=%u\n", ntasks,
           nthreads);
  fprintf (stderr,
           "optimize_genetic: nvariables=%u population=%u generations=%u\n",
           optimize->nvariables, optimize->nsimulations, optimize->niterations);
  fprintf (stderr,
           "optimize_genetic: mutation=%lg reproduction=%lg adaptation=%lg\n",
           optimize->mutation_ratio, optimize->reproduction_ratio,
           optimize->adaptation_ratio);
#endif
  genetic_algorithm_default (optimize->nvariables,
                             optimize->genetic_variable,
                             optimize->nsimulations,
                             optimize->niterations,
                             optimize->mutation_ratio,
                             optimize->reproduction_ratio,
                             optimize->adaptation_ratio,
                             optimize->seed,
                             optimize->threshold,
                             &optimize_genetic_objective,
                             &best_genome, &best_variable, &best_objective);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_genetic: the best\n");
#endif
  optimize->error_old = (double *) g_malloc (sizeof (double));
  optimize->value_old
    = (double *) g_malloc (optimize->nvariables * sizeof (double));
  optimize->error_old[0] = best_objective;
  memcpy (optimize->value_old, best_variable,
          optimize->nvariables * sizeof (double));
  g_free (best_genome);
  g_free (best_variable);
  optimize_print ();
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_genetic: end\n");
#endif
}

static inline void
optimize_save_old ()
{
  unsigned int i, j;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_save_old: start\n");
  fprintf (stderr, "optimize_save_old: nsaveds=%u\n", optimize->nsaveds);
#endif
  memcpy (optimize->error_old, optimize->error_best,
          optimize->nbest * sizeof (double));
  for (i = 0; i < optimize->nbest; ++i)
    {
      j = optimize->simulation_best[i];
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_save_old: i=%u j=%u\n", i, j);
#endif
      memcpy (optimize->value_old + i * optimize->nvariables,
              optimize->value + j * optimize->nvariables,
              optimize->nvariables * sizeof (double));
    }
#if DEBUG_OPTIMIZE
  for (i = 0; i < optimize->nvariables; ++i)
    fprintf (stderr, "optimize_save_old: best variable %u=%lg\n",
             i, optimize->value_old[i]);
  fprintf (stderr, "optimize_save_old: end\n");
#endif
}

static inline void
optimize_merge_old ()
{
  unsigned int i, j, k;
  double v[optimize->nbest * optimize->nvariables], e[optimize->nbest],
    *enew, *eold;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_merge_old: start\n");
#endif
  enew = optimize->error_best;
  eold = optimize->error_old;
  i = j = k = 0;
  do
    {
      if (*enew < *eold)
        {
          memcpy (v + k * optimize->nvariables,
                  optimize->value
                  + optimize->simulation_best[i] * optimize->nvariables,
                  optimize->nvariables * sizeof (double));
          e[k] = *enew;
          ++k;
          ++enew;
          ++i;
        }
      else
        {
          memcpy (v + k * optimize->nvariables,
                  optimize->value_old + j * optimize->nvariables,
                  optimize->nvariables * sizeof (double));
          e[k] = *eold;
          ++k;
          ++eold;
          ++j;
        }
    }
  while (k < optimize->nbest);
  memcpy (optimize->value_old, v, k * optimize->nvariables * sizeof (double));
  memcpy (optimize->error_old, e, k * sizeof (double));
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_merge_old: end\n");
#endif
}

static inline void
optimize_refine ()
{
  unsigned int i, j;
  double d;
#if HAVE_MPI
  MPI_Status mpi_stat;
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_refine: start\n");
#endif
#if HAVE_MPI
  if (!optimize->mpi_rank)
    {
#endif
      for (j = 0; j < optimize->nvariables; ++j)
        {
          optimize->rangemin[j] = optimize->rangemax[j]
            = optimize->value_old[j];
          optimize->step[j] = input->variable[j].step;
        }
      for (i = 0; ++i < optimize->nbest;)
        {
          for (j = 0; j < optimize->nvariables; ++j)
            {
              optimize->rangemin[j]
                = fmin (optimize->rangemin[j],
                        optimize->value_old[i * optimize->nvariables + j]);
              optimize->rangemax[j]
                = fmax (optimize->rangemax[j],
                        optimize->value_old[i * optimize->nvariables + j]);
            }
        }
      for (j = 0; j < optimize->nvariables; ++j)
        {
          d = optimize->tolerance
            * (optimize->rangemax[j] - optimize->rangemin[j]);
          switch (optimize->algorithm)
            {
            case ALGORITHM_MONTE_CARLO:
              d *= 0.5;
              break;
            default:
              if (optimize->nsweeps[j] > 1)
                d /= optimize->nsweeps[j] - 1;
              else
                d = 0.;
            }
          optimize->rangemin[j] -= d;
          optimize->rangemin[j]
            = fmax (optimize->rangemin[j], optimize->rangeminabs[j]);
          optimize->rangemax[j] += d;
          optimize->rangemax[j]
            = fmin (optimize->rangemax[j], optimize->rangemaxabs[j]);
          printf ("%s min=%lg max=%lg\n", optimize->label[j],
                  optimize->rangemin[j], optimize->rangemax[j]);
          fprintf (optimize->file_result, "%s min=%lg max=%lg\n",
                   optimize->label[j], optimize->rangemin[j],
                   optimize->rangemax[j]);
        }
#if HAVE_MPI
      for (i = 1; (int) i < ntasks; ++i)
        {
          MPI_Send (optimize->rangemin, optimize->nvariables, MPI_DOUBLE, i,
                    1, MPI_COMM_WORLD);
          MPI_Send (optimize->rangemax, optimize->nvariables, MPI_DOUBLE, i,
                    1, MPI_COMM_WORLD);
        }
    }
  else
    {
      MPI_Recv (optimize->rangemin, optimize->nvariables, MPI_DOUBLE, 0, 1,
                MPI_COMM_WORLD, &mpi_stat);
      MPI_Recv (optimize->rangemax, optimize->nvariables, MPI_DOUBLE, 0, 1,
                MPI_COMM_WORLD, &mpi_stat);
    }
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_refine: end\n");
#endif
}

static void
optimize_step ()
{
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_step: start\n");
#endif
  optimize_algorithm ();
  if (optimize->nsteps)
    optimize_climbing (optimize->nsteps);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_step: end\n");
#endif
}

static inline void
optimize_iterate ()
{
  unsigned int i;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_iterate: start\n");
#endif
  optimize->error_old = (double *) g_malloc (optimize->nbest * sizeof (double));
  optimize->value_old =
    (double *) g_malloc (optimize->nbest * optimize->nvariables *
                         sizeof (double));
  optimize_step ();
  optimize_save_old ();
  optimize_refine ();
  optimize_print ();
  for (i = 1; i < optimize->niterations && !optimize->stop; ++i)
    {
      optimize_step ();
      optimize_merge_old ();
      optimize_refine ();
      optimize_print ();
    }
  if (optimize->nfinal_steps && !optimize->stop)
    {
      optimize_climbing_best ();
      optimize_climbing (optimize->nfinal_steps);
      optimize_merge_old ();
      optimize_print ();
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_iterate: end\n");
#endif
}

static inline void
optimize_save_optimal ()
{
  char cinput[32];
  unsigned int i, j;
  unsigned int flags = 1;

  // Getting optimal values
  memcpy (optimize->value, optimize->value_old,
          optimize->nvariables * sizeof (double));

  // Saving optimal input files
  for (i = 0; i < optimize->ninputs; ++i)
    for (j = 0; j < optimize->nexperiments; ++j)
      {
        snprintf (cinput, 32, "optimal-%u-%u", i, j);
#if DEBUG_OPTIMIZE
        fprintf (stderr, "optimize_save_optimal: i=%u j=%u input=%s\n",
                 i, j, cinput);
#endif
```

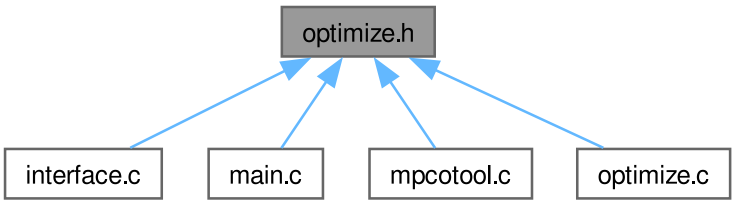
```
      // Checking templates
      if (optimize->template_flags & flags)
        optimize_input (0, cinput, optimize->file[i][j]);
      flags «= 1;
    }
}

void
optimize_free ()
{
  unsigned int i, j;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_free: start\n");
#endif
  for (j = 0; j < optimize->ninputs; ++j)
    {
      for (i = 0; i < optimize->nexperiments; ++i)
        g_mapped_file_unref (optimize->file[j][i]);
      g_free (optimize->file[j]);
    }
  g_free (optimize->error_old);
  g_free (optimize->value_old);
  g_free (optimize->value);
  g_free (optimize->genetic_variable);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_free: end\n");
#endif
}

void
optimize_open ()
{
  GTimeZone *tz;
  GDateTime *t0, *t;
  unsigned int i, j, nsteps;

#if DEBUG_OPTIMIZE
  char *buffer;
  fprintf (stderr, "optimize_open: start\n");
#endif

  // Getting initial time
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: getting initial time\n");
#endif
  tz = g_time_zone_new_utc ();
  t0 = g_date_time_new_now (tz);

  // Obtaining and initing the pseudo-random numbers generator seed
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: getting initial seed\n");
#endif
  if (optimize->seed == DEFAULT_RANDOM_SEED)
    optimize->seed = input->seed;
  gsl_rng_set (optimize->rng, optimize->seed);

  // Obtaining template flags
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: getting template flags\n");
#endif
  optimize->template_flags = input->template_flags;

  // Replacing the working directory
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: replacing the working directory\n");
#endif
  g_chdir (input->directory);

  // Getting results file names
  optimize->result = input->result;
  optimize->variables = input->variables;

  // Obtaining the simulator file
  optimize->simulator = input->simulator;

  // Obtaining the evaluator file
  optimize->evaluator = input->evaluator;

  // Obtaining the cleaner file
  optimize->cleaner = input->cleaner;

  // Reading the algorithm
  optimize->algorithm = input->algorithm;
  switch (optimize->algorithm)
    {
    case ALGORITHM_MONTE_CARLO:
      optimize_algorithm = optimize_MonteCarlo;
      break;
    case ALGORITHM_SWEEP:
      optimize_algorithm = optimize_sweep;
      break;
    case ALGORITHM_ORTHOGONAL:
      optimize_algorithm = optimize_orthogonal;
      break;
    default:
      optimize_algorithm = optimize_genetic;
      optimize->mutation_ratio = input->mutation_ratio;
      optimize->reproduction_ratio = input->reproduction_ratio;
      optimize->adaptation_ratio = input->adaptation_ratio;
    }
  optimize->nvariables = input->nvariables;
  optimize->nsimulations = input->nsimulations;
  optimize->niterations = input->niterations;
  optimize->nbest = input->nbest;
  optimize->tolerance = input->tolerance;
  optimize->nsteps = input->nsteps;
  optimize->nfinal_steps = input->nfinal_steps;
  nsteps = JBM_MAX (optimize->nsteps, optimize->nfinal_steps);
  optimize->nestimates = 0;
  optimize->threshold = input->threshold;
  optimize->stop = 0;
  if (nsteps)
    {
      optimize->relaxation = input->relaxation;
      switch (input->climbing)
        {
        case CLIMBING_METHOD_COORDINATES:
          optimize->nestimates = 2 * optimize->nvariables;
          optimize_estimate_climbing = optimize_estimate_climbing_coordinates;
          break;
        default:
          optimize->nestimates = input->nestimates;
          optimize_estimate_climbing = optimize_estimate_climbing_random;
        }
    }

#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: nbest=%u\n", optimize->nbest);
#endif
  optimize->simulation_best
    = (unsigned int *) alloca (optimize->nbest * sizeof (unsigned int));
  optimize->error_best = (double *) alloca (optimize->nbest * sizeof (double));

  // Reading the experimental data
#if DEBUG_OPTIMIZE
  buffer = g_get_current_dir ();
  fprintf (stderr, "optimize_open: current directory=%s\n", buffer);
  g_free (buffer);
#endif
  optimize->nexperiments = input->nexperiments;
  optimize->ninputs = input->experiment->ninputs;
  optimize->experiment
    = (char **) alloca (input->nexperiments * sizeof (char *));
  optimize->weight = (double *) alloca (input->nexperiments * sizeof (double));
  for (i = 0; i < input->experiment->ninputs; ++i)
    optimize->file[i] = (GMappedFile **)
      g_malloc (input->nexperiments * sizeof (GMappedFile *));
  for (i = 0; i < input->nexperiments; ++i)
    {
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_open: i=%u\n", i);
#endif
      optimize->experiment[i] = input->experiment[i].name;
      optimize->weight[i] = input->experiment[i].weight;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_open: experiment=%s weight=%lg\n",
               optimize->experiment[i], optimize->weight[i]);
#endif
      for (j = 0; j < input->experiment->ninputs; ++j)
        {
#if DEBUG_OPTIMIZE
          fprintf (stderr, "optimize_open: stencil%u\n", j + 1);
#endif
          optimize->file[j][i]
            = g_mapped_file_new (input->experiment[i].stencil[j], 0, NULL);
        }
    }

  // Reading the variables data
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: reading variables\n");
#endif
  optimize->label = (char **) alloca (input->nvariables * sizeof (char *));
  j = input->nvariables * sizeof (double);
  optimize->rangemin = (double *) alloca (j);
  optimize->rangeminabs = (double *) alloca (j);
  optimize->rangemax = (double *) alloca (j);
  optimize->rangemaxabs = (double *) alloca (j);
  optimize->step = (double *) alloca (j);
  j = input->nvariables * sizeof (unsigned int);
  optimize->precision = (unsigned int *) alloca (j);
  optimize->nsweeps = (unsigned int *) alloca (j);
  optimize->nbits = (unsigned int *) alloca (j);
  for (i = 0; i < input->nvariables; ++i)
    {
      optimize->label[i] = input->variable[i].name;
      optimize->rangemin[i] = input->variable[i].rangemin;
      optimize->rangeminabs[i] = input->variable[i].rangeminabs;
      optimize->rangemax[i] = input->variable[i].rangemax;
      optimize->rangemaxabs[i] = input->variable[i].rangemaxabs;
      optimize->precision[i] = input->variable[i].precision;
      optimize->step[i] = input->variable[i].step;
      optimize->nsweeps[i] = input->variable[i].nsweeps;
      optimize->nbits[i] = input->variable[i].nbits;
    }
  if (input->algorithm == ALGORITHM_SWEEP
      || input->algorithm == ALGORITHM_ORTHOGONAL)
    {
      optimize->nsimulations = 1;
      for (i = 0; i < input->nvariables; ++i)
        {
          optimize->nsimulations *= optimize->nsweeps[i];
#if DEBUG_OPTIMIZE
          fprintf (stderr, "optimize_open: nsweeps=%u nsimulations=%u\n",
                   optimize->nsweeps[i], optimize->nsimulations);
#endif
        }
    }
  if (nsteps)
    optimize->climbing
      = (double *) alloca (optimize->nvariables * sizeof (double));

  // Setting error norm
  switch (input->norm)
    {
    case ERROR_NORM_EUCLIDIAN:
      optimize_norm = optimize_norm_euclidian;
      break;
    case ERROR_NORM_MAXIMUM:
      optimize_norm = optimize_norm_maximum;
      break;
    case ERROR_NORM_P:
      optimize_norm = optimize_norm_p;
      optimize->p = input->p;
      break;
    default:
      optimize_norm = optimize_norm_taxicab;
    }

  // Allocating values
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: allocating variables\n");
  fprintf (stderr, "optimize_open: nvariables=%u algorithm=%u\n",
           optimize->nvariables, optimize->algorithm);
#endif
  optimize->genetic_variable = NULL;
  if (optimize->algorithm == ALGORITHM_GENETIC)
    {
      optimize->genetic_variable = (GeneticVariable *)
        g_malloc (optimize->nvariables * sizeof (GeneticVariable));
      for (i = 0; i < optimize->nvariables; ++i)
        {
#if DEBUG_OPTIMIZE
          fprintf (stderr, "optimize_open: i=%u min=%lg max=%lg nbits=%u\n",
                   i, optimize->rangemin[i], optimize->rangemax[i],
                   optimize->nbits[i]);
#endif
          optimize->genetic_variable[i].minimum = optimize->rangemin[i];
          optimize->genetic_variable[i].maximum = optimize->rangemax[i];
          optimize->genetic_variable[i].nbits = optimize->nbits[i];
        }
    }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: nvariables=%u nsimulations=%u\n",
           optimize->nvariables, optimize->nsimulations);
#endif
  optimize->value = (double *)
    g_malloc ((optimize->nsimulations + optimize->nestimates * nsteps)
              * optimize->nvariables * sizeof (double));

  // Calculating simulations to perform for each task
```

```
#if HAVE_MPI
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: rank=%u ntasks=%u\n",
           optimize->mpi_rank, ntasks);
#endif
  optimize->nstart = optimize->mpi_rank * optimize->nsimulations / ntasks;
  optimize->nend = (1 + optimize->mpi_rank) * optimize->nsimulations / ntasks;
  if (nsteps)
    {
      optimize->nstart_climbing
        = optimize->mpi_rank * optimize->nestimates / ntasks;
      optimize->nend_climbing
        = (1 + optimize->mpi_rank) * optimize->nestimates / ntasks;
    }
#else
  optimize->nstart = 0;
  optimize->nend = optimize->nsimulations;
  if (nsteps)
    {
      optimize->nstart_climbing = 0;
      optimize->nend_climbing = optimize->nestimates;
    }
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: nstart=%u nend=%u\n", optimize->nstart,
           optimize->nend);
#endif

  // Calculating simulations to perform for each thread
  optimize->thread
    = (unsigned int *) alloca ((1 + nthreads) * sizeof (unsigned int));
  for (i = 0; i <= nthreads; ++i)
    {
      optimize->thread[i] = optimize->nstart
        + i * (optimize->nend - optimize->nstart) / nthreads;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_open: i=%u thread=%u\n", i,
               optimize->thread[i]);
#endif
    }
  if (nsteps)
    optimize->thread_climbing = (unsigned int *)
      alloca ((1 + nthreads_climbing) * sizeof (unsigned int));

  // Opening result files
  optimize->file_result = g_fopen (optimize->result, "w");
  optimize->file_variables = g_fopen (optimize->variables, "w");

  // Performing the algorithm
  switch (optimize->algorithm)
    {
      // Genetic algorithm
    case ALGORITHM_GENETIC:
      optimize_genetic ();
      break;

      // Iterative algorithm
    default:
      optimize_iterate ();
    }

  // Getting calculation time
  t = g_date_time_new_now (tz);
  optimize->calculation_time = 0.000001 * g_date_time_difference (t, t0);
  g_date_time_unref (t);
  g_date_time_unref (t0);
  g_time_zone_unref (tz);
  printf ("%s = %.6lg s\n", _("Calculation time"), optimize->calculation_time);
  fprintf (optimize->file_result, "%s = %.6lg s\n",
           _("Calculation time"), optimize->calculation_time);

  // Closing result files
  optimize_save_optimal ();
  fclose (optimize->file_variables);
  fclose (optimize->file_result);

#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: end\n");
#endif
}
```

4.23 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_free ()
- void optimize_open ()

Variables

- int **ntasks**
- unsigned int **nthreads**
- unsigned int nthreads_climbing

  Number of threads for the hill climbing method.
- GMutex **mutex** [1]
- Optimize optimize [1]

  Optimization data.

4.23.1 Detailed Description

Header file to define the optimization functions.

Authors

Javier Burguete.

Copyright

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Definition in file optimize.h.

4.23.2 Function Documentation

4.23.2.1 optimize_free()

```
void optimize_free ( )
```

Function to free the memory used by the Optimize struct.

Definition at line 1487 of file optimize.c.

```
{
  unsigned int i, j;
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_free: start\n");
#endif
  for (j = 0; j < optimize->ninputs; ++j)
    {
      for (i = 0; i < optimize->nexperiments; ++i)
        g_mapped_file_unref (optimize->file[j][i]);
      g_free (optimize->file[j]);
    }
  g_free (optimize->error_old);
  g_free (optimize->value_old);
  g_free (optimize->value);
  g_free (optimize->genetic_variable);
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_free: end\n");
#endif
}
```

4.23.2.2 optimize_open()

```
void optimize_open ( )
```

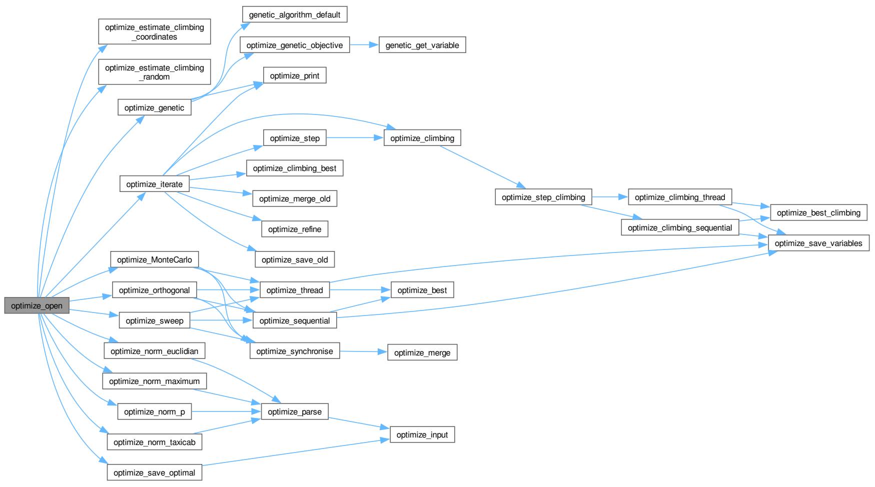
Function to open and perform a optimization.

Definition at line 1512 of file optimize.c.

```
{
  GTimeZone *tz;
  GDateTime *t0, *t;
  unsigned int i, j, nsteps;

#if DEBUG_OPTIMIZE
  char *buffer;
  fprintf (stderr, "optimize_open: start\n");
#endif

  // Getting initial time
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: getting initial time\n");
#endif
  tz = g_time_zone_new_utc ();
  t0 = g_date_time_new_now (tz);

  // Obtaining and initing the pseudo-random numbers generator seed
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: getting initial seed\n");
#endif
  if (optimize->seed == DEFAULT_RANDOM_SEED)
    optimize->seed = input->seed;
  gsl_rng_set (optimize->rng, optimize->seed);

  // Obtaining template flags
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: getting template flags\n");
#endif
  optimize->template_flags = input->template_flags;

  // Replacing the working directory
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: replacing the working directory\n");
#endif
  g_chdir (input->directory);

  // Getting results file names
  optimize->result = input->result;
  optimize->variables = input->variables;

  // Obtaining the simulator file
  optimize->simulator = input->simulator;

  // Obtaining the evaluator file
  optimize->evaluator = input->evaluator;

  // Obtaining the cleaner file
  optimize->cleaner = input->cleaner;

  // Reading the algorithm
  optimize->algorithm = input->algorithm;
  switch (optimize->algorithm)
    {
    case ALGORITHM_MONTE_CARLO:
      optimize_algorithm = optimize_MonteCarlo;
      break;
    case ALGORITHM_SWEEP:
      optimize_algorithm = optimize_sweep;
      break;
    case ALGORITHM_ORTHOGONAL:
      optimize_algorithm = optimize_orthogonal;
      break;
    default:
      optimize_algorithm = optimize_genetic;
      optimize->mutation_ratio = input->mutation_ratio;
      optimize->reproduction_ratio = input->reproduction_ratio;
      optimize->adaptation_ratio = input->adaptation_ratio;
    }
  optimize->nvariables = input->nvariables;
  optimize->nsimulations = input->nsimulations;
  optimize->niterations = input->niterations;
  optimize->nbest = input->nbest;
  optimize->tolerance = input->tolerance;
  optimize->nsteps = input->nsteps;
  optimize->nfinal_steps = input->nfinal_steps;
  nsteps = JBM_MAX (optimize->nsteps, optimize->nfinal_steps);
  optimize->nestimates = 0;
  optimize->threshold = input->threshold;
  optimize->stop = 0;
  if (nsteps)
    {
      optimize->relaxation = input->relaxation;
      switch (input->climbing)
        {
        case CLIMBING_METHOD_COORDINATES:
          optimize->nestimates = 2 * optimize->nvariables;
          optimize_estimate_climbing = optimize_estimate_climbing_coordinates;
          break;
        default:
          optimize->nestimates = input->nestimates;
          optimize_estimate_climbing = optimize_estimate_climbing_random;
        }
    }

#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: nbest=%u\n", optimize->nbest);
#endif
  optimize->simulation_best
    = (unsigned int *) alloca (optimize->nbest * sizeof (unsigned int));
  optimize->error_best = (double *) alloca (optimize->nbest * sizeof (double));

  // Reading the experimental data
#if DEBUG_OPTIMIZE
  buffer = g_get_current_dir ();
  fprintf (stderr, "optimize_open: current directory=%s\n", buffer);
  g_free (buffer);
#endif
  optimize->nexperiments = input->nexperiments;
  optimize->ninputs = input->experiment->ninputs;
  optimize->experiment
    = (char **) alloca (input->nexperiments * sizeof (char *));
  optimize->weight = (double *) alloca (input->nexperiments * sizeof (double));
  for (i = 0; i < input->experiment->ninputs; ++i)
    optimize->file[i] = (GMappedFile **)
      g_malloc (input->nexperiments * sizeof (GMappedFile *));
  for (i = 0; i < input->nexperiments; ++i)
    {
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_open: i=%u\n", i);
#endif
      optimize->experiment[i] = input->experiment[i].name;
      optimize->weight[i] = input->experiment[i].weight;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_open: experiment=%s weight=%lg\n",
               optimize->experiment[i], optimize->weight[i]);
```

```
#endif
      for (j = 0; j < input->experiment->ninputs; ++j)
        {
#if DEBUG_OPTIMIZE
          fprintf (stderr, "optimize_open: stencil%u\n", j + 1);
#endif
          optimize->file[j][i]
            = g_mapped_file_new (input->experiment[i].stencil[j], 0, NULL);
        }
    }

  // Reading the variables data
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: reading variables\n");
#endif
  optimize->label = (char **) alloca (input->nvariables * sizeof (char *));
  j = input->nvariables * sizeof (double);
  optimize->rangemin = (double *) alloca (j);
  optimize->rangeminabs = (double *) alloca (j);
  optimize->rangemax = (double *) alloca (j);
  optimize->rangemaxabs = (double *) alloca (j);
  optimize->step = (double *) alloca (j);
  j = input->nvariables * sizeof (unsigned int);
  optimize->precision = (unsigned int *) alloca (j);
  optimize->nsweeps = (unsigned int *) alloca (j);
  optimize->nbits = (unsigned int *) alloca (j);
  for (i = 0; i < input->nvariables; ++i)
    {
      optimize->label[i] = input->variable[i].name;
      optimize->rangemin[i] = input->variable[i].rangemin;
      optimize->rangeminabs[i] = input->variable[i].rangeminabs;
      optimize->rangemax[i] = input->variable[i].rangemax;
      optimize->rangemaxabs[i] = input->variable[i].rangemaxabs;
      optimize->precision[i] = input->variable[i].precision;
      optimize->step[i] = input->variable[i].step;
      optimize->nsweeps[i] = input->variable[i].nsweeps;
      optimize->nbits[i] = input->variable[i].nbits;
    }
  if (input->algorithm == ALGORITHM_SWEEP
      || input->algorithm == ALGORITHM_ORTHOGONAL)
    {
      optimize->nsimulations = 1;
      for (i = 0; i < input->nvariables; ++i)
        {
          optimize->nsimulations *= optimize->nsweeps[i];
#if DEBUG_OPTIMIZE
          fprintf (stderr, "optimize_open: nsweeps=%u nsimulations=%u\n",
                   optimize->nsweeps[i], optimize->nsimulations);
#endif
        }
    }
  if (nsteps)
    optimize->climbing
      = (double *) alloca (optimize->nvariables * sizeof (double));

  // Setting error norm
  switch (input->norm)
    {
    case ERROR_NORM_EUCLIDIAN:
      optimize_norm = optimize_norm_euclidian;
      break;
    case ERROR_NORM_MAXIMUM:
      optimize_norm = optimize_norm_maximum;
      break;
    case ERROR_NORM_P:
      optimize_norm = optimize_norm_p;
      optimize->p = input->p;
      break;
    default:
      optimize_norm = optimize_norm_taxicab;
    }

  // Allocating values
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: allocating variables\n");
  fprintf (stderr, "optimize_open: nvariables=%u algorithm=%u\n",
           optimize->nvariables, optimize->algorithm);
#endif
  optimize->genetic_variable = NULL;
  if (optimize->algorithm == ALGORITHM_GENETIC)
    {
      optimize->genetic_variable = (GeneticVariable *)
        g_malloc (optimize->nvariables * sizeof (GeneticVariable));
      for (i = 0; i < optimize->nvariables; ++i)
        {
#if DEBUG_OPTIMIZE
          fprintf (stderr, "optimize_open: i=%u min=%lg max=%lg nbits=%u\n",
                   i, optimize->rangemin[i], optimize->rangemax[i],
                   optimize->nbits[i]);
#endif
         optimize->genetic_variable[i].minimum = optimize->rangemin[i];
         optimize->genetic_variable[i].maximum = optimize->rangemax[i];
         optimize->genetic_variable[i].nbits = optimize->nbits[i];
       }
   }
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: nvariables=%u nsimulations=%u\n",
           optimize->nvariables, optimize->nsimulations);
#endif
  optimize->value = (double *)
    g_malloc ((optimize->nsimulations + optimize->nestimates * nsteps)
              * optimize->nvariables * sizeof (double));

  // Calculating simulations to perform for each task
#if HAVE_MPI
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: rank=%u ntasks=%u\n",
           optimize->mpi_rank, ntasks);
#endif
  optimize->nstart = optimize->mpi_rank * optimize->nsimulations / ntasks;
  optimize->nend = (1 + optimize->mpi_rank) * optimize->nsimulations / ntasks;
  if (nsteps)
    {
      optimize->nstart_climbing
        = optimize->mpi_rank * optimize->nestimates / ntasks;
      optimize->nend_climbing
        = (1 + optimize->mpi_rank) * optimize->nestimates / ntasks;
    }
#else
  optimize->nstart = 0;
  optimize->nend = optimize->nsimulations;
  if (nsteps)
    {
      optimize->nstart_climbing = 0;
      optimize->nend_climbing = optimize->nestimates;
    }
#endif
#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: nstart=%u nend=%u\n", optimize->nstart,
           optimize->nend);
#endif

  // Calculating simulations to perform for each thread
  optimize->thread
    = (unsigned int *) alloca ((1 + nthreads) * sizeof (unsigned int));
  for (i = 0; i <= nthreads; ++i)
    {
      optimize->thread[i] = optimize->nstart
        + i * (optimize->nend - optimize->nstart) / nthreads;
#if DEBUG_OPTIMIZE
      fprintf (stderr, "optimize_open: i=%u thread=%u\n", i,
               optimize->thread[i]);
#endif
    }
  if (nsteps)
    optimize->thread_climbing = (unsigned int *)
      alloca ((1 + nthreads_climbing) * sizeof (unsigned int));

  // Opening result files
  optimize->file_result = g_fopen (optimize->result, "w");
  optimize->file_variables = g_fopen (optimize->variables, "w");

  // Performing the algorithm
  switch (optimize->algorithm)
    {
      // Genetic algorithm
    case ALGORITHM_GENETIC:
      optimize_genetic ();
      break;

      // Iterative algorithm
    default:
      optimize_iterate ();
    }

  // Getting calculation time
  t = g_date_time_new_now (tz);
  optimize->calculation_time = 0.000001 * g_date_time_difference (t, t0);
  g_date_time_unref (t);
  g_date_time_unref (t0);
  g_time_zone_unref (tz);
  printf ("%s = %.6lg s\n", _("Calculation time"), optimize->calculation_time);
  fprintf (optimize->file_result, "%s = %.6lg s\n",
           _("Calculation time"), optimize->calculation_time);

  // Closing result files
  optimize_save_optimal ();
  fclose (optimize->file_variables);
  fclose (optimize->file_result);

#if DEBUG_OPTIMIZE
  fprintf (stderr, "optimize_open: end\n");
#endif
}
```

Here is the call graph for this function:



4.23.3 Variable Documentation

4.23.3.1 nthreads_climbing

```
unsigned int nthreads_climbing  [extern]
```

Number of threads for the hill climbing method.

Definition at line 84 of file optimize.c.

4.23.3.2 optimize

```
Optimize optimize[1]  [extern]
```

Optimization data.

Definition at line 83 of file optimize.c.

4.24 optimize.h

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#ifndef OPTIMIZE__H
#define OPTIMIZE__H 1

typedef struct
{
  GMappedFile **file[MAX_NINPUTS];
  char **experiment;
  char **label;
  gsl_rng *rng;
  GeneticVariable *genetic_variable;
  FILE *file_result;
  FILE *file_variables;
  char *result;
  char *variables;
  char *simulator;
  char *evaluator;
  char *cleaner;
  double *value;
  double *rangemin;
  double *rangemax;
  double *rangeminabs;
  double *rangemaxabs;
  double *error_best;
  double *weight;
  double *step;
  double *climbing;
  double *value_old;
  double *error_old;
  unsigned int *precision;
  unsigned int *nsweeps;
  unsigned int *nbits;
  unsigned int *thread;
  unsigned int *thread_climbing;
  unsigned int *simulation_best;
  double tolerance;
  double mutation_ratio;
  double reproduction_ratio;
  double adaptation_ratio;
  double relaxation;
  double calculation_time;
  double p;
  double threshold;
  unsigned long int seed;
  unsigned int nvariables;
  unsigned int nexperiments;
  unsigned int ninputs;
  unsigned int nsimulations;
  unsigned int nsteps;
  unsigned int nfinal_steps;
  unsigned int nestimates;
  unsigned int algorithm;
  unsigned int nstart;
  unsigned int nend;
  unsigned int nstart_climbing;
  unsigned int nend_climbing;
  unsigned int niterations;
  unsigned int nbest;
  unsigned int nsaveds;
  unsigned int stop;
  unsigned int template_flags;
#if HAVE_MPI
  int mpi_rank;
#endif
} Optimize;

typedef struct
{
  unsigned int thread;
} ParallelData;

// Global variables
extern int ntasks;
extern unsigned int nthreads;
extern unsigned int nthreads_climbing;
extern GMutex mutex[1];
extern Optimize optimize[1];

// Public functions
void optimize_free ();
void optimize_open ();

#endif
```
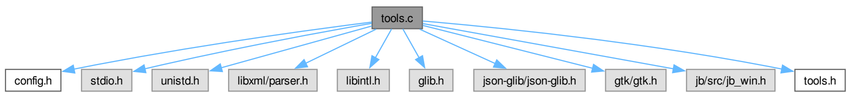

4.25 tools.c File Reference

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 "jb/src/jb_win.h"
#include "tools.h"
```

Include dependency graph for tools.c:



Variables

- GtkWindow ∗ main_window

  Main GtkWindow.
- char ∗ error_message

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

  Pointer to the function to show pending events.

4.25.1 Detailed Description

Source file to define some useful functions.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file tools.c.

4.25.2 Variable Documentation

4.25.2.1 error_message

```
char* error_message
```

Error message.

Definition at line 59 of file tools.c.

4.25.2.2 main_window

```
GtkWindow* main_window
```

Main GtkWindow.

Definition at line 56 of file tools.c.

4.25.2.3 show_pending

```
void(* show_pending) () ( ) = NULL
```

Pointer to the function to show pending events.

Definition at line 60 of file tools.c.

4.26 tools.c

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#define _GNU_SOURCE
#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>
#ifdef G_OS_WIN32
#include <windows.h>
#endif
#if HAVE_GTK
#include <gtk/gtk.h>
#endif
#include "jb/src/jb_win.h"
#include "tools.h"

#if HAVE_GTK
GtkWindow *main_window;
#endif

char *error_message;
void (*show_pending) () = NULL;
```
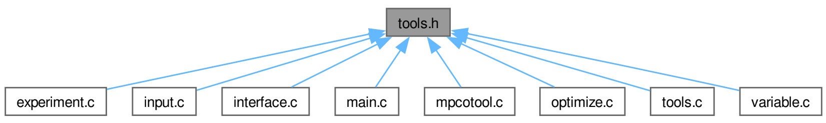

4.27 tools.h File Reference

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.

Variables

- GtkWindow ∗ main_window

  Main GtkWindow.
- GtkWindow ∗ **window_parent**
- char ∗ error_message

  Error message.
- void(∗ show_pending)()

  Pointer to the function to show pending events.

4.27.1 Detailed Description

Header file to define some useful functions.

Authors

Javier Burguete.

Copyright

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Definition in file tools.h.

4.27.2 Macro Definition Documentation

4.27.2.1 ERROR_TYPE

```
#define ERROR_TYPE GTK_MESSAGE_ERROR
```

Macro to define the error message type.

Definition at line 48 of file tools.h.

4.27.2.2 INFO_TYPE

```
#define INFO_TYPE GTK_MESSAGE_INFO
```

Macro to define the information message type.

Definition at line 49 of file tools.h.

4.27.3 Variable Documentation

4.27.3.1 error_message

```
char* error_message [extern]
```

Error message.

Definition at line 59 of file tools.c.

4.27.3.2 main_window

```
GtkWindow* main_window [extern]
```

Main GtkWindow.

Definition at line 56 of file tools.c.

4.27.3.3 show_pending

```
void(* show_pending) () ( ) [extern]
```

Pointer to the function to show pending events.

Definition at line 60 of file tools.c.

4.28 tools.h

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#ifndef TOOLS__H
#define TOOLS__H 1

```
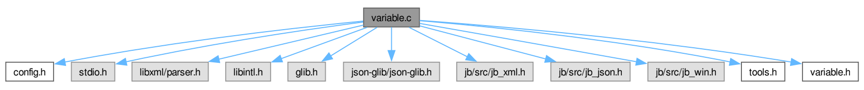

```
#if HAVE_GTK
#define ERROR_TYPE GTK_MESSAGE_ERROR
#define INFO_TYPE GTK_MESSAGE_INFO
extern GtkWindow *main_window;
extern GtkWindow *window_parent;
#else
#define ERROR_TYPE 0
#define INFO_TYPE 0
#endif

// Public functions

extern char *error_message;
extern void (*show_pending) ();

#endif
```

4.29 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 "jb/src/jb_xml.h"
#include "jb/src/jb_json.h"
#include "jb/src/jb_win.h"
#include "tools.h"
#include "variable.h"
```

Include dependency graph for variable.c:



Macros

- #define DEBUG_VARIABLE 0

  Macro to debug variable functions.

Functions

- void variable_free (Variable ∗variable, unsigned int type)
- void variable_error (Variable ∗variable, char ∗message)
- int variable_open_xml (Variable ∗variable, xmlNode ∗node, unsigned int algorithm, unsigned int nsteps)
- int variable_open_json (Variable ∗variable, JsonNode ∗node, unsigned int algorithm, unsigned int nsteps)

Variables

- const char ∗ format [NPRECISIONS]

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

  Array of variable precisions.

4.29.1 Detailed Description

Source file to define the variable data.

Authors

Javier Burguete and Borja Latorre.

Copyright

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Definition in file variable.c.

4.29.2 Macro Definition Documentation

4.29.2.1 DEBUG_VARIABLE

```
#define DEBUG_VARIABLE 0
```

Macro to debug variable functions.

Definition at line 51 of file variable.c.

4.29.3 Function Documentation

4.29.3.1 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 88 of file variable.c.

```
{
  char buffer[64];
  if (!variable->name)
    snprintf (buffer, 64, "%s: %s", _("Variable"), message);
  else
    snprintf (buffer, 64, "%s %s: %s", _("Variable"), variable->name, message);
  error_message = g_strdup (buffer);
}
```

4.29.3.2 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 67 of file variable.c.

```
{
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_free: start\n");
#endif
  if (type == INPUT_TYPE_XML)
    xmlFree (variable->name);
  else
    g_free (variable->name);
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_free: end\n");
#endif
}
```

4.29.3.3 variable_open_json()

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

Function to open the variable file.

Returns

1 on success, 0 on error.

Parameters

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

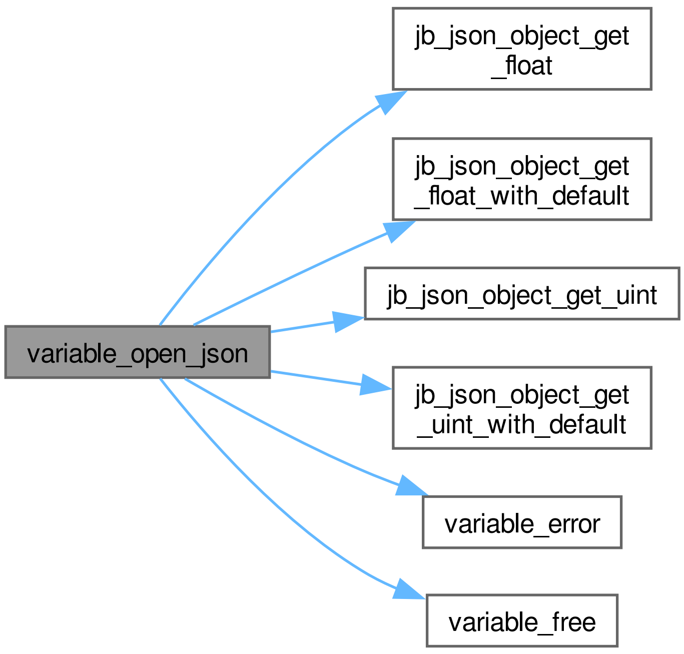
Definition at line 270 of file variable.c.

```
{
  JsonObject *object;
  const char *label;
  int error_code;
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_json: start\n");
#endif
  object = json_node_get_object (node);
  label = json_object_get_string_member (object, LABEL_NAME);
  if (!label)
```

```
    {
      variable_error (variable, _("no name"));
      goto exit_on_error;
    }
  variable->name = g_strdup (label);
  if (json_object_get_member (object, LABEL_MINIMUM))
    {
      variable->rangemin
        = jb_json_object_get_float (object, LABEL_MINIMUM, &error_code);
      if (!error_code)
        {
          variable_error (variable, _("bad minimum"));
          goto exit_on_error;
        }
      variable->rangeminabs
        = jb_json_object_get_float_with_default (object, LABEL_ABSOLUTE_MINIMUM,
                                                 &error_code, -G_MAXDOUBLE);
      if (!error_code)
        {
          variable_error (variable, _("bad absolute minimum"));
          goto exit_on_error;
        }
      if (variable->rangemin < variable->rangeminabs)
        {
          variable_error (variable, _("minimum range not allowed"));
          goto exit_on_error;
        }
    }
  else
    {
      variable_error (variable, _("no minimum range"));
      goto exit_on_error;
    }
  if (json_object_get_member (object, LABEL_MAXIMUM))
    {
      variable->rangemax
        = jb_json_object_get_float (object, LABEL_MAXIMUM, &error_code);
      if (!error_code)
        {
          variable_error (variable, _("bad maximum"));
          goto exit_on_error;
        }
      variable->rangemaxabs
        = jb_json_object_get_float_with_default (object, LABEL_ABSOLUTE_MAXIMUM,
                                                 &error_code, G_MAXDOUBLE);
      if (!error_code)
        {
          variable_error (variable, _("bad absolute maximum"));
          goto exit_on_error;
        }
      if (variable->rangemax > variable->rangemaxabs)
        {
          variable_error (variable, _("maximum range not allowed"));
          goto exit_on_error;
        }
      if (variable->rangemax < variable->rangemin)
        {
          variable_error (variable, _("bad range"));
          goto exit_on_error;
        }
    }
  else
    {
      variable_error (variable, _("no maximum range"));
      goto exit_on_error;
    }
  variable->precision
    = jb_json_object_get_uint_with_default (object, LABEL_PRECISION,
                                            &error_code, DEFAULT_PRECISION);
  if (!error_code || variable->precision >= NPRECISIONS)
    {
      variable_error (variable, _("bad precision"));
      goto exit_on_error;
    }
  if (algorithm == ALGORITHM_SWEEP || algorithm == ALGORITHM_ORTHOGONAL)
    {
      if (json_object_get_member (object, LABEL_NSWEEPS))
        {
          variable->nsweeps
            = jb_json_object_get_uint (object, LABEL_NSWEEPS, &error_code);
          if (!error_code || !variable->nsweeps)
            {
              variable_error (variable, _("bad sweeps"));
              goto exit_on_error;
            }
        }
      else
```

```
        {
          variable_error (variable, _("no sweeps number"));
          goto exit_on_error;
        }
#if DEBUG_VARIABLE
      fprintf (stderr, "variable_open_json: nsweeps=%u\n", variable->nsweeps);
#endif
    }
  if (algorithm == ALGORITHM_GENETIC)
    {
      // Obtaining bits representing each variable
      if (json_object_get_member (object, LABEL_NBITS))
        {
          variable->nbits
            = jb_json_object_get_uint (object, LABEL_NBITS, &error_code);
          if (!error_code || !variable->nbits)
            {
              variable_error (variable, _("invalid bits number"));
              goto exit_on_error;
            }
        }
      else
        {
          variable_error (variable, _("no bits number"));
          goto exit_on_error;
        }
    }
  else if (nsteps)
    {
      variable->step
        = jb_json_object_get_float (object, LABEL_STEP, &error_code);
      if (!error_code || variable->step < 0.)
        {
          variable_error (variable, _("bad step size"));
          goto exit_on_error;
        }
    }

#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_json: end\n");
#endif
  return 1;
exit_on_error:
  variable_free (variable, INPUT_TYPE_JSON);
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_json: end\n");
#endif
  return 0;
}
```

Here is the call graph for this function:



4.29.3.4 variable_open_xml()

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

Function to open the variable file.

Returns

1 on success, 0 on error.

Parameters

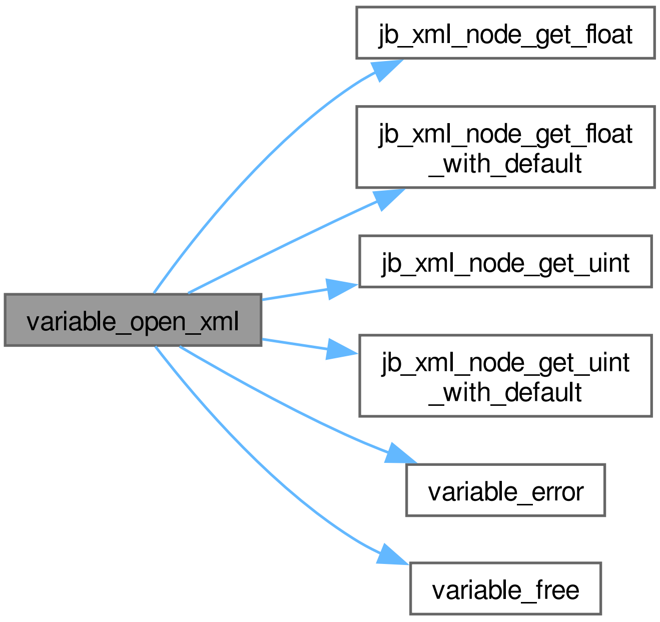
variable	Variable struct.
node	XML node.
algorithm	Algorithm type.
nsteps	Number of steps to do the hill climbing method.

Definition at line 107 of file variable.c.

```
{
  int error_code;

#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_xml: start\n");
#endif

  variable->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
  if (!variable->name)
    {
      variable_error (variable, _("no name"));
      goto exit_on_error;
    }
  if (xmlHasProp (node, (const xmlChar *) LABEL_MINIMUM))
    {
      variable->rangemin
        = jb_xml_node_get_float (node, (const xmlChar *) LABEL_MINIMUM,
                                 &error_code);
      if (!error_code)
        {
          variable_error (variable, _("bad minimum"));
          goto exit_on_error;
        }
      variable->rangeminabs = jb_xml_node_get_float_with_default
        (node, (const xmlChar *) LABEL_ABSOLUTE_MINIMUM, &error_code,
         -G_MAXDOUBLE);

      if (!error_code)
        {
          variable_error (variable, _("bad absolute minimum"));
          goto exit_on_error;
        }
      if (variable->rangemin < variable->rangeminabs)
        {
          variable_error (variable, _("minimum range not allowed"));
          goto exit_on_error;
        }
    }
  else
    {
      variable_error (variable, _("no minimum range"));
      goto exit_on_error;
    }
  if (xmlHasProp (node, (const xmlChar *) LABEL_MAXIMUM))
    {
      variable->rangemax
        = jb_xml_node_get_float (node, (const xmlChar *) LABEL_MAXIMUM,
                                 &error_code);
      if (!error_code)
        {
          variable_error (variable, _("bad maximum"));
          goto exit_on_error;
        }
      variable->rangemaxabs = jb_xml_node_get_float_with_default
        (node, (const xmlChar *) LABEL_ABSOLUTE_MAXIMUM, &error_code,
         G_MAXDOUBLE);
      if (!error_code)
        {
          variable_error (variable, _("bad absolute maximum"));
          goto exit_on_error;
        }
      if (variable->rangemax > variable->rangemaxabs)
        {
          variable_error (variable, _("maximum range not allowed"));
          goto exit_on_error;
        }
      if (variable->rangemax < variable->rangemin)
        {
          variable_error (variable, _("bad range"));
          goto exit_on_error;
        }
    }
  else
    {
      variable_error (variable, _("no maximum range"));
      goto exit_on_error;
    }
  variable->precision
    = jb_xml_node_get_uint_with_default (node,
                                         (const xmlChar *) LABEL_PRECISION,
                                         &error_code, DEFAULT_PRECISION);
  if (!error_code || variable->precision >= NPRECISIONS)
    {
      variable_error (variable, _("bad precision"));
      goto exit_on_error;
    }
  if (algorithm == ALGORITHM_SWEEP || algorithm == ALGORITHM_ORTHOGONAL)
```

```
    {
      if (xmlHasProp (node, (const xmlChar *) LABEL_NSWEEPS))
        {
          variable->nsweeps
            = jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NSWEEPS,
                                    &error_code);
          if (!error_code || !variable->nsweeps)
            {
              variable_error (variable, _("bad sweeps"));
              goto exit_on_error;
            }
        }
      else
        {
          variable_error (variable, _("no sweeps number"));
          goto exit_on_error;
        }
#if DEBUG_VARIABLE
      fprintf (stderr, "variable_open_xml: nsweeps=%u\n", variable->nsweeps);
#endif
    }
  if (algorithm == ALGORITHM_GENETIC)
    {
      // Obtaining bits representing each variable
      if (xmlHasProp (node, (const xmlChar *) LABEL_NBITS))
        {
          variable->nbits
            = jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NBITS,
                                    &error_code);
          if (!error_code || !variable->nbits)
            {
              variable_error (variable, _("invalid bits number"));
              goto exit_on_error;
            }
        }
      else
        {
          variable_error (variable, _("no bits number"));
          goto exit_on_error;
        }
    }
  else if (nsteps)
    {
      variable->step
        = jb_xml_node_get_float (node, (const xmlChar *) LABEL_STEP,
                                 &error_code);
      if (!error_code || variable->step < 0.)
        {
          variable_error (variable, _("bad step size"));
          goto exit_on_error;
        }
    }

#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_xml: end\n");
#endif
  return 1;
exit_on_error:
  variable_free (variable, INPUT_TYPE_XML);
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_xml: end\n");
#endif
  return 0;
}
```

Here is the call graph for this function:



4.29.4 Variable Documentation

4.29.4.1 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 53 of file variable.c.

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

4.29.4.2 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 58 of file variable.c.

```
                                  {
  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
};
```

4.30 variable.c

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

AUTHORS: Javier Burguete and Borja Latorre.

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IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#define _GNU_SOURCE
#include "config.h"
#include <stdio.h>
#include <libxml/parser.h>
#include <libintl.h>
#include <glib.h>
#include <json-glib/json-glib.h>
#include "jb/src/jb_xml.h"
#include "jb/src/jb_json.h"
#include "jb/src/jb_win.h"
#include "tools.h"
#include "variable.h"

#define DEBUG_VARIABLE 0

const char *format[NPRECISIONS] = {
  "%.0lf", "%.1lf", "%.2lf", "%.3lf", "%.4lf", "%.5lf", "%.6lf", "%.7lf",
  "%.8lf", "%.9lf", "%.10lf", "%.11lf", "%.12lf", "%.13lf", "%.14lf"
};

const double precision[NPRECISIONS] = {
  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
};

void
variable_free (Variable * variable,
               unsigned int type)
{
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_free: start\n");
#endif
  if (type == INPUT_TYPE_XML)
    xmlFree (variable->name);
  else
    g_free (variable->name);
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_free: end\n");
#endif
}

void
variable_error (Variable * variable,
                char *message)
{
  char buffer[64];
  if (!variable->name)
    snprintf (buffer, 64, "%s: %s", _("Variable"), message);
  else
    snprintf (buffer, 64, "%s %s: %s", _("Variable"), variable->name, message);
  error_message = g_strdup (buffer);
```

```c
}

int
variable_open_xml (Variable * variable,
                   xmlNode * node,
                   unsigned int algorithm,
                   unsigned int nsteps)
{
  int error_code;

#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_xml: start\n");
#endif

  variable->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
  if (!variable->name)
    {
      variable_error (variable, _("no name"));
      goto exit_on_error;
    }
  if (xmlHasProp (node, (const xmlChar *) LABEL_MINIMUM))
    {
      variable->rangemin
        = jb_xml_node_get_float (node, (const xmlChar *) LABEL_MINIMUM,
                                 &error_code);
      if (!error_code)
        {
          variable_error (variable, _("bad minimum"));
          goto exit_on_error;
        }
      variable->rangeminabs = jb_xml_node_get_float_with_default
        (node, (const xmlChar *) LABEL_ABSOLUTE_MINIMUM, &error_code,
         -G_MAXDOUBLE);

      if (!error_code)
        {
          variable_error (variable, _("bad absolute minimum"));
          goto exit_on_error;
        }
      if (variable->rangemin < variable->rangeminabs)
        {
          variable_error (variable, _("minimum range not allowed"));
          goto exit_on_error;
        }
    }
  else
    {
      variable_error (variable, _("no minimum range"));
      goto exit_on_error;
    }
  if (xmlHasProp (node, (const xmlChar *) LABEL_MAXIMUM))
    {
      variable->rangemax
        = jb_xml_node_get_float (node, (const xmlChar *) LABEL_MAXIMUM,
                                 &error_code);
      if (!error_code)
        {
          variable_error (variable, _("bad maximum"));
          goto exit_on_error;
        }
      variable->rangemaxabs = jb_xml_node_get_float_with_default
        (node, (const xmlChar *) LABEL_ABSOLUTE_MAXIMUM, &error_code,
         G_MAXDOUBLE);
      if (!error_code)
        {
          variable_error (variable, _("bad absolute maximum"));
          goto exit_on_error;
        }
      if (variable->rangemax > variable->rangemaxabs)
        {
          variable_error (variable, _("maximum range not allowed"));
          goto exit_on_error;
        }
      if (variable->rangemax < variable->rangemin)
        {
          variable_error (variable, _("bad range"));
          goto exit_on_error;
        }
    }
  else
    {
      variable_error (variable, _("no maximum range"));
      goto exit_on_error;
    }
  variable->precision
    = jb_xml_node_get_uint_with_default (node,
                                         (const xmlChar *) LABEL_PRECISION,
                                           &error_code, DEFAULT_PRECISION);
  if (!error_code || variable->precision >= NPRECISIONS)
    {
      variable_error (variable, _("bad precision"));
      goto exit_on_error;
    }
  if (algorithm == ALGORITHM_SWEEP || algorithm == ALGORITHM_ORTHOGONAL)
    {
      if (xmlHasProp (node, (const xmlChar *) LABEL_NSWEEPS))
        {
          variable->nsweeps
            = jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NSWEEPS,
                                    &error_code);
          if (!error_code || !variable->nsweeps)
            {
              variable_error (variable, _("bad sweeps"));
              goto exit_on_error;
            }
        }
      else
        {
          variable_error (variable, _("no sweeps number"));
          goto exit_on_error;
        }
#if DEBUG_VARIABLE
      fprintf (stderr, "variable_open_xml: nsweeps=%u\n", variable->nsweeps);
#endif
    }
  if (algorithm == ALGORITHM_GENETIC)
    {
      // Obtaining bits representing each variable
      if (xmlHasProp (node, (const xmlChar *) LABEL_NBITS))
        {
          variable->nbits
            = jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NBITS,
                                    &error_code);
          if (!error_code || !variable->nbits)
            {
              variable_error (variable, _("invalid bits number"));
              goto exit_on_error;
            }
        }
      else
        {
          variable_error (variable, _("no bits number"));
          goto exit_on_error;
        }
    }
  else if (nsteps)
    {
      variable->step
        = jb_xml_node_get_float (node, (const xmlChar *) LABEL_STEP,
                                 &error_code);
      if (!error_code || variable->step < 0.)
        {
          variable_error (variable, _("bad step size"));
          goto exit_on_error;
        }
    }

#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_xml: end\n");
#endif
  return 1;
exit_on_error:
  variable_free (variable, INPUT_TYPE_XML);
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_xml: end\n");
#endif
  return 0;
}

int
variable_open_json (Variable * variable,
                    JsonNode * node,
                    unsigned int algorithm,
                    unsigned int nsteps)
{
  JsonObject *object;
  const char *label;
  int error_code;
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_json: start\n");
#endif
  object = json_node_get_object (node);
  label = json_object_get_string_member (object, LABEL_NAME);
  if (!label)
```

```
    {
      variable_error (variable, _("no name"));
      goto exit_on_error;
    }
  variable->name = g_strdup (label);
  if (json_object_get_member (object, LABEL_MINIMUM))
    {
      variable->rangemin
        = jb_json_object_get_float (object, LABEL_MINIMUM, &error_code);
      if (!error_code)
        {
          variable_error (variable, _("bad minimum"));
          goto exit_on_error;
        }
      variable->rangeminabs
        = jb_json_object_get_float_with_default (object, LABEL_ABSOLUTE_MINIMUM,
                                                 &error_code, -G_MAXDOUBLE);
      if (!error_code)
        {
          variable_error (variable, _("bad absolute minimum"));
          goto exit_on_error;
        }
      if (variable->rangemin < variable->rangeminabs)
        {
          variable_error (variable, _("minimum range not allowed"));
          goto exit_on_error;
        }
    }
  else
    {
      variable_error (variable, _("no minimum range"));
      goto exit_on_error;
    }
  if (json_object_get_member (object, LABEL_MAXIMUM))
    {
      variable->rangemax
        = jb_json_object_get_float (object, LABEL_MAXIMUM, &error_code);
      if (!error_code)
        {
          variable_error (variable, _("bad maximum"));
          goto exit_on_error;
        }
      variable->rangemaxabs
        = jb_json_object_get_float_with_default (object, LABEL_ABSOLUTE_MAXIMUM,
                                                 &error_code, G_MAXDOUBLE);
      if (!error_code)
        {
          variable_error (variable, _("bad absolute maximum"));
          goto exit_on_error;
        }
      if (variable->rangemax > variable->rangemaxabs)
        {
          variable_error (variable, _("maximum range not allowed"));
          goto exit_on_error;
        }
      if (variable->rangemax < variable->rangemin)
        {
          variable_error (variable, _("bad range"));
          goto exit_on_error;
        }
    }
  else
    {
      variable_error (variable, _("no maximum range"));
      goto exit_on_error;
    }
  variable->precision
    = jb_json_object_get_uint_with_default (object, LABEL_PRECISION,
                                            &error_code, DEFAULT_PRECISION);
  if (!error_code || variable->precision >= NPRECISIONS)
    {
      variable_error (variable, _("bad precision"));
      goto exit_on_error;
    }
  if (algorithm == ALGORITHM_SWEEP || algorithm == ALGORITHM_ORTHOGONAL)
    {
      if (json_object_get_member (object, LABEL_NSWEEPS))
        {
          variable->nsweeps
            = jb_json_object_get_uint (object, LABEL_NSWEEPS, &error_code);
          if (!error_code || !variable->nsweeps)
            {
              variable_error (variable, _("bad sweeps"));
              goto exit_on_error;
            }
        }
      else
```

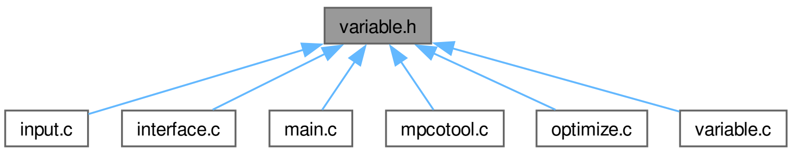
```
        {
          variable_error (variable, _("no sweeps number"));
          goto exit_on_error;
        }
#if DEBUG_VARIABLE
      fprintf (stderr, "variable_open_json: nsweeps=%u\n", variable->nsweeps);
#endif
    }
  if (algorithm == ALGORITHM_GENETIC)
    {
      // Obtaining bits representing each variable
      if (json_object_get_member (object, LABEL_NBITS))
        {
          variable->nbits
            = jb_json_object_get_uint (object, LABEL_NBITS, &error_code);
          if (!error_code || !variable->nbits)
            {
              variable_error (variable, _("invalid bits number"));
              goto exit_on_error;
            }
        }
      else
        {
          variable_error (variable, _("no bits number"));
          goto exit_on_error;
        }
    }
  else if (nsteps)
    {
      variable->step
        = jb_json_object_get_float (object, LABEL_STEP, &error_code);
      if (!error_code || variable->step < 0.)
        {
          variable_error (variable, _("bad step size"));
          goto exit_on_error;
        }
    }

#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_json: end\n");
#endif
  return 1;
exit_on_error:
  variable_free (variable, INPUT_TYPE_JSON);
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_json: end\n");
#endif
  return 0;
}
```

4.31 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 , ALGORITHM_ORTHOGONAL = 3 }

  Enum to define the algorithms.

Functions

- void variable_free (Variable ∗variable, unsigned int type)
- void variable_error (Variable ∗variable, char ∗message)
- int variable_open_xml (Variable ∗variable, xmlNode ∗node, unsigned int algorithm, unsigned int nsteps)
- int variable_open_json (Variable ∗variable, JsonNode ∗node, unsigned int algorithm, unsigned int nsteps)

Variables

- const char ∗ format [NPRECISIONS]

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

  Array of variable precisions.

4.31.1 Detailed Description

Header file to define the variable data.

Authors

Javier Burguete.

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Definition in file variable.h.

4.31.2 Enumeration Type Documentation

4.31.2.1 Algorithm

```
enum Algorithm
```

Enum to define the algorithms.

Enumerator

ALGORITHM_MONTE_CARLO	Monte-Carlo algorithm.
ALGORITHM_SWEEP	Sweep algorithm.
ALGORITHM_GENETIC	Genetic algorithm.
ALGORITHM_ORTHOGONAL	Orthogonal sampling algorithm.

Definition at line 42 of file variable.h.

```
{
  ALGORITHM_MONTE_CARLO = 0,
  ALGORITHM_SWEEP = 1,
  ALGORITHM_GENETIC = 2,
  ALGORITHM_ORTHOGONAL = 3
};
```

4.31.3 Function Documentation

4.31.3.1 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 88 of file variable.c.

```
{
  char buffer[64];
  if (!variable->name)
    snprintf (buffer, 64, "%s: %s", _("Variable"), message);
  else
    snprintf (buffer, 64, "%s %s: %s", _("Variable"), variable->name, message);
  error_message = g_strdup (buffer);
}
```

4.31.3.2 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 67 of file variable.c.

```
{
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_free: start\n");
#endif
  if (type == INPUT_TYPE_XML)
    xmlFree (variable->name);
  else
    g_free (variable->name);
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_free: end\n");
#endif
}
```

4.31.3.3 variable_open_json()

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

Function to open the variable file.

Returns

1 on success, 0 on error.

Parameters

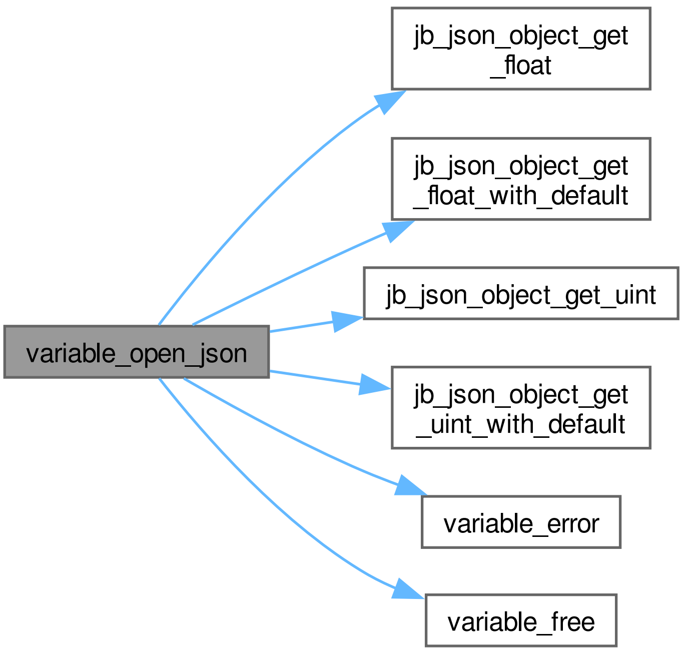
variable	Variable struct.
node	XML node.
algorithm	Algorithm type.
nsteps	Number of steps to do the hill climbing method.

Definition at line 270 of file variable.c.

```
{
  JsonObject *object;
  const char *label;
  int error_code;
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_json: start\n");
#endif
  object = json_node_get_object (node);
  label = json_object_get_string_member (object, LABEL_NAME);
  if (!label)
    {
      variable_error (variable, _("no name"));
      goto exit_on_error;
    }
  variable->name = g_strdup (label);
  if (json_object_get_member (object, LABEL_MINIMUM))
    {
      variable->rangemin
        = jb_json_object_get_float (object, LABEL_MINIMUM, &error_code);
      if (!error_code)
        {
          variable_error (variable, _("bad minimum"));
          goto exit_on_error;
        }
      variable->rangeminabs
        = jb_json_object_get_float_with_default (object, LABEL_ABSOLUTE_MINIMUM,
                                                  &error_code, -G_MAXDOUBLE);
      if (!error_code)
        {
          variable_error (variable, _("bad absolute minimum"));
          goto exit_on_error;
        }
      if (variable->rangemin < variable->rangeminabs)
        {
          variable_error (variable, _("minimum range not allowed"));
          goto exit_on_error;
        }
    }
  else
    {
      variable_error (variable, _("no minimum range"));
      goto exit_on_error;
    }
  if (json_object_get_member (object, LABEL_MAXIMUM))
    {
      variable->rangemax
        = jb_json_object_get_float (object, LABEL_MAXIMUM, &error_code);
      if (!error_code)
        {
          variable_error (variable, _("bad maximum"));
          goto exit_on_error;
        }
      variable->rangemaxabs
        = jb_json_object_get_float_with_default (object, LABEL_ABSOLUTE_MAXIMUM,
                                                 &error_code, G_MAXDOUBLE);
      if (!error_code)
        {
          variable_error (variable, _("bad absolute maximum"));
          goto exit_on_error;
        }
      if (variable->rangemax > variable->rangemaxabs)
        {
          variable_error (variable, _("maximum range not allowed"));
          goto exit_on_error;
        }
      if (variable->rangemax < variable->rangemin)
        {
          variable_error (variable, _("bad range"));
          goto exit_on_error;
        }
    }
  else
    {
      variable_error (variable, _("no maximum range"));
      goto exit_on_error;
    }
  variable->precision
    = jb_json_object_get_uint_with_default (object, LABEL_PRECISION,
                                            &error_code, DEFAULT_PRECISION);
  if (!error_code || variable->precision >= NPRECISIONS)
    {
      variable_error (variable, _("bad precision"));
      goto exit_on_error;
    }
  if (algorithm == ALGORITHM_SWEEP || algorithm == ALGORITHM_ORTHOGONAL)
    {
      if (json_object_get_member (object, LABEL_NSWEEPS))
        {
          variable->nsweeps
            = jb_json_object_get_uint (object, LABEL_NSWEEPS, &error_code);
          if (!error_code || !variable->nsweeps)
            {
              variable_error (variable, _("bad sweeps"));
              goto exit_on_error;
            }
        }
      else
        {
          variable_error (variable, _("no sweeps number"));
          goto exit_on_error;
        }
#if DEBUG_VARIABLE
      fprintf (stderr, "variable_open_json: nsweeps=%u\n", variable->nsweeps);
#endif
    }
  if (algorithm == ALGORITHM_GENETIC)
    {
      // Obtaining bits representing each variable
      if (json_object_get_member (object, LABEL_NBITS))
        {
          variable->nbits
            = jb_json_object_get_uint (object, LABEL_NBITS, &error_code);
          if (!error_code || !variable->nbits)
            {
              variable_error (variable, _("invalid bits number"));
              goto exit_on_error;
            }
        }
      else
        {
          variable_error (variable, _("no bits number"));
          goto exit_on_error;
        }
    }
  else if (nsteps)
    {
      variable->step
        = jb_json_object_get_float (object, LABEL_STEP, &error_code);
      if (!error_code || variable->step < 0.)
        {
          variable_error (variable, _("bad step size"));
          goto exit_on_error;
        }
    }

#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_json: end\n");
```

```
#endif
  return 1;
exit_on_error:
  variable_free (variable, INPUT_TYPE_JSON);
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_json: end\n");
#endif
  return 0;
}
```

Here is the call graph for this function:



4.31.3.4 variable_open_xml()

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

Function to open the variable file.

Returns

1 on success, 0 on error.

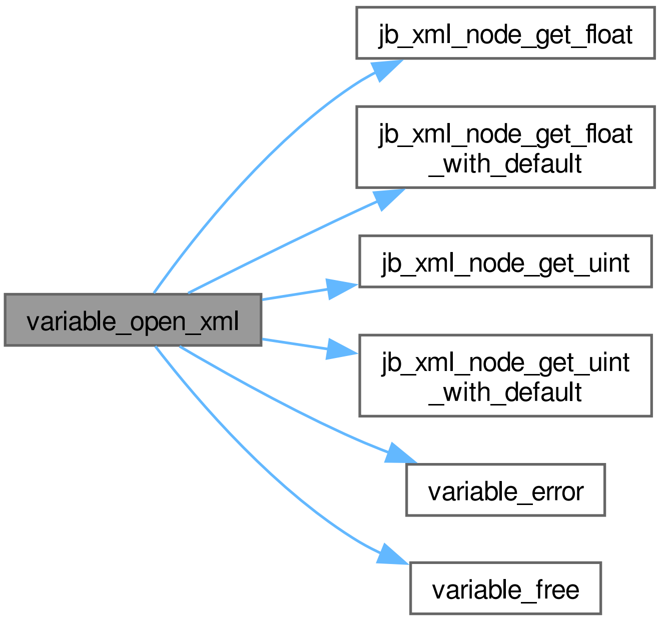
Parameters

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

Definition at line 107 of file variable.c.

```
{
  int error_code;

#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_xml: start\n");
#endif

  variable->name = (char *) xmlGetProp (node, (const xmlChar *) LABEL_NAME);
  if (!variable->name)
    {
      variable_error (variable, _("no name"));
      goto exit_on_error;
    }
  if (xmlHasProp (node, (const xmlChar *) LABEL_MINIMUM))
    {
      variable->rangemin
        = jb_xml_node_get_float (node, (const xmlChar *) LABEL_MINIMUM,
                                 &error_code);
      if (!error_code)
        {
          variable_error (variable, _("bad minimum"));
          goto exit_on_error;
        }
      variable->rangeminabs = jb_xml_node_get_float_with_default
        (node, (const xmlChar *) LABEL_ABSOLUTE_MINIMUM, &error_code,
         -G_MAXDOUBLE);

      if (!error_code)
        {
          variable_error (variable, _("bad absolute minimum"));
          goto exit_on_error;
        }
      if (variable->rangemin < variable->rangeminabs)
        {
          variable_error (variable, _("minimum range not allowed"));
          goto exit_on_error;
        }
    }
  else
    {
      variable_error (variable, _("no minimum range"));
      goto exit_on_error;
    }
  if (xmlHasProp (node, (const xmlChar *) LABEL_MAXIMUM))
    {
      variable->rangemax
        = jb_xml_node_get_float (node, (const xmlChar *) LABEL_MAXIMUM,
                                 &error_code);
      if (!error_code)
        {
          variable_error (variable, _("bad maximum"));
          goto exit_on_error;
        }
      variable->rangemaxabs = jb_xml_node_get_float_with_default
        (node, (const xmlChar *) LABEL_ABSOLUTE_MAXIMUM, &error_code,
         G_MAXDOUBLE);
      if (!error_code)
        {
          variable_error (variable, _("bad absolute maximum"));
          goto exit_on_error;
        }
      if (variable->rangemax > variable->rangemaxabs)
        {
          variable_error (variable, _("maximum range not allowed"));
          goto exit_on_error;
        }
      if (variable->rangemax < variable->rangemin)
        {
          variable_error (variable, _("bad range"));
          goto exit_on_error;
        }
    }
  else
    {
      variable_error (variable, _("no maximum range"));
      goto exit_on_error;
    }
  variable->precision
    = jb_xml_node_get_uint_with_default (node,
                                         (const xmlChar *) LABEL_PRECISION,
                                         &error_code, DEFAULT_PRECISION);
  if (!error_code || variable->precision >= NPRECISIONS)
    {
      variable_error (variable, _("bad precision"));
      goto exit_on_error;
    }
  if (algorithm == ALGORITHM_SWEEP || algorithm == ALGORITHM_ORTHOGONAL)
    {
      if (xmlHasProp (node, (const xmlChar *) LABEL_NSWEEPS))
        {
          variable->nsweeps
            = jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NSWEEPS,
                                    &error_code);
          if (!error_code || !variable->nsweeps)
            {
              variable_error (variable, _("bad sweeps"));
              goto exit_on_error;
            }
        }
      else
        {
          variable_error (variable, _("no sweeps number"));
          goto exit_on_error;
        }
#if DEBUG_VARIABLE
      fprintf (stderr, "variable_open_xml: nsweeps=%u\n", variable->nsweeps);
#endif
    }
  if (algorithm == ALGORITHM_GENETIC)
    {
      // Obtaining bits representing each variable
      if (xmlHasProp (node, (const xmlChar *) LABEL_NBITS))
        {
          variable->nbits
            = jb_xml_node_get_uint (node, (const xmlChar *) LABEL_NBITS,
                                    &error_code);
          if (!error_code || !variable->nbits)
            {
              variable_error (variable, _("invalid bits number"));
              goto exit_on_error;
            }
        }
      else
        {
          variable_error (variable, _("no bits number"));
          goto exit_on_error;
        }
    }
  else if (nsteps)
    {
      variable->step
        = jb_xml_node_get_float (node, (const xmlChar *) LABEL_STEP,
                                 &error_code);
      if (!error_code || variable->step < 0.)
        {
          variable_error (variable, _("bad step size"));
          goto exit_on_error;
        }
    }

#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_xml: end\n");
#endif
  return 1;
exit_on_error:
  variable_free (variable, INPUT_TYPE_XML);
#if DEBUG_VARIABLE
  fprintf (stderr, "variable_open_xml: end\n");
#endif
  return 0;
}
```

Here is the call graph for this function:



4.31.4 Variable Documentation

4.31.4.1 format

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

Array of C-strings with variable formats.

Definition at line 53 of file variable.c.

```
00053                             {
00054   "%.0lf", "%.1lf", "%.2lf", "%.3lf", "%.4lf", "%.5lf", "%.6lf", "%.7lf",
00055   "%.8lf", "%.9lf", "%.10lf", "%.11lf", "%.12lf", "%.13lf", "%.14lf"
00056 };
```

4.31.4.2 precision

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

Array of variable precisions.

Definition at line 58 of file variable.c.

```
00058                                  {
00059   1., 0.1, 0.01, 1e-3, 1e-4, 1e-5, 1e-6, 1e-7, 1e-8, 1e-9, 1e-10, 1e-11,
00060   1e-12, 1e-13, 1e-14
00061 };
```

4.32 variable.h

Go to the documentation of this file.

```
/*
MPCOTool:
The Multi-Purposes Calibration and Optimization Tool. A software to perform
calibrations or optimizations of empirical parameters.

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IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF SUCH DAMAGE.
*/

#ifndef VARIABLE__H
#define VARIABLE__H 1

enum Algorithm
{
  ALGORITHM_MONTE_CARLO = 0,
  ALGORITHM_SWEEP = 1,
  ALGORITHM_GENETIC = 2,
  ALGORITHM_ORTHOGONAL = 3
};

typedef struct
{
  char *name;
  double rangemin;
  double rangemax;
  double rangeminabs;
  double rangemaxabs;
  double step;
  unsigned int precision;
  unsigned int nsweeps;
  unsigned int nbits;
} Variable;

extern const char *format[NPRECISIONS];
extern const double precision[NPRECISIONS];

// Public functions
void variable_free (Variable * variable, unsigned int type);
void variable_error (Variable * variable, char *message);
int variable_open_xml (Variable * variable, xmlNode * node,
                       unsigned int algorithm, unsigned int nsteps);
int variable_open_json (Variable * variable, JsonNode * node,
                        unsigned int algorithm, unsigned int nsteps);

#endif
```

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