

# Calibrator

1.5.1

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# Chapter 1

## MPCOTool

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

### VERSIONS

- 1.2.5: Stable and recommended version.
- 1.5.1: Developing version to do new features.

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### TOOLS AND LIBRARIES REQUIRED TO BUILD THE EXECUTABLE

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

### OPTIONAL TOOLS AND LIBRARIES

- `gettext` (to work with different locales)
- `gtk+` (to create the interactive GUI tool)
- `openmpi` or `mpich` (to run in parallelized tasks on multiple computers)

- `doxygen` (standard comments format to generate documentation)
- `latex` (to build the PDF manuals)

## FILES

The source code has to have the following files:

- 1.2.5/configure.ac: configure generator.
- 1.2.5/Makefile.in: Makefile generator.
- 1.2.5/config.h.in: config header generator.
- 1.2.5/mpcotool.c: main source code.
- 1.2.5/mpcotool.h: main header code.
- 1.2.5/interface.h: interface header code.
- 1.2.5/build: script to build all.
- 1.2.5/logo.png: logo figure.
- 1.2.5/Doxyfile: configuration file to generate doxygen documentation.
- TODO: tasks to do.
- [README.md](#): this file.
- tests/testX/\*: several tests to check the program working.
- locales/\*/LC\_MESSAGES/mpcotool.po: translation files.
- manuals/\*.eps: manual figures in EPS format.
- manuals/\*.png: manual figures in PNG format.
- manuals/\*.tex: documentation source files.
- applications/\*/\*: several practical application cases.
- check\_errors/\*.xml: several mistaken files to check error handling.

## BUILDING INSTRUCTIONS

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

Debian 8 (Linux, kFreeBSD or Hurd)

DragonFly BSD 4.2

Dyson Illumos

FreeBSD 10.2

Linux Mint DE 2

NetBSD 7.0

OpenSUSE Linux 13

Ubuntu Linux 12, 14, and 15

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



---

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

2. Download this repository:

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

3. Link the latest genetic version to genetic:

```
$ cd mpcotool/1.2.5
$ ln -s ../../genetic/0.6.1 genetic
```

4. Build doing on a terminal:

```
$ ./build
```

## OpenBSD 5.8

1. Select adequate versions:

```
$ export AUTOCONF_VERSION=2.69 AUTOMAKE_VERSION=1.15
```

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

## Microsoft Windows 7 (with MSYS2)

### Microsoft Windows 8.1 (with MSYS2)

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

```
$ make windist
```

## Fedora Linux 23

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

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

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

## MAKING MANUALS INSTRUCTIONS

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

```
$ make manuals
```

## MAKING TESTS INSTRUCTIONS

In order to build the tests follow the next instructions:

1. Link some tests that needs genetic library doing in a terminal (assuming that you are in the directory mpcotool/1.2.5):

```
$ cd ../tests/test2
$ ln -s ../../genetic/0.6.1 genetic
$ cd ../test3
$ ln -s ../../genetic/0.6.1 genetic
$ cd ../test4
$ ln -s ../../genetic/0.6.1 genetic
```

2. Build all tests doing in the same terminal:

```
$ cd ../1.2.5
$ make tests
```

## USER INSTRUCTIONS

- Command line in sequential mode:

```
$ ./mpcotoolbin [-nthreads X] input_file.xml
```

- Command line in parallelized mode (where X is the number of threads to open in every node):

```
$ mpirun [MPI options] ./mpcotoolbin [-nthreads X] input_file.xml
```

- The syntax of the simulator has to be:

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

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

```
$ ./evaluator_name simulated_file data_file results_file
```

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

```
$ ./mpcotool
```

## INPUT FILE FORMAT

The format of the main input file is as:

```
“<?xml version="1.0"?> <calibrate simulator="simulator_name" evaluator="evaluator_name" algorithm="algorithm_name"
nsimulations="simulations_number" niterations="iterations_number" tolerance="tolerance_value" nbest="best_number"
npopulation="population_number" ngenerations="generations_number" mutation="mutation_ratio" reproduction="reproduction_ratio"
adaptation="adaptation_ratio" gradient_type="gradient_method_type" nsteps="steps_number" relaxation="relaxation_paramter"
nestimates="estimates_number" seed="random_seed" result="result_file" variables="variables_file"> <experiment name="data_file_1"
template1="template_1_1" template2="template_1_2" ... weight="weight_1"/> ... <experiment name="data_file_N" template1="template_
_N_1" template2="template_N_2" ... weight="weight_N"/> <variable name="variable_1" minimum="min_value" maximum="max_value"
precision="precision_digits" sweeps="sweeps_number" nbits="bits_number" step="step_size"> ... <variable name="variable_M"
minimum="min_value" maximum="max_value" precision="precision_digits" sweeps="sweeps_number" nbits="bits_number" step="step_size">
</calibrate> “
```

with:

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

- **precision:** Optional, defined for each variable. Number of precision digits to evaluate the variable. 0 apply for integer numbers (default value is 14).
- **weight** Optional, defined for each experiment. Multiplies the objective value obtained for each experiment in the final objective function value (default value is 1).

Implemented algorithms are:

- **sweep:** Sweep brute force algorithm. It requires for each variable:
  - *sweeps*: number of sweeps to generate for each variable in every experiment.
 The total number of simulations to run is:
 
$$(\text{number of experiments}) \times (\text{variable 1 number of sweeps}) \times \dots \times (\text{variable n number of sweeps}) \times (\text{number of iterations})$$
- **Monte-Carlo:** Monte-Carlo brute force algorithm. It requires on calibrate:
  - *nsimulations*: number of simulations to run in every experiment.
 The total number of simulations to run is:
 
$$(\text{number of experiments}) \times (\text{number of simulations}) \times (\text{number of iterations})$$
- Both brute force algorithms can be iterated to improve convergence by using the following parameters:
  - *nbest*: number of best simulations to calculate convergence interval on next iteration (default 1).
  - *tolerance*: tolerance parameter to increase convergence interval (default 0).
  - *niterations*: number of iterations (default 1).
 It multiplies the total number of simulations:
 
$$\times (\text{number of iterations})$$
- Moreover, both brute force algorithms can be coupled with a gradient based method by using:
  - *gradient\_type*: method to estimate the gradient. Two options are currently available:
    - \* *coordinates*: coordinates descent method.  
It increases the total number of simulations by:
 
$$(\text{number of experiments}) \times (\text{number of iterations}) \times (\text{number of steps}) \times 2 \times (\text{number of variables})$$
    - \* *random*: random method. It requires:
    - \* *nestimates*: number of random checks to estimate the gradient.  
It increases the total number of simulations by:
 
$$(\text{number of experiments}) \times (\text{number of iterations}) \times (\text{number of steps}) \times (\text{number of estimates})$$

Both methods require also:

- *nsteps*: number of steps to perform the gradient based method,
- *relaxation*: relaxation parameter,

and for each variable:

- *step*: initial step size for the gradient based method.

- **genetic:** Genetic algorithm. It requires the following parameters:
  - *npopulation*: number of population.
  - *ngenerations*: number of generations.
  - *mutation*: mutation ratio.
  - *reproduction*: reproduction ratio.
  - *adaptation*: adaptation ratio.

and for each variable:

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

The total number of simulations to run is:

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

## SOME EXAMPLES OF INPUT FILES

### Example 1

- The simulator program name is: *pivot*

- The syntax is:

```
$ ./pivot input_file output_file
```

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

- The syntax is:

```
$ ./compare simulated_file data_file result_file
```

- The calibration is performed with a *sweep brute force algorithm*.

- The experimental data files are:

27-48.txt

42.txt

52.txt

100.txt

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

template1.js

template2.js

template3.js

template4.js

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

alpha1, [179.70, 180.20], 2, 5

alpha2, [179.30, 179.60], 2, 5

random, [0.00, 0.20], 2, 5

boot-time, [0.0, 3.0], 1, 5

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

- The input file is:

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

- A template file as *template1.js*:

```

“ { "towers" : [ { "length" : 50.11, "velocity" : 0.02738, "@variable1@" : @, "@variable2@" : @, "@variable3@" :
@, "@variable4@" : @ }, { "length" : 50.11, "velocity" : 0.02824, "@variable1@" : @, "@variable2@" : @, "@vari-
able3@" : @, "@variable4@" : @ }, { "length" : 50.11, "velocity" : 0.03008, "@variable1@" : @, "@variable2@" :
@, "@variable3@" : @, "@variable4@" : @ }, { "length" : 50.11, "velocity" : 0.03753, "@variable1@" : @, "@vari-
able2@" : @, "@variable3@" : @, "@variable4@" : @ } ], "cycle-time" : 71.0, "plot-time" : 1.0, "comp-time-step":
0.1, "active-percent" : 27.48 } “

```

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

```

“json { "towers" : [ { "length" : 50.11, "velocity" : 0.02738, "alpha1" : 179.95, "alpha2" : 179.45, "random" : 0.10,
"boot-time" : 1.5 }, { "length" : 50.11, "velocity" : 0.02824, "alpha1" : 179.95, "alpha2" : 179.45, "random" : 0.10,
"boot-time" : 1.5 }, { "length" : 50.11, "velocity" : 0.03008, "alpha1" : 179.95, "alpha2" : 179.45, "random" : 0.10,
"boot-time" : 1.5 }, { "length" : 50.11, "velocity" : 0.03753, "alpha1" : 179.95, "alpha2" : 179.45, "random" : 0.10,
"boot-time" : 1.5 } ], "cycle-time" : 71.0, "plot-time" : 1.0, "comp-time-step": 0.1, "active-percent" : 27.48 } “

```



## Chapter 2

# Data Structure Index

### 2.1 Data Structures

Here are the data structures with brief descriptions:

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## Chapter 3

# File Index

### 3.1 File List

Here is a list of all documented files with brief descriptions:

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<a href="#">interface.h</a>	Header file of the interface . . . . .	31
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## Chapter 4

# Data Structure Documentation

### 4.1 Calibrate Struct Reference

Struct to define the calibration data.

```
#include <mpcotool.h>
```

#### Data Fields

- `GMappedFile ** file [MAX_NINPUTS]`  
*Matrix of input template files.*
- `char ** template [MAX_NINPUTS]`  
*Matrix of template names of input files.*
- `char ** experiment`  
*Array of experimental data file names.*
- `char ** label`  
*Array of variable names.*
- `gsl_rng * rng`  
*GSL random number generator.*
- `GeneticVariable * genetic_variable`  
*Array of variables for the genetic algorithm.*
- `FILE * file_result`  
*Result file.*
- `FILE * file_variables`  
*Variables file.*
- `char * result`  
*Name of the result file.*
- `char * variables`  
*Name of the variables file.*
- `char * simulator`  
*Name of the simulator program.*
- `char * evaluator`  
*Name of the program to evaluate the objective function.*
- `double * value`  
*Array of variable values.*
- `double * rangemin`  
*Array of minimum variable values.*
- `double * rangemax`

- Array of maximum variable values.*

  - double \* [rangeminabs](#)
- Array of absolute minimum variable values.*

  - double \* [rangemaxabs](#)
- Array of absolute maximum variable values.*

  - double \* [error\\_best](#)
- Array of the best minimum errors.*

  - double \* [weight](#)
- Array of the experiment weights.*

  - double \* [step](#)
- Array of gradient based method step sizes.*

  - double \* [gradient](#)
- Vector of gradient 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 \* [thread](#)
- Array of simulation numbers to calculate on the thread.*

  - unsigned int \* [thread\\_gradient](#)
- Array of best simulation numbers.*

  - unsigned int \* [simulation\\_best](#)
- Algorithm tolerance.*

  - double [tolerance](#)
- Mutation probability.*

  - double [mutation\\_ratio](#)
- Reproduction probability.*

  - double [reproduction\\_ratio](#)
- Adaptation probability.*

  - double [adaptation\\_ratio](#)
- Relaxation parameter.*

  - double [relaxation](#)
- Calculation time.*

  - double [calculation\\_time](#)
- Exponent of the P error norm.*

  - double [p](#)
- Seed of the pseudo-random numbers generator.*

  - unsigned long int [seed](#)
- Variables number.*

  - unsigned int [nvariables](#)
- Experiments number.*

  - unsigned int [nexperiments](#)
- Number of input files to the simulator.*

  - unsigned int [ninputs](#)
- Simulations number per experiment.*

  - unsigned int [nsimulations](#)
- Gradient method.*

  - unsigned int [gradient\\_method](#)

- Method to estimate the gradient.*

  - unsigned int [nsteps](#)

*Number of steps for the gradient based method.*
- unsigned int [nestimates](#)

*Number of simulations to estimate the gradient.*
- 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\\_gradient](#)

*Beginning simulation number of the task for the gradient based method.*
- unsigned int [nend\\_gradient](#)

*Ending simulation number of the task for the gradient based method.*
- unsigned int [niterations](#)

*Number of algorithm iterations.*
- unsigned int [nbest](#)

*Number of best simulations.*
- unsigned int [nsaveds](#)

*Number of saved simulations.*
- int [mpi\\_rank](#)

*Number of MPI task.*

#### 4.1.1 Detailed Description

Struct to define the calibration data.

Definition at line [129](#) of file [mpcotool.h](#).

#### 4.1.2 Field Documentation

##### 4.1.2.1 unsigned int\* Calibrate::thread\_gradient

Array of simulation numbers to calculate on the thread for the gradient based method.

Definition at line [162](#) of file [mpcotool.h](#).

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

- [mpcotool.h](#)

## 4.2 Experiment Struct Reference

Struct to define experiment data.

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

## Data Fields

- char \* [template](#) [MAX\_NINPUTS]  
*Array of input template names.*
- char \* [name](#)  
*File name.*
- double [weight](#)  
*Weight to calculate the objective function value.*

### 4.2.1 Detailed Description

Struct to define experiment data.

Definition at line 46 of file [interface.h](#).

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

- [interface.h](#)

## 4.3 Input Struct Reference

Struct to define the calibration input file.

```
#include <mpcotool.h>
```

## Data Fields

- char \*\* [template](#) [MAX\_NINPUTS]  
*Matrix of template names of input files.*
- char \*\* [experiment](#)  
*Array of experimental data file names.*
- char \*\* [label](#)  
*Array of variable names.*
- char \* [result](#)  
*Name of the result file.*
- char \* [variables](#)  
*Name of the variables file.*
- char \* [simulator](#)  
*Name of the simulator program.*
- char \* [evaluator](#)  
*Name of the program to evaluate the objective function.*
- char \* [directory](#)  
*Working directory.*
- char \* [name](#)  
*Input data file name.*
- double \* [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 \* [weight](#)  
*Array of the experiment weights.*
- double \* [step](#)  
*Array of gradient based method step sizes.*
- unsigned int \* [precision](#)  
*Array of variable precisions.*
- unsigned int \* [nsweeps](#)  
*Array of sweeps of the sweep algorithm.*
- unsigned int \* [nbits](#)  
*Array of bits numbers of the genetic algorithm.*
- 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.*
- 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 [algorithm](#)  
*Algorithm type.*
- unsigned int [nsteps](#)  
*Number of steps to do the gradient based method.*
- unsigned int [gradient\\_method](#)  
*Method to estimate the gradient.*
- unsigned int [nestimates](#)  
*Number of simulations to estimate the gradient.*
- unsigned int [niterations](#)  
*Number of algorithm iterations.*
- unsigned int [nbest](#)  
*Number of best simulations.*
- unsigned int [norm](#)  
*Error norm type.*

### 4.3.1 Detailed Description

Struct to define the calibration input file.

Definition at line 80 of file [mpcotool.h](#).

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

- [mpcotool.h](#)

## 4.4 Options Struct Reference

Struct to define the options dialog.

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

### Data Fields

- GtkDialog \* [dialog](#)  
*Main GtkDialog.*
- GtkGrid \* [grid](#)  
*Main GtkGrid.*
- GtkLabel \* [label\\_seed](#)  
*Pseudo-random numbers generator seed GtkLabel.*
- GtkSpinButton \* [spin\\_seed](#)  
*Pseudo-random numbers generator seed GtkSpinButton.*
- GtkLabel \* [label\\_threads](#)  
*Threads number GtkLabel.*
- GtkSpinButton \* [spin\\_threads](#)  
*Threads number GtkSpinButton.*
- GtkLabel \* [label\\_gradient](#)  
*Gradient threads number GtkLabel.*
- GtkSpinButton \* [spin\\_gradient](#)  
*Gradient threads number GtkSpinButton.*

### 4.4.1 Detailed Description

Struct to define the options dialog.

Definition at line 76 of file [interface.h](#).

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

- [interface.h](#)

## 4.5 ParallelData Struct Reference

Struct to pass to the GThreads parallelized function.

```
#include <mpcotool.h>
```



## Data Fields

- unsigned int [thread](#)  
*Thread number.*

### 4.5.1 Detailed Description

Struct to pass to the GThreads parallelized function.

Definition at line 203 of file [mpcotool.h](#).

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

- [mpcotool.h](#)

## 4.6 Running Struct Reference

Struct to define the running dialog.

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

## Data Fields

- GtkDialog \* [dialog](#)  
*Main GtkDialog.*
- GtkLabel \* [label](#)  
*Label GtkLabel.*

### 4.6.1 Detailed Description

Struct to define the running dialog.

Definition at line 94 of file [interface.h](#).

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

- [interface.h](#)

## 4.7 Variable Struct Reference

Struct to define variable data.

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

## Data Fields

- char \* [label](#)  
*Variable label.*
- double [rangemin](#)  
*Minimum value.*
- double [rangemax](#)  
*Maximum value.*
- double [rangeminabs](#)

- Minimum allowed value.*
  - double [rangemaxabs](#)
- Maximum allowed value.*
  - double [step](#)
- Initial step size for the gradient based method.*
  - unsigned int [precision](#)
- Precision digits.*
  - unsigned int [nsweeps](#)
- Sweeps number of the sweep algorithm.*
  - unsigned int [nbits](#)
- Bits number of the genetic algorithm.*

#### 4.7.1 Detailed Description

Struct to define variable data.

Definition at line 58 of file [interface.h](#).

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

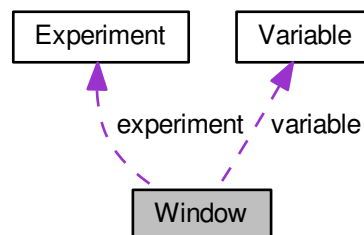
- [interface.h](#)

### 4.8 Window Struct Reference

Struct to define the main window.

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

Collaboration diagram for Window:



#### Data Fields

- GtkWidget \* [window](#)  
*Main GtkWindow.*
- GtkWidget \* [grid](#)  
*Main GtkGrid.*
- GtkWidget \* [bar\\_buttons](#)  
*GtkToolbar to store the main buttons.*

- GtkToolButton \* [button\\_open](#)  
*Open GtkToolButton.*
- GtkToolButton \* [button\\_save](#)  
*Save GtkToolButton.*
- GtkToolButton \* [button\\_run](#)  
*Run GtkToolButton.*
- GtkToolButton \* [button\\_options](#)  
*Options GtkToolButton.*
- GtkToolButton \* [button\\_help](#)  
*Help GtkToolButton.*
- GtkToolButton \* [button\\_about](#)  
*Help GtkToolButton.*
- GtkToolButton \* [button\\_exit](#)  
*Exit GtkToolButton.*
- GtkGrid \* [grid\\_files](#)  
*Files GtkGrid.*
- GtkLabel \* [label\\_simulator](#)  
*Simulator program GtkLabel.*
- GtkFileChooserButton \* [button\\_simulator](#)  
*Simulator program GtkFileChooserButton.*
- GtkCheckButton \* [check\\_evaluator](#)  
*Evaluator program GtkCheckButton.*
- GtkFileChooserButton \* [button\\_evaluator](#)  
*Evaluator program GtkFileChooserButton.*
- GtkLabel \* [label\\_result](#)  
*Result file GtkLabel.*
- GtkEntry \* [entry\\_result](#)  
*Result file GtkEntry.*
- GtkLabel \* [label\\_variables](#)  
*Variables file GtkLabel.*
- GtkEntry \* [entry\\_variables](#)  
*Variables file GtkEntry.*
- GtkFrame \* [frame\\_norm](#)  
*GtkFrame to set the error norm.*
- GtkGrid \* [grid\\_norm](#)  
*GtkGrid to set the error norm.*
- GtkRadioButton \* [button\\_norm](#) [NNORMS]  
*Array of GtkButtons to set the error norm.*
- GtkLabel \* [label\\_p](#)  
*GtkLabel to set the p parameter.*
- GtkSpinButton \* [spin\\_p](#)  
*GtkSpinButton to set the p parameter.*
- GtkScrolledWindow \* [scrolled\\_p](#)  
*GtkScrolledWindow to set the p parameter.*
- GtkFrame \* [frame\\_algorithm](#)  
*GtkFrame to set the algorithm.*
- GtkGrid \* [grid\\_algorithm](#)  
*GtkGrid to set the algorithm.*
- GtkRadioButton \* [button\\_algorithm](#) [NALGORITHMS]  
*Array of GtkButtons to set the algorithm.*
- GtkLabel \* [label\\_simulations](#)

- GtkLabel to set the simulations number.*
- GtkSpinButton \* [spin\\_simulations](#)  
*GtkSpinButton to set the simulations number.*
- GtkLabel \* [label\\_iterations](#)  
*GtkLabel to set the iterations number.*
- GtkSpinButton \* [spin\\_iterations](#)  
*GtkSpinButton to set the iterations number.*
- GtkLabel \* [label\\_tolerance](#)  
*GtkLabel to set the tolerance.*
- GtkSpinButton \* [spin\\_tolerance](#)  
*GtkSpinButton to set the tolerance.*
- GtkLabel \* [label\\_bests](#)  
*GtkLabel to set the best number.*
- GtkSpinButton \* [spin\\_bests](#)  
*GtkSpinButton to set the best number.*
- GtkLabel \* [label\\_population](#)  
*GtkLabel to set the population number.*
- GtkSpinButton \* [spin\\_population](#)  
*GtkSpinButton to set the population number.*
- GtkLabel \* [label\\_generations](#)  
*GtkLabel to set the generations number.*
- GtkSpinButton \* [spin\\_generations](#)  
*GtkSpinButton to set the generations number.*
- GtkLabel \* [label\\_mutation](#)  
*GtkLabel to set the mutation ratio.*
- GtkSpinButton \* [spin\\_mutation](#)  
*GtkSpinButton to set the mutation ratio.*
- GtkLabel \* [label\\_reproduction](#)  
*GtkLabel to set the reproduction ratio.*
- GtkSpinButton \* [spin\\_reproduction](#)  
*GtkSpinButton to set the reproduction ratio.*
- GtkLabel \* [label\\_adaptation](#)  
*GtkLabel to set the adaptation ratio.*
- GtkSpinButton \* [spin\\_adaptation](#)  
*GtkSpinButton to set the adaptation ratio.*
- GtkCheckButton \* [check\\_gradient](#)  
*GtkCheckButton to check running the gradient based method.*
- GtkGrid \* [grid\\_gradient](#)  
*GtkGrid to pack the gradient based method widgets.*
- GtkRadioButton \* [button\\_gradient](#) [NGRADIENTS]  
*GtkRadioButtons array to set the gradient estimate method.*
- GtkLabel \* [label\\_steps](#)  
*GtkLabel to set the steps number.*
- GtkSpinButton \* [spin\\_steps](#)  
*GtkSpinButton to set the steps number.*
- GtkLabel \* [label\\_estimates](#)  
*GtkLabel to set the estimates number.*
- GtkSpinButton \* [spin\\_estimates](#)  
*GtkSpinButton to set the estimates number.*
- GtkLabel \* [label\\_relaxation](#)  
*GtkLabel to set the relaxation parameter.*

- GtkSpinButton \* [spin\\_relaxation](#)  
*GtkSpinButton to set the relaxation parameter.*
- GtkFrame \* [frame\\_variable](#)  
*Variable GtkFrame.*
- GtkGrid \* [grid\\_variable](#)  
*Variable GtkGrid.*
- GtkComboBoxText \* [combo\\_variable](#)  
*GtkComboBoxEntry to select a variable.*
- GtkButton \* [button\\_add\\_variable](#)  
*GtkButton to add a variable.*
- GtkButton \* [button\\_remove\\_variable](#)  
*GtkButton to remove a variable.*
- GtkLabel \* [label\\_variable](#)  
*Variable GtkLabel.*
- GtkEntry \* [entry\\_variable](#)  
*GtkEntry to set the variable name.*
- GtkLabel \* [label\\_min](#)  
*Minimum GtkLabel.*
- GtkSpinButton \* [spin\\_min](#)  
*Minimum GtkSpinButton.*
- GtkScrolledWindow \* [scrolled\\_min](#)  
*Minimum GtkScrolledWindow.*
- GtkLabel \* [label\\_max](#)  
*Maximum GtkLabel.*
- GtkSpinButton \* [spin\\_max](#)  
*Maximum GtkSpinButton.*
- GtkScrolledWindow \* [scrolled\\_max](#)  
*Maximum GtkScrolledWindow.*
- GtkCheckButton \* [check\\_minabs](#)  
*Absolute minimum GtkCheckButton.*
- GtkSpinButton \* [spin\\_minabs](#)  
*Absolute minimum GtkSpinButton.*
- GtkScrolledWindow \* [scrolled\\_minabs](#)  
*Absolute minimum GtkScrolledWindow.*
- GtkCheckButton \* [check\\_maxabs](#)  
*Absolute maximum GtkCheckButton.*
- GtkSpinButton \* [spin\\_maxabs](#)  
*Absolute maximum GtkSpinButton.*
- GtkScrolledWindow \* [scrolled\\_maxabs](#)  
*Absolute maximum GtkScrolledWindow.*
- GtkLabel \* [label\\_precision](#)  
*Precision GtkLabel.*
- GtkSpinButton \* [spin\\_precision](#)  
*Precision digits GtkSpinButton.*
- GtkLabel \* [label\\_sweeps](#)  
*Sweeps number GtkLabel.*
- GtkSpinButton \* [spin\\_sweeps](#)  
*Sweeps number GtkSpinButton.*
- GtkLabel \* [label\\_bits](#)  
*Bits number GtkLabel.*
- GtkSpinButton \* [spin\\_bits](#)

- Bits number GtkSpinButton.*
- GtkLabel \* [label\\_step](#)
  - GtkLabel to set the step.*
- GtkSpinButton \* [spin\\_step](#)
  - GtkSpinButton to set the step.*
- GtkScrolledWindow \* [scrolled\\_step](#)
  - step GtkScrolledWindow.*
- GtkFrame \* [frame\\_experiment](#)
  - [Experiment](#) GtkFrame.*
- GtkGrid \* [grid\\_experiment](#)
  - [Experiment](#) GtkGrid.*
- GtkComboBoxText \* [combo\\_experiment](#)
  - [Experiment](#) GtkComboBoxEntry.*
- GtkButton \* [button\\_add\\_experiment](#)
  - GtkButton to add a experiment.*
- GtkButton \* [button\\_remove\\_experiment](#)
  - GtkButton to remove a experiment.*
- GtkLabel \* [label\\_experiment](#)
  - [Experiment](#) GtkLabel.*
- GtkFileChooserButton \* [button\\_experiment](#)
  - GtkFileChooserButton to set the experimental data file.*
- GtkLabel \* [label\\_weight](#)
  - Weight GtkLabel.*
- GtkSpinButton \* [spin\\_weight](#)
  - Weight GtkSpinButton.*
- GtkCheckButton \* [check\\_template](#) [MAX\_NINPUTS]
  - Array of GtkCheckButtons to set the input templates.*
- GtkFileChooserButton \* [button\\_template](#) [MAX\_NINPUTS]
  - Array of GtkFileChooserButtons to set the input templates.*
- GdkPixbuf \* [logo](#)
  - Logo GdkPixbuf.*
- [Experiment](#) \* [experiment](#)
  - Array of experiments data.*
- [Variable](#) \* [variable](#)
  - Array of variables data.*
- char \* [application\\_directory](#)
  - Application directory.*
- gulong [id\\_experiment](#)
  - Identifier of the combo\_experiment signal.*
- gulong [id\\_experiment\\_name](#)
  - Identifier of the button\_experiment signal.*
- gulong [id\\_variable](#)
  - Identifier of the combo\_variable signal.*
- gulong [id\\_variable\\_label](#)
  - Identifier of the entry\_variable signal.*
- gulong [id\\_template](#) [MAX\_NINPUTS]
  - Array of identifiers of the check\_template signal.*
- gulong [id\\_input](#) [MAX\_NINPUTS]
  - Array of identifiers of the button\_template signal.*
- unsigned int [nexperiments](#)
  - Number of experiments.*
- unsigned int [nvariables](#)
  - Number of variables.*

### 4.8.1 Detailed Description

Struct to define the main window.

Definition at line 104 of file [interface.h](#).

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

- [interface.h](#)





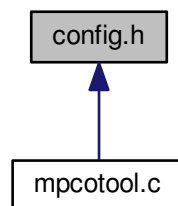
## Chapter 5

# File Documentation

### 5.1 config.h File Reference

Configuration header file.

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



#### Macros

- #define **MAX\_NINPUTS** 8  
*Maximum number of input files in the simulator program.*
- #define **NALGORITHMS** 3  
*Number of stochastic algorithms.*
- #define **NGRADIENTS** 2  
*Number of gradient 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 `XML_ABSOLUTE_MINIMUM` (const xmlChar\*)"absolute\_minimum"  
*absolute minimum XML label.*
- #define `XML_ABSOLUTE_MAXIMUM` (const xmlChar\*)"absolute\_maximum"  
*absolute maximum XML label.*
- #define `XML_ADAPTATION` (const xmlChar\*)"adaptation"  
*adaption XML label.*
- #define `XML_ALGORITHM` (const xmlChar\*)"algorithm"  
*algorith XML label.*
- #define `XML_CALIBRATE` (const xmlChar\*)"calibrate"  
*calibrate XML label.*
- #define `XML_COORDINATES` (const xmlChar\*)"coordinates"  
*coordinates XML label.*
- #define `XML_EUCLIDIAN` (const xmlChar\*)"euclidian"  
*euclidian XML label.*
- #define `XML_EVALUATOR` (const xmlChar\*)"evaluator"  
*evaluator XML label.*
- #define `XML_EXPERIMENT` (const xmlChar\*)"experiment"  
*experiment XML label.*
- #define `XML_GENETIC` (const xmlChar\*)"genetic"  
*genetic XML label.*
- #define `XML_GRADIENT_METHOD` (const xmlChar\*)"gradient\_method"  
*gradient\_method XML label.*
- #define `XML_MINIMUM` (const xmlChar\*)"minimum"  
*minimum XML label.*
- #define `XML_MAXIMUM` (const xmlChar\*)"maximum"  
*maximum XML label.*
- #define `XML_MONTE_CARLO` (const xmlChar\*)"Monte-Carlo"  
*Monte-Carlo XML label.*
- #define `XML_MUTATION` (const xmlChar\*)"mutation"  
*mutation XML label.*
- #define `XML_NAME` (const xmlChar\*)"name"  
*name XML label.*
- #define `XML_NBEST` (const xmlChar\*)"nbest"  
*nbest XML label.*
- #define `XML_NBITS` (const xmlChar\*)"nbits"  
*nbits XML label.*
- #define `XML_NESTIMATES` (const xmlChar\*)"nestimates"  
*nestimates XML label.*
- #define `XML_NGENERATIONS` (const xmlChar\*)"ngenerations"  
*ngenerations XML label.*
- #define `XML_NITERATIONS` (const xmlChar\*)"niterations"  
*niterations XML label.*
- #define `XML_NORM` (const xmlChar\*)"norm"  
*norm XML label.*
- #define `XML_NPOPULATION` (const xmlChar\*)"npopulation"  
*npopulation XML label.*
- #define `XML_NSIMULATIONS` (const xmlChar\*)"nsimulations"

- nsimulations XML label.*
- #define `XML_NSTEPS` (const xmlChar\*)"nsteps"  
*nsteps XML label.*
- #define `XML_NSWEEPS` (const xmlChar\*)"nsweeps"  
*nsweeps XML label.*
- #define `XML_P` (const xmlChar\*)"p"  
*p XML label.*
- #define `XML_PRECISION` (const xmlChar\*)"precision"  
*precision XML label.*
- #define `XML_RANDOM` (const xmlChar\*)"random"  
*random XML label.*
- #define `XML_RELAXATION` (const xmlChar\*)"relaxation"  
*relaxation XML label.*
- #define `XML_REPRODUCTION` (const xmlChar\*)"reproduction"  
*reproduction XML label.*
- #define `XML_RESULT` (const xmlChar\*)"result"  
*result XML label.*
- #define `XML_SIMULATOR` (const xmlChar\*)"simulator"  
*simulator XML label.*
- #define `XML_SEED` (const xmlChar\*)"seed"  
*seed XML label.*
- #define `XML_STEP` (const xmlChar\*)"step"  
*step XML label.*
- #define `XML_SWEEP` (const xmlChar\*)"sweep"  
*sweep XML label.*
- #define `XML_TAXICAB` (const xmlChar\*)"taxicab"  
*taxicab XML label.*
- #define `XML_TEMPLATE1` (const xmlChar\*)"template1"  
*template1 XML label.*
- #define `XML_TEMPLATE2` (const xmlChar\*)"template2"  
*template2 XML label.*
- #define `XML_TEMPLATE3` (const xmlChar\*)"template3"  
*template3 XML label.*
- #define `XML_TEMPLATE4` (const xmlChar\*)"template4"  
*template4 XML label.*
- #define `XML_TEMPLATE5` (const xmlChar\*)"template5"  
*template5 XML label.*
- #define `XML_TEMPLATE6` (const xmlChar\*)"template6"  
*template6 XML label.*
- #define `XML_TEMPLATE7` (const xmlChar\*)"template7"  
*template7 XML label.*
- #define `XML_TEMPLATE8` (const xmlChar\*)"template8"  
*template8 XML label.*
- #define `XML_TOLERANCE` (const xmlChar\*)"tolerance"  
*tolerance XML label.*
- #define `XML_VARIABLE` (const xmlChar\*)"variable"  
*variable XML label.*
- #define `XML_VARIABLES` (const xmlChar\*)"variables"  
*variables XML label.*
- #define `XML_WEIGHT` (const xmlChar\*)"weight"  
*weight XML label.*

### 5.1.1 Detailed Description

Configuration header file.

#### Authors

Javier Burguete and Borja Latorre.

#### Copyright

Copyright 2012-2016, all rights reserved.

Definition in file [config.h](#).

## 5.2 config.h

```

00001 /* config.h.  Generated from config.h.in by configure.  */
00002 /*
00003 MPCOTool: a software to make calibrations of empirical parameters.
00004
00005 AUTHORS: Javier Burguete and Borja Latorre.
00006
00007 Copyright 2012-2016, AUTHORS.
00008
00009 Redistribution and use in source and binary forms, with or without modification,
00010 are permitted provided that the following conditions are met:
00011
00012     1. Redistributions of source code must retain the above copyright notice,
00013        this list of conditions and the following disclaimer.
00014
00015     2. Redistributions in binary form must reproduce the above copyright notice,
00016        this list of conditions and the following disclaimer in the
00017        documentation and/or other materials provided with the distribution.
00018
00019 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00020 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00021 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00022 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00023 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00024 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00025 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00026 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00027 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00028 OF SUCH DAMAGE.
00029 */
00030
00037 #ifndef CONFIG__H
00038 #define CONFIG__H 1
00039
00040 // Array sizes
00041
00042 #define MAX_NINPUTS 8
00043 #define NALGORITHMS 3
00045 #define NGRADIENTS 2
00046 #define NNORMS 4
00047 #define NPRECISIONS 15
00048
00049 // Default choices
00050
00051 #define DEFAULT_PRECISION (NPRECISIONS - 1)
00052 #define DEFAULT_RANDOM_SEED 7007
00053 #define DEFAULT_RELAXATION 1.
00054
00055 // Interface labels
00056
00057 #define LOCALE_DIR "locales"
00058 #define PROGRAM_INTERFACE "mpcotool"
00059
00060 // XML labels
00061
00062 #define XML_ABSOLUTE_MINIMUM (const xmlChar*)"absolute_minimum"
00063 #define XML_ABSOLUTE_MAXIMUM (const xmlChar*)"absolute_maximum"
00065 #define XML_ADAPTATION (const xmlChar*)"adaptation"
00067 #define XML_ALGORITHM (const xmlChar*)"algorithm"
00069 #define XML_CALIBRATE (const xmlChar*)"calibrate"
00071 #define XML_COORDINATES (const xmlChar*)"coordinates"
00073 #define XML_EUCLIDIAN (const xmlChar*)"euclidian"

```

```

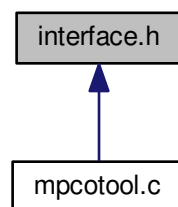
00075 #define XML_EVALUATOR (const xmlChar*)"evaluator"
00077 #define XML_EXPERIMENT (const xmlChar*)"experiment"
00079 #define XML_GENETIC (const xmlChar*)"genetic"
00081 #define XML_GRADIENT_METHOD (const xmlChar*)"gradient_method"
00082 #define XML_MINIMUM (const xmlChar*)"minimum"
00084 #define XML_MAXIMUM (const xmlChar*)"maximum"
00085 #define XML_MONTE_CARLO (const xmlChar*)"Monte-Carlo"
00086 #define XML_MUTATION (const xmlChar*)"mutation"
00088 #define XML_NAME (const xmlChar*)"name"
00089 #define XML_NBEST (const xmlChar*)"nbest"
00090 #define XML_NBITS (const xmlChar*)"nbits"
00091 #define XML_NESTIMATES (const xmlChar*)"nestimates"
00092 #define XML_NGENERATIONS (const xmlChar*)"ngenerations"
00094 #define XML_NITERATIONS (const xmlChar*)"niterations"
00096 #define XML_NORM (const xmlChar*)"norm"
00098 #define XML_NPOPULATION (const xmlChar*)"npopulation"
00099 #define XML_NSIMULATIONS (const xmlChar*)"nsimulations"
00101 #define XML_NSTEPS (const xmlChar*)"nsteps"
00103 #define XML_NSWEEPS (const xmlChar*)"nsweeps"
00104 #define XML_P (const xmlChar*)"p"
00105 #define XML_PRECISION (const xmlChar*)"precision"
00106 #define XML_RANDOM (const xmlChar*)"random"
00108 #define XML_RELAXATION (const xmlChar*)"relaxation"
00109 #define XML_REPRODUCTION (const xmlChar*)"reproduction"
00111 #define XML_RESULT (const xmlChar*)"result"
00113 #define XML_SIMULATOR (const xmlChar*)"simulator"
00114 #define XML_SEED (const xmlChar*)"seed"
00116 #define XML_STEP (const xmlChar*)"step"
00117 #define XML_SWEEP (const xmlChar*)"sweep"
00118 #define XML_TAXICAB (const xmlChar*)"taxicab"
00119 #define XML_TEMPLATE1 (const xmlChar*)"template1"
00120 #define XML_TEMPLATE2 (const xmlChar*)"template2"
00122 #define XML_TEMPLATE3 (const xmlChar*)"template3"
00124 #define XML_TEMPLATE4 (const xmlChar*)"template4"
00126 #define XML_TEMPLATE5 (const xmlChar*)"template5"
00128 #define XML_TEMPLATE6 (const xmlChar*)"template6"
00130 #define XML_TEMPLATE7 (const xmlChar*)"template7"
00132 #define XML_TEMPLATE8 (const xmlChar*)"template8"
00134 #define XML_TOLERANCE (const xmlChar*)"tolerance"
00136 #define XML_VARIABLE (const xmlChar*)"variable"
00138 #define XML_VARIABLES (const xmlChar*)"variables"
00139 #define XML_WEIGHT (const xmlChar*)"weight"
00141
00142 #endif

```

## 5.3 interface.h File Reference

Header file of the interface.

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



## Data Structures

- struct [Experiment](#)

*Struct to define experiment data.*

- struct [Variable](#)  
*Struct to define variable data.*
- struct [Options](#)  
*Struct to define the options dialog.*
- struct [Running](#)  
*Struct to define the running dialog.*
- struct [Window](#)  
*Struct to define the main window.*

## Macros

- #define [MAX\\_LENGTH](#) ([DEFAULT\\_PRECISION](#) + 8)  
*Max length of texts allowed in GtkSpinButtons.*

## Functions

- unsigned int [gtk\\_array\\_get\\_active](#) (GtkRadioButton \*array[], unsigned int n)  
*Function to get the active GtkRadioButton.*
- void [input\\_save](#) (char \*filename)  
*Function to save the input file.*
- void [options\\_new](#) ()  
*Function to open the options dialog.*
- void [running\\_new](#) ()  
*Function to open the running dialog.*
- unsigned int [window\\_get\\_algorithm](#) ()  
*Function to get the stochastic algorithm number.*
- unsigned int [window\\_get\\_gradient](#) ()  
*Function to get the gradient base method number.*
- unsigned int [window\\_get\\_norm](#) ()  
*Function to get the norm base method number.*
- void [window\\_save\\_gradient](#) ()  
*Function to save the gradient based method data in the input file.*
- int [window\\_save](#) ()  
*Function to save the input file.*
- void [window\\_run](#) ()  
*Function to run a calibration.*
- void [window\\_help](#) ()  
*Function to show a help dialog.*
- void [window\\_update\\_gradient](#) ()  
*Function to update gradient based method widgets view in the main window.*
- void [window\\_update](#) ()  
*Function to update the main window view.*
- void [window\\_set\\_algorithm](#) ()  
*Function to avoid memory errors changing the algorithm.*
- void [window\\_set\\_experiment](#) ()  
*Function to set the experiment data in the main window.*
- void [window\\_remove\\_experiment](#) ()  
*Function to remove an experiment in the main window.*
- void [window\\_add\\_experiment](#) ()  
*Function to add an experiment in the main window.*

- void [window\\_name\\_experiment](#) ()  
*Function to set the experiment name in the main window.*
- void [window\\_weight\\_experiment](#) ()  
*Function to update the experiment weight in the main window.*
- void [window\\_inputs\\_experiment](#) ()  
*Function to update the experiment input templates number in the main window.*
- void [window\\_template\\_experiment](#) (void \*data)  
*Function to update the experiment i-th input template in the main window.*
- void [window\\_set\\_variable](#) ()  
*Function to set the variable data in the main window.*
- void [window\\_remove\\_variable](#) ()  
*Function to remove a variable in the main window.*
- void [window\\_add\\_variable](#) ()  
*Function to add a variable in the main window.*
- void [window\\_label\\_variable](#) ()  
*Function to set the variable label in the main window.*
- void [window\\_precision\\_variable](#) ()  
*Function to update the variable precision in the main window.*
- void [window\\_rangemin\\_variable](#) ()  
*Function to update the variable rangemin in the main window.*
- void [window\\_rangemax\\_variable](#) ()  
*Function to update the variable rangemax in the main window.*
- void [window\\_rangeminabs\\_variable](#) ()  
*Function to update the variable rangeminabs in the main window.*
- void [window\\_rangemaxabs\\_variable](#) ()  
*Function to update the variable rangemaxabs in the main window.*
- void [window\\_update\\_variable](#) ()  
*Function to update the variable data in the main window.*
- int [window\\_read](#) (char \*filename)  
*Function to read the input data of a file.*
- void [window\\_open](#) ()  
*Function to open the input data.*
- void [window\\_new](#) ()  
*Function to open the main window.*
- int [cores\\_number](#) ()  
*Function to obtain the cores number.*

### 5.3.1 Detailed Description

Header file of the interface.

#### Authors

Javier Burguete.

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Definition in file [interface.h](#).

## 5.3.2 Function Documentation

### 5.3.2.1 int cores\_number ( )

Function to obtain the cores number.

#### Returns

Cores number.

Definition at line 5140 of file [mpcotool.c](#).

```
05141 {
05142     #ifdef G_OS_WIN32
05143         SYSTEM_INFO sysinfo;
05144         GetSystemInfo (&sysinfo);
05145         return sysinfo.dwNumberOfProcessors;
05146     #else
05147         return (int) sysconf (_SC_NPROCESSORS_ONLN);
05148     #endif
05149 }
```

### 5.3.2.2 unsigned int gtk\_array\_get\_active ( GtkWidget \* array[], unsigned int n )

Function to get the active GtkWidget.

#### Parameters

<i>array</i>	Array of GtkWidget.
<i>n</i>	Number of GtkWidget.

#### Returns

Active GtkWidget.

Definition at line 486 of file [mpcotool.c](#).

```
00487 {
00488     unsigned int i;
00489     for (i = 0; i < n; ++i)
00490         if (gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (array[i])))
00491             break;
00492     return i;
00493 }
```

### 5.3.2.3 void input\_save ( char \* filename )

Function to save the input file.

#### Parameters

<i>filename</i>	Input file name.
-----------------	------------------

Definition at line 2874 of file [mpcotool.c](#).

```
02875 {
02876     unsigned int i, j;
02877     char *buffer;
02878     xmlDoc *doc;
02879     xmlNode *node, *child;
02880     GFile *file, *file2;
02881
02882     #if DEBUG
02883         fprintf (stderr, "input_save: start\n");
02884     #endif
02885 }
```



```

02886 // Getting the input file directory
02887 input->name = g_path_get_basename (filename);
02888 input->directory = g_path_get_dirname (filename);
02889 file = g_file_new_for_path (input->directory);
02890
02891 // Opening the input file
02892 doc = xmlNewDoc ((const xmlChar *) "1.0");
02893
02894 // Setting root XML node
02895 node = xmlNewDocNode (doc, 0, XML_CALIBRATE, 0);
02896 xmlDocSetRootElement (doc, node);
02897
02898 // Adding properties to the root XML node
02899 if (xmlStrcmp ((const xmlChar *) input->result, result_name))
02900     xmlSetProp (node, XML_RESULT, (xmlChar *) input->result);
02901 if (xmlStrcmp ((const xmlChar *) input->variables,
variables_name))
02902     xmlSetProp (node, XML_VARIABLES, (xmlChar *) input->
variables);
02903 file2 = g_file_new_for_path (input->simulator);
02904 buffer = g_file_get_relative_path (file, file2);
02905 g_object_unref (file2);
02906 xmlSetProp (node, XML_SIMULATOR, (xmlChar *) buffer);
02907 g_free (buffer);
02908 if (input->evaluator)
02909 {
02910     file2 = g_file_new_for_path (input->evaluator);
02911     buffer = g_file_get_relative_path (file, file2);
02912     g_object_unref (file2);
02913     if (xmlStrlen ((xmlChar *) buffer))
02914         xmlSetProp (node, XML_EVALUATOR, (xmlChar *) buffer);
02915     g_free (buffer);
02916 }
02917 if (input->seed != DEFAULT_RANDOM_SEED)
02918     xml_node_set_uint (node, XML_SEED, input->seed);
02919
02920 // Setting the algorithm
02921 buffer = (char *) g_malloc (64);
02922 switch (input->algorithm)
02923 {
02924     case ALGORITHM_MONTE_CARLO:
02925         xmlSetProp (node, XML_ALGORITHM, XML_MONTE_CARLO);
02926         snprintf (buffer, 64, "%u", input->nsimulations);
02927         xmlSetProp (node, XML_NSIMULATIONS, (xmlChar *) buffer);
02928         snprintf (buffer, 64, "%u", input->niterations);
02929         xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02930         snprintf (buffer, 64, "%.3lg", input->tolerance);
02931         xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02932         snprintf (buffer, 64, "%u", input->nbest);
02933         xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02934         input_save_gradient (node);
02935         break;
02936     case ALGORITHM_SWEEP:
02937         xmlSetProp (node, XML_ALGORITHM, XML_SWEEP);
02938         snprintf (buffer, 64, "%u", input->niterations);
02939         xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02940         snprintf (buffer, 64, "%.3lg", input->tolerance);
02941         xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02942         snprintf (buffer, 64, "%u", input->nbest);
02943         xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02944         input_save_gradient (node);
02945         break;
02946     default:
02947         xmlSetProp (node, XML_ALGORITHM, XML_GENETIC);
02948         snprintf (buffer, 64, "%u", input->nsimulations);
02949         xmlSetProp (node, XML_NPOPULATION, (xmlChar *) buffer);
02950         snprintf (buffer, 64, "%u", input->niterations);
02951         xmlSetProp (node, XML_NGENERATIONS, (xmlChar *) buffer);
02952         snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
02953         xmlSetProp (node, XML_MUTATION, (xmlChar *) buffer);
02954         snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
02955         xmlSetProp (node, XML_REPRODUCTION, (xmlChar *) buffer);
02956         snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
02957         xmlSetProp (node, XML_ADAPTATION, (xmlChar *) buffer);
02958         break;
02959 }
02960 g_free (buffer);
02961
02962 // Setting the experimental data
02963 for (i = 0; i < input->nexperiments; ++i)
02964 {
02965     child = xmlNewChild (node, 0, XML_EXPERIMENT, 0);
02966     xmlSetProp (child, XML_NAME, (xmlChar *) input->experiment[i]);
02967     if (input->weight[i] != 1.)
02968         xml_node_set_float (child, XML_WEIGHT, input->
weight[i]);
02969     for (j = 0; j < input->ninputs; ++j)

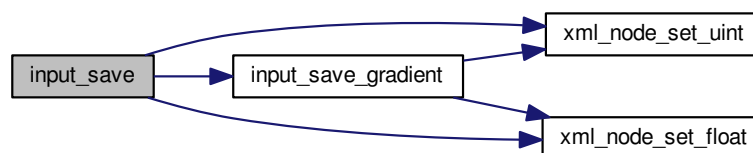
```

```

02970         xmlSetProp (child, template[j], (xmlChar *) input->template[j][i]);
02971     }
02972
02973     // Setting the variables data
02974     for (i = 0; i < input->nvariables; ++i)
02975     {
02976         child = xmlNewChild (node, 0, XML_VARIABLE, 0);
02977         xmlSetProp (child, XML_NAME, (xmlChar *) input->label[i]);
02978         xml_node_set_float (child, XML_MINIMUM, input->
rangemin[i]);
02979         if (input->rangeminabs[i] != -G_MAXDOUBLE)
02980             xml_node_set_float (child, XML_ABSOLUTE_MINIMUM,
input->rangeminabs[i]);
02981         xml_node_set_float (child, XML_MAXIMUM, input->
rangemax[i]);
02982         if (input->rangemaxabs[i] != G_MAXDOUBLE)
02983             xml_node_set_float (child, XML_ABSOLUTE_MAXIMUM,
input->rangemaxabs[i]);
02984         if (input->precision[i] != DEFAULT_PRECISION)
02985             xml_node_set_uint (child, XML_PRECISION,
input->precision[i]);
02986         if (input->algorithm == ALGORITHM_SWEEP)
02987             xml_node_set_uint (child, XML_NSWEEPS, input->
nsweeps[i]);
02988         else if (input->algorithm == ALGORITHM_GENETIC)
02989             xml_node_set_uint (child, XML_NBITS, input->
nbits[i]);
02990         if (input->nsteps)
02991             xml_node_set_float (child, XML_STEP, input->
step[i]);
02992     }
02993
02994     // Saving the error norm
02995     switch (input->norm)
02996     {
02997     case ERROR_NORM_MAXIMUM:
02998         xmlSetProp (node, XML_NORM, XML_MAXIMUM);
02999         break;
03000     case ERROR_NORM_P:
03001         xmlSetProp (node, XML_NORM, XML_P);
03002         xml_node_set_float (node, XML_P, input->p);
03003         break;
03004     case ERROR_NORM_TAXICAB:
03005         xmlSetProp (node, XML_NORM, XML_TAXICAB);
03006     }
03007
03008     // Saving the XML file
03009     xmlSaveFormatFile (filename, doc, 1);
03010
03011     // Freeing memory
03012     xmlFreeDoc (doc);
03013
03014     #if DEBUG
03015     fprintf (stderr, "input_save: end\n");
03016     #endif
03017 }

```

Here is the call graph for this function:



### 5.3.2.4 unsigned int window\_get\_algorithm ( )

Function to get the stochastic algorithm number.

**Returns**

Stochastic algorithm number.

Definition at line 3121 of file [mpcotool.c](#).

```

03122 {
03123     unsigned int i;
03124     #if DEBUG
03125     fprintf (stderr, "window_get_algorithm: start\n");
03126     #endif
03127     i = gtk_array_get_active (window->button_algorithm,
        NALGORITHMS);
03128     #if DEBUG
03129     fprintf (stderr, "window_get_algorithm: %u\n", i);
03130     fprintf (stderr, "window_get_algorithm: end\n");
03131     #endif
03132     return i;
03133 }
```

Here is the call graph for this function:

**5.3.2.5 unsigned int window\_get\_gradient ( )**

Function to get the gradient base method number.

**Returns**

Gradient base method number.

Definition at line 3141 of file [mpcotool.c](#).

```

03142 {
03143     unsigned int i;
03144     #if DEBUG
03145     fprintf (stderr, "window_get_gradient: start\n");
03146     #endif
03147     i = gtk_array_get_active (window->button_gradient ,
        NGRADIENTS);
03148     #if DEBUG
03149     fprintf (stderr, "window_get_gradient: %u\n", i);
03150     fprintf (stderr, "window_get_gradient: end\n");
03151     #endif
03152     return i;
03153 }
```

Here is the call graph for this function:



### 5.3.2.6 unsigned int window\_get\_norm ( )

Function to get the norm base method number.

#### Returns

Gradient base method number.

Definition at line 3161 of file [mpcotool.c](#).

```
03162 {
03163     unsigned int i;
03164     #if DEBUG
03165     fprintf (stderr, "window_get_norm: start\n");
03166     #endif
03167     i = gtk_array_get_active (window->button_norm ,
03168                             NNORMS);
03169     #if DEBUG
03169     fprintf (stderr, "window_get_norm: %u\n", i);
03170     fprintf (stderr, "window_get_norm: end\n");
03171     #endif
03172     return i;
03173 }
```

Here is the call graph for this function:



### 5.3.2.7 int window\_read ( char \* filename )

Function to read the input data of a file.

#### Parameters

<i>filename</i>	File name.
-----------------	------------

#### Returns

1 on succes, 0 on error.

Definition at line 4264 of file [mpcotool.c](#).

```
04265 {
04266     unsigned int i;
04267     char *buffer;
04268     #if DEBUG
04269     fprintf (stderr, "window_read: start\n");
04270     #endif
04271     // Reading new input file
04272     input_free ();
04273     if (!input_open (filename))
04274         return 0;
04275     // Setting GTK+ widgets data
04276     gtk_entry_set_text (window->entry_result, input->result);
04277     gtk_entry_set_text (window->entry_variables, input->
04278                         variables);
04279 }
```

```

04280     buffer = g_build_filename (input->directory, input->
simulator, NULL);
04281     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
04282         (window->button_simulator), buffer);
04283     g_free (buffer);
04284     gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
04285         (size_t) input->evaluator);
04286     if (input->evaluator)
04287     {
04288         buffer = g_build_filename (input->directory, input->
evaluator, NULL);
04289         gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
04290             (window->button_evaluator), buffer);
04291         g_free (buffer);
04292     }
04293     gtk_toggle_button_set_active
04294         (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
algorithm]), TRUE);
04295     switch (input->algorithm)
04296     {
04297     case ALGORITHM_MONTE_CARLO:
04298         gtk_spin_button_set_value (window->spin_simulations,
04299             (gdouble) input->nsimulations);
04300     case ALGORITHM_SWEEP:
04301         gtk_spin_button_set_value (window->spin_iterations,
04302             (gdouble) input->niterations);
04303         gtk_spin_button_set_value (window->spin_bests, (gdouble)
input->nbest);
04304         gtk_spin_button_set_value (window->spin_tolerance,
input->tolerance);
04305         gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->
check_gradient),
input->nsteps);
04306     if (input->nsteps)
04307     {
04308         gtk_toggle_button_set_active
04309             (GTK_TOGGLE_BUTTON (window->button_gradient
[input->gradient_method]), TRUE);
04310         gtk_spin_button_set_value (window->spin_steps,
04311             (gdouble) input->nsteps);
04312         gtk_spin_button_set_value (window->spin_relaxation,
04313             (gdouble) input->relaxation);
04314         switch (input->gradient_method)
04315         {
04316         case GRADIENT_METHOD_RANDOM:
04317             gtk_spin_button_set_value (window->spin_estimates,
04318                 (gdouble) input->nestimates);
04319         }
04320     }
04321     break;
04322 default:
04323     gtk_spin_button_set_value (window->spin_population,
04324         (gdouble) input->nsimulations);
04325     gtk_spin_button_set_value (window->spin_generations,
04326         (gdouble) input->niterations);
04327     gtk_spin_button_set_value (window->spin_mutation, input->
mutation_ratio);
04328     gtk_spin_button_set_value (window->spin_reproduction,
input->reproduction_ratio);
04329     gtk_spin_button_set_value (window->spin_adaptation,
input->adaptation_ratio);
04330 }
04331 gtk_toggle_button_set_active
04332     (GTK_TOGGLE_BUTTON (window->button_norm[input->norm]), TRUE);
04333 gtk_spin_button_set_value (window->spin_p, input->p);
04334 g_signal_handler_block (window->combo_experiment, window->
id_experiment);
04335 g_signal_handler_block (window->button_experiment,
window->id_experiment_name);
04336 gtk_combo_box_text_remove_all (window->combo_experiment);
04337 for (i = 0; i < input->nexperiments; ++i)
04338     gtk_combo_box_text_append_text (window->combo_experiment,
input->experiment[i]);
04339 g_signal_handler_unblock
04340     (window->button_experiment, window->
id_experiment_name);
04341 g_signal_handler_unblock (window->combo_experiment,
window->id_experiment);
04342 gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
04343 g_signal_handler_block (window->combo_variable, window->
id_variable);
04344 g_signal_handler_block (window->entry_variable, window->
id_variable_label);
04345 gtk_combo_box_text_remove_all (window->combo_variable);
04346 for (i = 0; i < input->nvariables; ++i)
04347     gtk_combo_box_text_append_text (window->combo_variable,
input->label[i]);

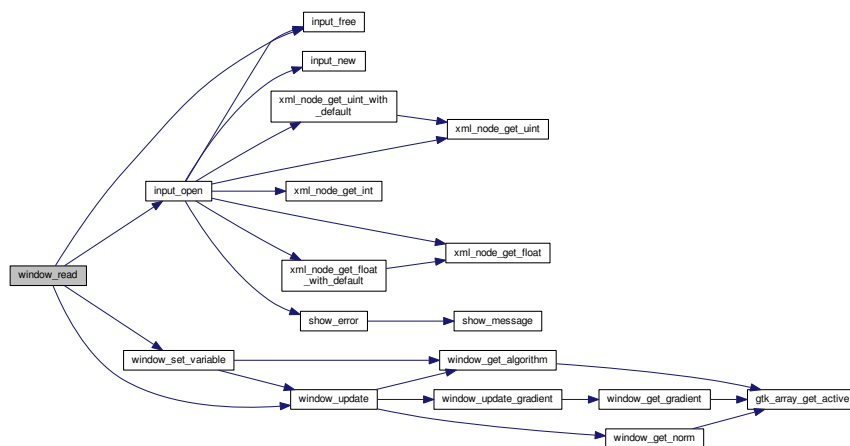
```

```

04354 g_signal_handler_unblock (window->entry_variable, window->
id_variable_label);
04355 g_signal_handler_unblock (window->combo_variable, window->
id_variable);
04356 gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
04357 window_set_variable ();
04358 window_update ();
04359
04360 #if DEBUG
04361 fprintf (stderr, "window_read: end\n");
04362 #endif
04363 return 1;
04364 }

```

Here is the call graph for this function:



### 5.3.2.8 int window\_save ( )

Function to save the input file.

#### Returns

1 on OK, 0 on Cancel.

Definition at line 3213 of file [mpcotool.c](#).

```

03214 {
03215     GtkFileChooserDialog *dlg;
03216     GtkFileFilter *filter;
03217     char *buffer;
03218
03219     #if DEBUG
03220     fprintf (stderr, "window_save: start\n");
03221     #endif
03222
03223     // Opening the saving dialog
03224     dlg = (GtkFileChooserDialog *)
03225         gtk_file_chooser_dialog_new (gettext ("Save file"),
03226                                     window->window,
03227                                     GTK_FILE_CHOOSER_ACTION_SAVE,
03228                                     gettext ("_Cancel"),
03229                                     GTK_RESPONSE_CANCEL,
03230                                     gettext ("_OK"), GTK_RESPONSE_OK, NULL);
03231     gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
03232     buffer = g_build_filename (input->directory, input->name, NULL);
03233     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER (dlg), buffer);
03234     g_free (buffer);
03235
03236     // Adding XML filter
03237     filter = (GtkFileFilter *) gtk_file_filter_new ();

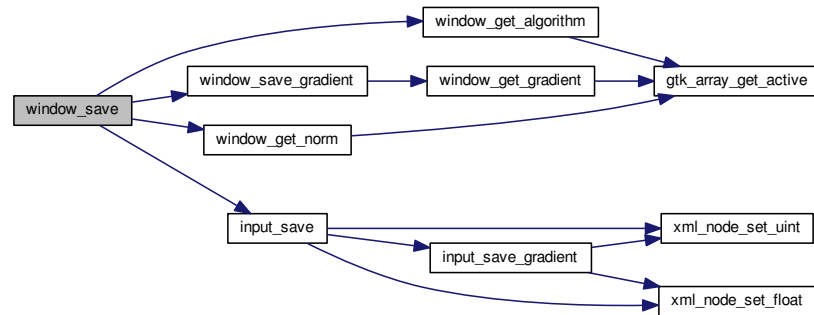
```

```

03238 gtk_file_filter_set_name (filter, "XML");
03239 gtk_file_filter_add_pattern (filter, "*.xml");
03240 gtk_file_filter_add_pattern (filter, "*.XML");
03241 gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter);
03242
03243 // If OK response then saving
03244 if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
03245 {
03246
03247     // Adding properties to the root XML node
03248     input->simulator = gtk_file_chooser_get_filename
03249         (GTK_FILE_CHOOSER (window->button_simulator));
03250     if (gtk_toggle_button_get_active
03251         (GTK_TOGGLE_BUTTON (window->check_evaluator)))
03252         input->evaluator = gtk_file_chooser_get_filename
03253             (GTK_FILE_CHOOSER (window->button_evaluator));
03254     else
03255         input->evaluator = NULL;
03256     input->result
03257         = (char *) xmlStrdup ((const xmlChar *)
03258             gtk_entry_get_text (window->entry_result));
03259     input->variables
03260         = (char *) xmlStrdup ((const xmlChar *)
03261             gtk_entry_get_text (window->entry_variables));
03262
03263     // Setting the algorithm
03264     switch (window_get_algorithm ())
03265     {
03266     case ALGORITHM_MONTE_CARLO:
03267         input->algorithm = ALGORITHM_MONTE_CARLO;
03268         input->nsimulations
03269             = gtk_spin_button_get_value_as_int (window->spin_simulations);
03270         input->niterations
03271             = gtk_spin_button_get_value_as_int (window->spin_iterations);
03272         input->tolerance = gtk_spin_button_get_value (window->
03273 spin_tolerance);
03274         input->nbest = gtk_spin_button_get_value_as_int (window->
03275 spin_bests);
03276         window_save_gradient ();
03277         break;
03278     case ALGORITHM_SWEEP:
03279         input->algorithm = ALGORITHM_SWEEP;
03280         input->niterations
03281             = gtk_spin_button_get_value_as_int (window->spin_iterations);
03282         input->tolerance = gtk_spin_button_get_value (window->
03283 spin_tolerance);
03284         input->nbest = gtk_spin_button_get_value_as_int (window->
03285 spin_bests);
03286         window_save_gradient ();
03287         break;
03288     default:
03289         input->algorithm = ALGORITHM_GENETIC;
03290         input->nsimulations
03291             = gtk_spin_button_get_value_as_int (window->spin_population);
03292         input->niterations
03293             = gtk_spin_button_get_value_as_int (window->spin_generations);
03294         input->mutation_ratio
03295             = gtk_spin_button_get_value (window->spin_mutation);
03296         input->reproduction_ratio
03297             = gtk_spin_button_get_value (window->spin_reproduction);
03298         input->adaptation_ratio
03299             = gtk_spin_button_get_value (window->spin_adaptation);
03300         break;
03301     }
03302     input->norm = window_get_norm ();
03303     input->p = gtk_spin_button_get_value (window->spin_p);
03304
03305     // Saving the XML file
03306     buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
03307     input_save (buffer);
03308
03309     // Closing and freeing memory
03310     g_free (buffer);
03311     gtk_widget_destroy (GTK_WIDGET (dlg));
03312 #if DEBUG
03313     fprintf (stderr, "window_save: end\n");
03314 #endif
03315     return 1;
03316 }
03317
03318 // Closing and freeing memory
03319 gtk_widget_destroy (GTK_WIDGET (dlg));
03320 #if DEBUG
03321     fprintf (stderr, "window_save: end\n");
03322 #endif
03323     return 0;
03324 }

```

Here is the call graph for this function:



### 5.3.2.9 void window\_template\_experiment ( void \* data )

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

#### Parameters

<i>data</i>	Callback data (i-th input template).
-------------	--------------------------------------

Definition at line 3868 of file [mpcotool.c](#).

```

03869 {
03870     unsigned int i, j;
03871     char *buffer;
03872     GFile *file1, *file2;
03873     #if DEBUG
03874         fprintf (stderr, "window_template_experiment: start\n");
03875     #endif
03876     i = (size_t) data;
03877     j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
03878     file1
03879         = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
03880     file2 = g_file_new_for_path (input->directory);
03881     buffer = g_file_get_relative_path (file2, file1);
03882     input->template[i][j] = (char *) xmlStrdup ((xmlChar *) buffer);
03883     g_free (buffer);
03884     g_object_unref (file2);
03885     g_object_unref (file1);
03886     #if DEBUG
03887         fprintf (stderr, "window_template_experiment: end\n");
03888     #endif
03889 }

```

## 5.4 interface.h

```

00001 /*
00002 MPCOTool: a software to make calibrations of empirical parameters.
00003
00004 AUTHORS: Javier Burguete and Borja Latorre.
00005
00006 Copyright 2012-2016, AUTHORS.
00007
00008 Redistribution and use in source and binary forms, with or without modification,
00009 are permitted provided that the following conditions are met:
00010
00011     1. Redistributions of source code must retain the above copyright notice,
00012        this list of conditions and the following disclaimer.
00013
00014     2. Redistributions in binary form must reproduce the above copyright notice,
00015        this list of conditions and the following disclaimer in the
00016        documentation and/or other materials provided with the distribution.
00017

```



```

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00020 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00021 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00022 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00023 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00024 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00025 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00026 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00027 OF SUCH DAMAGE.
00028 */
00029
00036 #ifndef INTERFACE__H
00037 #define INTERFACE__H 1
00038
00039 #define MAX_LENGTH (DEFAULT_PRECISION + 8)
00040
00046 typedef struct
00047 {
00048     char *template[MAX_NINPUTS];
00049     char *name;
00050     double weight;
00052 } Experiment;
00053
00058 typedef struct
00059 {
00060     char *label;
00061     double rangemin;
00062     double rangemax;
00063     double rangeminabs;
00064     double rangemaxabs;
00065     double step;
00067     unsigned int precision;
00068     unsigned int nsweeps;
00069     unsigned int nbits;
00070 } Variable;
00071
00076 typedef struct
00077 {
00078     GtkDialog *dialog;
00079     GtkGrid *grid;
00080     GtkLabel *label_seed;
00082     GtkSpinButton *spin_seed;
00084     GtkLabel *label_threads;
00085     GtkSpinButton *spin_threads;
00086     GtkLabel *label_gradient;
00087     GtkSpinButton *spin_gradient;
00088 } Options;
00089
00094 typedef struct
00095 {
00096     GtkDialog *dialog;
00097     GtkLabel *label;
00098 } Running;
00099
00104 typedef struct
00105 {
00106     GtkWidget *window;
00107     GtkGrid *grid;
00108     GtkToolbar *bar_buttons;
00109     GtkToolButton *button_open;
00110     GtkToolButton *button_save;
00111     GtkToolButton *button_run;
00112     GtkToolButton *button_options;
00113     GtkToolButton *button_help;
00114     GtkToolButton *button_about;
00115     GtkToolButton *button_exit;
00116     GtkGrid *grid_files;
00117     GtkLabel *label_simulator;
00118     GtkFileChooserButton *button_simulator;
00120     GtkCheckButton *check_evaluator;
00121     GtkFileChooserButton *button_evaluator;
00123     GtkLabel *label_result;
00124     GtkEntry *entry_result;
00125     GtkLabel *label_variables;
00126     GtkEntry *entry_variables;
00127     GtkFrame *frame_norm;
00128     GtkGrid *grid_norm;
00129     GtkRadioButton *button_norm[NNORMS];
00131     GtkLabel *label_p;
00132     GtkSpinButton *spin_p;
00133     GtkScrolledWindow *scrolled_p;
00134     GtkFrame *frame_algorithm;
00135     GtkGrid *grid_algorithm;
00136     GtkRadioButton *button_algorithm[NALGORITHMS];
00138     GtkLabel *label_simulations;
00139     GtkSpinButton *spin_simulations;

```

```

00141   GtkWidget *label_iterations;
00142   GtkSpinButton *spin_iterations;
00144   GtkWidget *label_tolerance;
00145   GtkSpinButton *spin_tolerance;
00146   GtkWidget *label_bests;
00147   GtkSpinButton *spin_bests;
00148   GtkWidget *label_population;
00149   GtkSpinButton *spin_population;
00151   GtkWidget *label_generations;
00152   GtkSpinButton *spin_generations;
00154   GtkWidget *label_mutation;
00155   GtkSpinButton *spin_mutation;
00156   GtkWidget *label_reproduction;
00157   GtkSpinButton *spin_reproduction;
00159   GtkWidget *label_adaptation;
00160   GtkSpinButton *spin_adaptation;
00162   GtkCheckButton *check_gradient;
00164   GtkWidget *grid_gradient;
00166   GtkRadioButton *button_gradient[NGRADIENTS];
00168   GtkWidget *label_steps;
00169   GtkSpinButton *spin_steps;
00170   GtkWidget *label_estimates;
00171   GtkSpinButton *spin_estimates;
00173   GtkWidget *label_relaxation;
00175   GtkSpinButton *spin_relaxation;
00177   GtkFrame *frame_variable;
00178   GtkWidget *grid_variable;
00179   GtkComboBoxText *combo_variable;
00181   GtkButton *button_add_variable;
00182   GtkButton *button_remove_variable;
00183   GtkWidget *label_variable;
00184   GtkEntry *entry_variable;
00185   GtkWidget *label_min;
00186   GtkSpinButton *spin_min;
00187   GtkScrolledWindow *scrolled_min;
00188   GtkWidget *label_max;
00189   GtkSpinButton *spin_max;
00190   GtkScrolledWindow *scrolled_max;
00191   GtkCheckButton *check_minabs;
00192   GtkSpinButton *spin_minabs;
00193   GtkScrolledWindow *scrolled_minabs;
00194   GtkCheckButton *check_maxabs;
00195   GtkSpinButton *spin_maxabs;
00196   GtkScrolledWindow *scrolled_maxabs;
00197   GtkWidget *label_precision;
00198   GtkSpinButton *spin_precision;
00199   GtkWidget *label_sweeps;
00200   GtkSpinButton *spin_sweeps;
00201   GtkWidget *label_bits;
00202   GtkSpinButton *spin_bits;
00203   GtkWidget *label_step;
00204   GtkSpinButton *spin_step;
00205   GtkScrolledWindow *scrolled_step;
00206   GtkFrame *frame_experiment;
00207   GtkWidget *grid_experiment;
00208   GtkComboBoxText *combo_experiment;
00209   GtkButton *button_add_experiment;
00210   GtkButton *button_remove_experiment;
00211   GtkWidget *label_experiment;
00212   GtkFileChooserButton *button_experiment;
00214   GtkWidget *label_weight;
00215   GtkSpinButton *spin_weight;
00216   GtkCheckButton *check_template[MAX_NINPUTS];
00218   GtkFileChooserButton *button_template[MAX_NINPUTS];
00220   GdkPixbuf *logo;
00221   Experiment *experiment;
00222   Variable *variable;
00223   char *application_directory;
00224   gulong id_experiment;
00225   gulong id_experiment_name;
00226   gulong id_variable;
00227   gulong id_variable_label;
00228   gulong id_template[MAX_NINPUTS];
00230   gulong id_input[MAX_NINPUTS];
00232   unsigned int nexperiments;
00233   unsigned int nvariables;
00234 } Window;
00235
00236 // Public functions
00237 unsigned int gtk_array_get_active (GtkRadioButton * array[], unsigned int n);
00238 void input_save (char *filename);
00239 void options_new ();
00240 void running_new ();
00241 unsigned int window_get_algorithm ();
00242 unsigned int window_get_gradient ();
00243 unsigned int window_get_norm ();
00244 void window_save_gradient ();

```

```

00245 int window_save ();
00246 void window_run ();
00247 void window_help ();
00248 void window_update_gradient ();
00249 void window_update ();
00250 void window_set_algorithm ();
00251 void window_set_experiment ();
00252 void window_remove_experiment ();
00253 void window_add_experiment ();
00254 void window_name_experiment ();
00255 void window_weight_experiment ();
00256 void window_inputs_experiment ();
00257 void window_template_experiment (void *data);
00258 void window_set_variable ();
00259 void window_remove_variable ();
00260 void window_add_variable ();
00261 void window_label_variable ();
00262 void window_precision_variable ();
00263 void window_rangemin_variable ();
00264 void window_rangemax_variable ();
00265 void window_rangeminabs_variable ();
00266 void window_rangemaxabs_variable ();
00267 void window_update_variable ();
00268 int window_read (char *filename);
00269 void window_open ();
00270 void window_new ();
00271 int cores_number ();
00272
00273 #endif

```

## 5.5 mpcotool.c File Reference

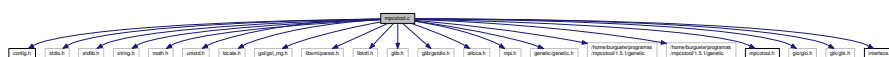
Source file of the mpcotool.

```

#include "config.h"
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <math.h>
#include <unistd.h>
#include <locale.h>
#include <gsl/gsl_rng.h>
#include <libxml/parser.h>
#include <libintl.h>
#include <glib.h>
#include <glib/gstdio.h>
#include <alloca.h>
#include <mpi.h>
#include "genetic/genetic.h"
#include "mpcotool.h"
#include <gio/gio.h>
#include <gtk/gtk.h>
#include "interface.h"

```

Include dependency graph for mpcotool.c:



## Macros

- #define **\_GNU\_SOURCE**
- #define **DEBUG** 0

*Macro to debug.*

- `#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.*
- `#define INPUT_FILE "test-ga.xml"`  
*Macro to define the initial input file.*
- `#define RM "rm"`  
*Macro to define the shell remove command.*

## Functions

- `void show_message (char *title, char *msg, int type)`  
*Function to show a dialog with a message.*
- `void show_error (char *msg)`  
*Function to show a dialog with an error message.*
- `int xml_node_get_int (xmlNode *node, const xmlChar *prop, int *error_code)`  
*Function to get an integer number of a XML node property.*
- `unsigned int xml_node_get_uint (xmlNode *node, const xmlChar *prop, int *error_code)`  
*Function to get an unsigned integer number of a XML node property.*
- `unsigned int xml_node_get_uint_with_default (xmlNode *node, const xmlChar *prop, unsigned int default_value, int *error_code)`  
*Function to get an unsigned integer number of a XML node property with a default value.*
- `double xml_node_get_float (xmlNode *node, const xmlChar *prop, int *error_code)`  
*Function to get a floating point number of a XML node property.*
- `double xml_node_get_float_with_default (xmlNode *node, const xmlChar *prop, double default_value, int *error_code)`  
*Function to get a floating point number of a XML node property with a default value.*
- `void xml_node_set_int (xmlNode *node, const xmlChar *prop, int value)`  
*Function to set an integer number in a XML node property.*
- `void xml_node_set_uint (xmlNode *node, const xmlChar *prop, unsigned int value)`  
*Function to set an unsigned integer number in a XML node property.*
- `void xml_node_set_float (xmlNode *node, const xmlChar *prop, double value)`  
*Function to set a floating point number in a XML node property.*
- `unsigned int gtk_array_get_active (GtkRadioButton *array[], unsigned int n)`  
*Function to get the active GtkRadioButton.*
- `void input_new ()`  
*Function to create a new Input struct.*
- `void input_free ()`  
*Function to free the memory of the input file data.*
- `int input_open (char *filename)`  
*Function to open the input file.*
- `void calibrate_input (unsigned int simulation, char *input, GMappedFile *template)`  
*Function to write the simulation input file.*
- `double calibrate_parse (unsigned int simulation, unsigned int experiment)`  
*Function to parse input files, simulating and calculating the \ objective function.*
- `double calibrate_norm_euclidian (unsigned int simulation)`  
*Function to calculate the Euclidian error norm.*
- `double calibrate_norm_maximum (unsigned int simulation)`  
*Function to calculate the maximum error norm.*
- `double calibrate_norm_p (unsigned int simulation)`  
*Function to calculate the P error norm.*

- double [calibrate\\_norm\\_taxicab](#) (unsigned int simulation)  
*Function to calculate the taxicab error norm.*
- void [calibrate\\_print](#) ()  
*Function to print the results.*
- void [calibrate\\_save\\_variables](#) (unsigned int simulation, double error)  
*Function to save in a file the variables and the error.*
- void [calibrate\\_best](#) (unsigned int simulation, double value)  
*Function to save the best simulations.*
- void [calibrate\\_sequential](#) ()  
*Function to calibrate sequentially.*
- void \* [calibrate\\_thread](#) ([ParallelData](#) \*data)  
*Function to calibrate on a thread.*
- void [calibrate\\_merge](#) (unsigned int nsaveds, unsigned int \*simulation\_best, double \*error\_best)  
*Function to merge the 2 calibration results.*
- void [calibrate\\_synchronise](#) ()  
*Function to synchronise the calibration results of MPI tasks.*
- void [calibrate\\_sweep](#) ()  
*Function to calibrate with the sweep algorithm.*
- void [calibrate\\_MonteCarlo](#) ()  
*Function to calibrate with the Monte-Carlo algorithm.*
- void [calibrate\\_best\\_gradient](#) (unsigned int simulation, double value)  
*Function to save the best simulation in a gradient based method.*
- void [calibrate\\_gradient\\_sequential](#) (unsigned int simulation)  
*Function to estimate the gradient sequentially.*
- void \* [calibrate\\_gradient\\_thread](#) ([ParallelData](#) \*data)  
*Function to estimate the gradient on a thread.*
- double [calibrate\\_estimate\\_gradient\\_random](#) (unsigned int variable, unsigned int estimate)  
*Function to estimate a component of the gradient vector.*
- double [calibrate\\_estimate\\_gradient\\_coordinates](#) (unsigned int variable, unsigned int estimate)  
*Function to estimate a component of the gradient vector.*
- void [calibrate\\_step\\_gradient](#) (unsigned int simulation)  
*Function to do a step of the gradient based method.*
- void [calibrate\\_gradient](#) ()  
*Function to calibrate with a gradient based method.*
- double [calibrate\\_genetic\\_objective](#) ([Entity](#) \*entity)  
*Function to calculate the objective function of an entity.*
- void [calibrate\\_genetic](#) ()  
*Function to calibrate with the genetic algorithm.*
- void [calibrate\\_save\\_old](#) ()  
*Function to save the best results on iterative methods.*
- void [calibrate\\_merge\\_old](#) ()  
*Function to merge the best results with the previous step best results on iterative methods.*
- void [calibrate\\_refine](#) ()  
*Function to refine the search ranges of the variables in iterative algorithms.*
- void [calibrate\\_step](#) ()  
*Function to do a step of the iterative algorithm.*
- void [calibrate\\_iterate](#) ()  
*Function to iterate the algorithm.*
- void [calibrate\\_free](#) ()  
*Function to free the memory used by [Calibrate](#) struct.*
- void [calibrate\\_open](#) ()

- Function to open and perform a calibration.*

  - void [input\\_save\\_gradient](#) (xmlNode \*node)

*Function to save the gradient based method data in a XML node.*
- void [input\\_save](#) (char \*filename)

*Function to save the input file.*
- void [options\\_new](#) ()

*Function to open the options dialog.*
- void [running\\_new](#) ()

*Function to open the running dialog.*
- unsigned int [window\\_get\\_algorithm](#) ()

*Function to get the stochastic algorithm number.*
- unsigned int [window\\_get\\_gradient](#) ()

*Function to get the gradient base method number.*
- unsigned int [window\\_get\\_norm](#) ()

*Function to get the norm base method number.*
- void [window\\_save\\_gradient](#) ()

*Function to save the gradient based method data in the input file.*
- int [window\\_save](#) ()

*Function to save the input file.*
- void [window\\_run](#) ()

*Function to run a calibration.*
- void [window\\_help](#) ()

*Function to show a help dialog.*
- void [window\\_about](#) ()

*Function to show an about dialog.*
- void [window\\_update\\_gradient](#) ()

*Function to update gradient based method widgets view in the main window.*
- void [window\\_update](#) ()

*Function to update the main window view.*
- void [window\\_set\\_algorithm](#) ()

*Function to avoid memory errors changing the algorithm.*
- void [window\\_set\\_experiment](#) ()

*Function to set the experiment data in the main window.*
- void [window\\_remove\\_experiment](#) ()

*Function to remove an experiment in the main window.*
- void [window\\_add\\_experiment](#) ()

*Function to add an experiment in the main window.*
- void [window\\_name\\_experiment](#) ()

*Function to set the experiment name in the main window.*
- void [window\\_weight\\_experiment](#) ()

*Function to update the experiment weight in the main window.*
- void [window\\_inputs\\_experiment](#) ()

*Function to update the experiment input templates number in the main window.*
- void [window\\_template\\_experiment](#) (void \*data)

*Function to update the experiment i-th input template in the main window.*
- void [window\\_set\\_variable](#) ()

*Function to set the variable data in the main window.*
- void [window\\_remove\\_variable](#) ()

*Function to remove a variable in the main window.*
- void [window\\_add\\_variable](#) ()

*Function to add a variable in the main window.*

- void [window\\_label\\_variable](#) ()  
*Function to set the variable label in the main window.*
- void [window\\_precision\\_variable](#) ()  
*Function to update the variable precision in the main window.*
- void [window\\_rangemin\\_variable](#) ()  
*Function to update the variable rangemin in the main window.*
- void [window\\_rangemax\\_variable](#) ()  
*Function to update the variable rangemax in the main window.*
- void [window\\_rangeminabs\\_variable](#) ()  
*Function to update the variable rangeminabs in the main window.*
- void [window\\_rangemaxabs\\_variable](#) ()  
*Function to update the variable rangemaxabs in the main window.*
- void [window\\_step\\_variable](#) ()  
*Function to update the variable step in the main window.*
- void [window\\_update\\_variable](#) ()  
*Function to update the variable data in the main window.*
- int [window\\_read](#) (char \*filename)  
*Function to read the input data of a file.*
- void [window\\_open](#) ()  
*Function to open the input data.*
- void [window\\_new](#) ()  
*Function to open the main window.*
- int [cores\\_number](#) ()  
*Function to obtain the cores number.*
- int [main](#) (int argn, char \*\*argc)  
*Main function.*

## Variables

- int [ntasks](#)  
*Number of tasks.*
- unsigned int [nthreads](#)  
*Number of threads.*
- unsigned int [nthreads\\_gradient](#)  
*Number of threads for the gradient based method.*
- GMutex [mutex](#) [1]  
*Mutex struct.*
- void(\* [calibrate\\_algorithm](#) )()  
*Pointer to the function to perform a calibration algorithm step.*
- double(\* [calibrate\\_estimate\\_gradient](#) )(unsigned int variable, unsigned int estimate)  
*Pointer to the function to estimate the gradient.*
- double(\* [calibrate\\_norm](#) )(unsigned int simulation)  
*Pointer to the error norm function.*
- Input [input](#) [1]  
*Input struct to define the input file to mpcotool.*
- Calibrate [calibrate](#) [1]  
*Calibration data.*
- const xmlChar \* [result\\_name](#) = (xmlChar \*) "result"  
*Name of the result file.*
- const xmlChar \* [variables\\_name](#) = (xmlChar \*) "variables"

- *Name of the variables file.*
- `const xmlChar * template [MAX\_NINPUTS]`  
*Array of xmlChar strings with template labels.*
- `const char * format [NPRECISIONS]`  
*Array of C-strings with variable formats.*
- `const double precision [NPRECISIONS]`  
*Array of variable precisions.*
- `const char * logo []`  
*Logo pixmap.*
- `Options options [1]`  
*[Options](#) struct to define the options dialog.*
- `Running running [1]`  
*[Running](#) struct to define the running dialog.*
- `Window window [1]`  
*[Window](#) struct to define the main interface window.*

### 5.5.1 Detailed Description

Source file of the mpcotool.

#### Authors

Javier Burguete and Borja Latorre.

#### Copyright

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Definition in file [mpcotool.c](#).

### 5.5.2 Function Documentation

#### 5.5.2.1 void [calibrate\\_best](#) ( unsigned int *simulation*, double *value* )

Function to save the best simulations.

#### Parameters

<i>simulation</i>	Simulation number.
<i>value</i>	Objective function value.

Definition at line [1610](#) of file [mpcotool.c](#).

```

01611 {
01612     unsigned int i, j;
01613     double e;
01614     #if DEBUG
01615         fprintf (stderr, "calibrate_best: start\n");
01616         fprintf (stderr, "calibrate_best: nsaveds=%u nbest=%u\n",
01617                 calibrate->nsaveds, calibrate->nbest);
01618     #endif
01619     if (calibrate->nsaveds < calibrate->nbest
01620         || value < calibrate->error_best[calibrate->nsaveds - 1])
01621     {
01622         if (calibrate->nsaveds < calibrate->nbest)
01623             ++calibrate->nsaveds;
01624         calibrate->error_best[calibrate->nsaveds - 1] = value;
01625         calibrate->simulation_best[calibrate->
01626             nsaveds - 1] = simulation;
01627         for (i = calibrate->nsaveds; --i;)
01628         {

```



```

01628         if (calibrate->error_best[i] < calibrate->
error_best[i - 1])
01629         {
01630             j = calibrate->simulation_best[i];
01631             e = calibrate->error_best[i];
01632             calibrate->simulation_best[i] = calibrate->
simulation_best[i - 1];
01633             calibrate->error_best[i] = calibrate->
error_best[i - 1];
01634             calibrate->simulation_best[i - 1] = j;
01635             calibrate->error_best[i - 1] = e;
01636         }
01637         else
01638             break;
01639     }
01640 }
01641 #if DEBUG
01642 fprintf (stderr, "calibrate_best: end\n");
01643 #endif
01644 }

```

#### 5.5.2.2 void calibrate\_best\_gradient ( unsigned int *simulation*, double *value* )

Function to save the best simulation in a gradient based method.

##### Parameters

<i>simulation</i>	Simulation number.
<i>value</i>	Objective function value.

Definition at line 1919 of file [mpcotool.c](#).

```

01920 {
01921 #if DEBUG
01922 fprintf (stderr, "calibrate_best_gradient: start\n");
01923 fprintf (stderr,
01924         "calibrate_best_gradient: simulation=%u value=%.14le best=%.14le\n",
01925         simulation, value, calibrate->error_best[0]);
01926 #endif
01927 if (value < calibrate->error_best[0])
01928 {
01929     calibrate->error_best[0] = value;
01930     calibrate->simulation_best[0] = simulation;
01931 #if DEBUG
01932 fprintf (stderr,
01933         "calibrate_best_gradient: BEST simulation=%u value=%.14le\n",
01934         simulation, value);
01935 #endif
01936 }
01937 #if DEBUG
01938 fprintf (stderr, "calibrate_best_gradient: end\n");
01939 #endif
01940 }

```

#### 5.5.2.3 double calibrate\_estimate\_gradient\_coordinates ( unsigned int *variable*, unsigned int *estimate* )

Function to estimate a component of the gradient vector.

##### Parameters

<i>variable</i>	Variable number.
<i>estimate</i>	Estimate number.

Definition at line 2052 of file [mpcotool.c](#).

```

02054 {
02055     double x;
02056 #if DEBUG
02057 fprintf (stderr, "calibrate_estimate_gradient_coordinates: start\n");
02058 #endif
02059 x = calibrate->gradient[variable];
02060 if (estimate >= (2 * variable) && estimate < (2 * variable + 2))
02061 {

```

```

02062         if (estimate & 1)
02063             x += calibrate->step[variable];
02064         else
02065             x -= calibrate->step[variable];
02066     }
02067     #if DEBUG
02068     fprintf (stderr, "calibrate_estimate_gradient_coordinates: gradient%u=%lg\n",
02069             variable, x);
02070     fprintf (stderr, "calibrate_estimate_gradient_coordinates: end\n");
02071     #endif
02072     return x;
02073 }

```

#### 5.5.2.4 double [calibrate\\_estimate\\_gradient\\_random](#) ( unsigned int *variable*, unsigned int *estimate* )

Function to estimate a component of the gradient vector.

##### Parameters

<i>variable</i>	Variable number.
<i>estimate</i>	Estimate number.

Definition at line 2025 of file [mpcotool.c](#).

```

02027 {
02028     double x;
02029     #if DEBUG
02030     fprintf (stderr, "calibrate_estimate_gradient_random: start\n");
02031     #endif
02032     x = calibrate->gradient[variable]
02033         + (1. - 2. * gsl\_rng\_uniform (calibrate->rng)) * calibrate->
02034         step[variable];
02035     #if DEBUG
02036     fprintf (stderr, "calibrate_estimate_gradient_random: gradient%u=%lg\n",
02037             variable, x);
02038     fprintf (stderr, "calibrate_estimate_gradient_random: end\n");
02039     #endif
02040     return x;
02041 }

```

#### 5.5.2.5 double [calibrate\\_genetic\\_objective](#) ( Entity \* *entity* )

Function to calculate the objective function of an entity.

##### Parameters

<i>entity</i>	entity data.
---------------	--------------

##### Returns

objective function value.

Definition at line 2218 of file [mpcotool.c](#).

```

02219 {
02220     unsigned int j;
02221     double objective;
02222     char buffer[64];
02223     #if DEBUG
02224     fprintf (stderr, "calibrate_genetic_objective: start\n");
02225     #endif
02226     for (j = 0; j < calibrate->nvariables; ++j)
02227     {
02228         calibrate->value[entity->id * calibrate->nvariables + j]
02229         = genetic\_get\_variable (entity, calibrate->genetic\_variable + j);
02230     }
02231     objective = calibrate\_norm (entity->id);
02232     g\_mutex\_lock (mutex);
02233     for (j = 0; j < calibrate->nvariables; ++j)
02234     {
02235         snprintf (buffer, 64, "%s ", format[calibrate->precision[j]]);

```

```

02236     fprintf (calibrate->file_variables, buffer,
02237             genetic_get_variable (entity, calibrate->
02238             genetic_variable + j));
02239     fprintf (calibrate->file_variables, "%.14le\n", objective);
02240     g_mutex_unlock (mutex);
02241     #if DEBUG
02242     fprintf (stderr, "calibrate_genetic_objective: end\n");
02243     #endif
02244     return objective;
02245 }

```

### 5.5.2.6 void calibrate\_gradient\_sequential ( unsigned int *simulation* )

Function to estimate the gradient sequentially.

#### Parameters

<i>simulation</i>	Simulation number.
-------------------	--------------------

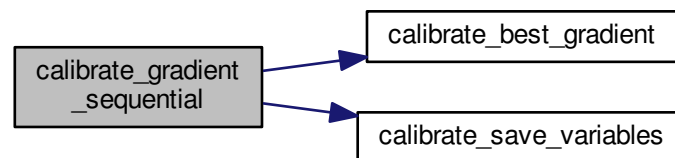
Definition at line 1949 of file [mpcotool.c](#).

```

01950 {
01951     unsigned int i, j;
01952     double e;
01953     #if DEBUG
01954     fprintf (stderr, "calibrate_gradient_sequential: start\n");
01955     fprintf (stderr, "calibrate_gradient_sequential: nstart_gradient=%u "
01956             "nend_gradient=%u\n",
01957             calibrate->nstart_gradient, calibrate->
01958             nend_gradient);
01959     #endif
01960     for (i = calibrate->nstart_gradient; i < calibrate->nend_gradient; ++i)
01961     {
01962         j = simulation + i;
01963         e = calibrate_norm (j);
01964         calibrate_best_gradient (j, e);
01965         calibrate_save_variables (j, e);
01966         #if DEBUG
01967         fprintf (stderr, "calibrate_gradient_sequential: i=%u e=%lg\n", i, e);
01968         #endif
01969     }
01970     #if DEBUG
01971     fprintf (stderr, "calibrate_gradient_sequential: end\n");
01972     #endif
01973 }

```

Here is the call graph for this function:



### 5.5.2.7 void \* calibrate\_gradient\_thread ( ParallelData \* *data* )

Function to estimate the gradient on a thread.

## Parameters

<i>data</i>	Function data.
-------------	----------------

## Returns

NULL

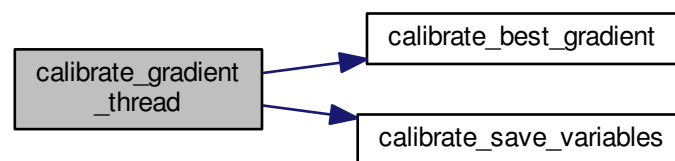
Definition at line 1982 of file [mpcotool.c](#).

```

01983 {
01984     unsigned int i, thread;
01985     double e;
01986     #if DEBUG
01987         fprintf (stderr, "calibrate_gradient_thread: start\n");
01988     #endif
01989     thread = data->thread;
01990     #if DEBUG
01991         fprintf (stderr, "calibrate_gradient_thread: thread=%u start=%u end=%u\n",
01992                 thread,
01993                 calibrate->thread_gradient[thread],
01994                 calibrate->thread_gradient[thread + 1]);
01995     #endif
01996     for (i = calibrate->thread_gradient[thread];
01997          i < calibrate->thread_gradient[thread + 1]; ++i)
01998     {
01999         e = calibrate_norm (i);
02000         g_mutex_lock (mutex);
02001         calibrate_best_gradient (i, e);
02002         calibrate_save_variables (i, e);
02003         g_mutex_unlock (mutex);
02004     #if DEBUG
02005         fprintf (stderr, "calibrate_gradient_thread: i=%u e=%lg\n", i, e);
02006     #endif
02007     }
02008     #if DEBUG
02009         fprintf (stderr, "calibrate_gradient_thread: end\n");
02010     #endif
02011     g_thread_exit (NULL);
02012     return NULL;
02013 }

```

Here is the call graph for this function:



#### 5.5.2.8 void calibrate\_input ( unsigned int *simulation*, char \* *input*, GMappedFile \* *template* )

Function to write the simulation input file.

## Parameters

--	--

<i>simulation</i>	Simulation number.
<i>input</i>	Input file name.
<i>template</i>	Template of the input file name.

Definition at line 1252 of file `mpcotool.c`.

```

01253 {
01254     unsigned int i;
01255     char buffer[32], value[32], *buffer2, *buffer3, *content;
01256     FILE *file;
01257     gsize length;
01258     GRegex *regex;
01259
01260     #if DEBUG
01261     fprintf (stderr, "calibrate_input: start\n");
01262     #endif
01263
01264     // Checking the file
01265     if (!template)
01266         goto calibrate_input_end;
01267
01268     // Opening template
01269     content = g_mapped_file_get_contents (template);
01270     length = g_mapped_file_get_length (template);
01271     #if DEBUG
01272     fprintf (stderr, "calibrate_input: length=%lu\ncontent:\n%s", length,
01273             content);
01274     #endif
01275     file = g_fopen (input, "w");
01276
01277     // Parsing template
01278     for (i = 0; i < calibrate->nvariables; ++i)
01279     {
01280         #if DEBUG
01281         fprintf (stderr, "calibrate_input: variable=%u\n", i);
01282         #endif
01283         snprintf (buffer, 32, "@variable%u@", i + 1);
01284         regex = g_regex_new (buffer, 0, 0, NULL);
01285         if (i == 0)
01286         {
01287             buffer2 = g_regex_replace_literal (regex, content, length, 0,
01288                                               calibrate->label[i], 0, NULL);
01289         #if DEBUG
01290         fprintf (stderr, "calibrate_input: buffer2\n%s", buffer2);
01291         #endif
01292         }
01293         else
01294         {
01295             length = strlen (buffer3);
01296             buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
01297                                               calibrate->label[i], 0, NULL);
01298             g_free (buffer3);
01299         }
01300         g_regex_unref (regex);
01301         length = strlen (buffer2);
01302         snprintf (buffer, 32, "@value%u@", i + 1);
01303         regex = g_regex_new (buffer, 0, 0, NULL);
01304         snprintf (value, 32, format[calibrate->precision[i]],
01305                 calibrate->value[simulation * calibrate->
01306                 nvariables + i]);
01307         #if DEBUG
01308         fprintf (stderr, "calibrate_input: value=%s\n", value);
01309         #endif
01310         buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
01311                                           0, NULL);
01312         g_free (buffer2);
01313         g_regex_unref (regex);
01314     }
01315
01316     // Saving input file
01317     fwrite (buffer3, strlen (buffer3), sizeof (char), file);
01318     g_free (buffer3);
01319     fclose (file);
01320
01321     calibrate_input_end:
01322     #if DEBUG
01323     fprintf (stderr, "calibrate_input: end\n");
01324     #endif
01325     return;
01326 }

```

5.5.2.9 void calibrate\_merge ( unsigned int *nsaveds*, unsigned int \* *simulation\_best*, double \* *error\_best* )

Function to merge the 2 calibration results.

## Parameters

<i>nsaveds</i>	Number of saved results.
<i>simulation_best</i>	Array of best simulation numbers.
<i>error_best</i>	Array of best objective function values.

Definition at line 1724 of file [mpcotool.c](#).

```

01726 {
01727     unsigned int i, j, k, s[calibrate->nbest];
01728     double e[calibrate->nbest];
01729     #if DEBUG
01730     fprintf (stderr, "calibrate_merge: start\n");
01731     #endif
01732     i = j = k = 0;
01733     do
01734     {
01735         if (i == calibrate->nsaveds)
01736         {
01737             s[k] = simulation_best[j];
01738             e[k] = error_best[j];
01739             ++j;
01740             ++k;
01741             if (j == nsaveds)
01742                 break;
01743         }
01744         else if (j == nsaveds)
01745         {
01746             s[k] = calibrate->simulation_best[i];
01747             e[k] = calibrate->error_best[i];
01748             ++i;
01749             ++k;
01750             if (i == calibrate->nsaveds)
01751                 break;
01752         }
01753         else if (calibrate->error_best[i] > error_best[j])
01754         {
01755             s[k] = simulation_best[j];
01756             e[k] = error_best[j];
01757             ++j;
01758             ++k;
01759         }
01760         else
01761         {
01762             s[k] = calibrate->simulation_best[i];
01763             e[k] = calibrate->error_best[i];
01764             ++i;
01765             ++k;
01766         }
01767     }
01768     while (k < calibrate->nbest);
01769     calibrate->nsaveds = k;
01770     memcpy (calibrate->simulation_best, s, k * sizeof (unsigned int));
01771     memcpy (calibrate->error_best, e, k * sizeof (double));
01772     #if DEBUG
01773     fprintf (stderr, "calibrate_merge: end\n");
01774     #endif
01775 }
```

### 5.5.2.10 double calibrate\_norm\_euclidian ( unsigned int *simulation* )

Function to calculate the Euclidian error norm.

## Parameters

<i>simulation</i>	simulation number.
-------------------	--------------------

## Returns

Euclidian error norm.

Definition at line 1443 of file [mpcotool.c](#).

```

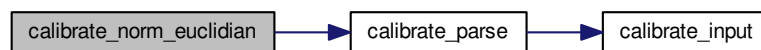
01444 {
01445     double e, ei;
```

```

01446 unsigned int i;
01447 #if DEBUG
01448 fprintf (stderr, "calibrate_norm_euclidian: start\n");
01449 #endif
01450 e = 0.;
01451 for (i = 0; i < calibrate->nexperiments; ++i)
01452 {
01453     ei = calibrate_parse (simulation, i);
01454     e += ei * ei;
01455 }
01456 e = sqrt (e);
01457 #if DEBUG
01458 fprintf (stderr, "calibrate_norm_euclidian: error=%lg\n", e);
01459 fprintf (stderr, "calibrate_norm_euclidian: end\n");
01460 #endif
01461 return e;
01462 }

```

Here is the call graph for this function:



### 5.5.2.11 double calibrate\_norm\_maximum ( unsigned int *simulation* )

Function to calculate the maximum error norm.

#### Parameters

<i>simulation</i>	simulation number.
-------------------	--------------------

#### Returns

Maximum error norm.

Definition at line 1472 of file [mpcotool.c](#).

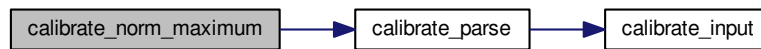
```

01473 {
01474     double e, ei;
01475     unsigned int i;
01476     #if DEBUG
01477     fprintf (stderr, "calibrate_norm_maximum: start\n");
01478     #endif
01479     e = 0.;
01480     for (i = 0; i < calibrate->nexperiments; ++i)
01481     {
01482         ei = fabs (calibrate_parse (simulation, i));
01483         e = fmax (e, ei);
01484     }
01485     #if DEBUG
01486     fprintf (stderr, "calibrate_norm_maximum: error=%lg\n", e);
01487     fprintf (stderr, "calibrate_norm_maximum: end\n");
01488     #endif
01489     return e;
01490 }

```



Here is the call graph for this function:



#### 5.5.2.12 double calibrate\_norm\_p ( unsigned int *simulation* )

Function to calculate the P error norm.

##### Parameters

<i>simulation</i>	simulation number.
-------------------	--------------------

##### Returns

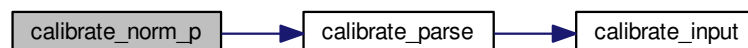
P error norm.

Definition at line 1500 of file [mpcotool.c](#).

```

01501 {
01502     double e, ei;
01503     unsigned int i;
01504     #if DEBUG
01505     fprintf (stderr, "calibrate_norm_p: start\n");
01506     #endif
01507     e = 0.;
01508     for (i = 0; i < calibrate->nexperiments; ++i)
01509     {
01510         ei = fabs (calibrate_parse (simulation, i));
01511         e += pow (ei, calibrate->p);
01512     }
01513     e = pow (e, 1. / calibrate->p);
01514     #if DEBUG
01515     fprintf (stderr, "calibrate_norm_p: error=%lg\n", e);
01516     fprintf (stderr, "calibrate_norm_p: end\n");
01517     #endif
01518     return e;
01519 }
  
```

Here is the call graph for this function:



#### 5.5.2.13 double calibrate\_norm\_taxicab ( unsigned int *simulation* )

Function to calculate the taxicab error norm.

## Parameters

<i>simulation</i>	simulation number.
-------------------	--------------------

## Returns

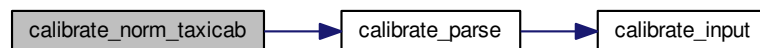
Taxicab error norm.

Definition at line 1529 of file [mpcotool.c](#).

```

01530 {
01531     double e;
01532     unsigned int i;
01533     #if DEBUG
01534     fprintf (stderr, "calibrate_norm_taxicab: start\n");
01535     #endif
01536     e = 0.;
01537     for (i = 0; i < calibrate->nexperiments; ++i)
01538         e += fabs (calibrate\_parse (simulation, i));
01539     #if DEBUG
01540     fprintf (stderr, "calibrate_norm_taxicab: error=%lg\n", e);
01541     fprintf (stderr, "calibrate_norm_taxicab: end\n");
01542     #endif
01543     return e;
01544 }
```

Here is the call graph for this function:



#### 5.5.2.14 double [calibrate\\_parse](#) ( unsigned int *simulation*, unsigned int *experiment* )

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

## Parameters

<i>simulation</i>	Simulation number.
<i>experiment</i>	<a href="#">Experiment</a> number.

## Returns

Objective function value.

Definition at line 1339 of file [mpcotool.c](#).

```

01340 {
01341     unsigned int i;
01342     double e;
01343     char buffer[512], input[MAX\_NINPUTS][32], output[32], result[32], *buffer2,
01344         *buffer3, *buffer4;
01345     FILE *file_result;
01346
01347     #if DEBUG
01348     fprintf (stderr, "calibrate_parse: start\n");
01349     fprintf (stderr, "calibrate_parse: simulation=%u experiment=%u\n", simulation,
01350             experiment);
01351     #endif
01352
01353     // Opening input files
01354     for (i = 0; i < calibrate->ninputs; ++i)
```

```

01355     {
01356         snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
01357     #if DEBUG
01358         fprintf (stderr, "calibrate_parse: i=%u input=%s\n", i, &input[i][0]);
01359     #endif
01360         calibrate_input (simulation, &input[i][0],
01361                         calibrate->file[i][experiment]);
01362     }
01363     for (; i < MAX_NINPUTS; ++i)
01364         strcpy (&input[i][0], "");
01365     #if DEBUG
01366         fprintf (stderr, "calibrate_parse: parsing end\n");
01367     #endif
01368
01369     // Performing the simulation
01370     snprintf (output, 32, "output-%u-%u", simulation, experiment);
01371     buffer2 = g_path_get_dirname (calibrate->simulator);
01372     buffer3 = g_path_get_basename (calibrate->simulator);
01373     buffer4 = g_build_filename (buffer2, buffer3, NULL);
01374     snprintf (buffer, 512, "\\\"%s\" %s %s %s %s %s %s %s %s %s",
01375             buffer4, input[0], input[1], input[2], input[3], input[4], input[5],
01376             input[6], input[7], output);
01377     g_free (buffer4);
01378     g_free (buffer3);
01379     g_free (buffer2);
01380     #if DEBUG
01381         fprintf (stderr, "calibrate_parse: %s\n", buffer);
01382     #endif
01383     system (buffer);
01384
01385     // Checking the objective value function
01386     if (calibrate->evaluator)
01387     {
01388         snprintf (result, 32, "result-%u-%u", simulation, experiment);
01389         buffer2 = g_path_get_dirname (calibrate->evaluator);
01390         buffer3 = g_path_get_basename (calibrate->evaluator);
01391         buffer4 = g_build_filename (buffer2, buffer3, NULL);
01392         snprintf (buffer, 512, "\\\"%s\" %s %s %s",
01393             buffer4, output, calibrate->experiment[experiment], result);
01394         g_free (buffer4);
01395         g_free (buffer3);
01396         g_free (buffer2);
01397     #if DEBUG
01398         fprintf (stderr, "calibrate_parse: %s\n", buffer);
01399     #endif
01400     }
01401     file_result = g_fopen (result, "r");
01402     e = atof (fgets (buffer, 512, file_result));
01403     fclose (file_result);
01404
01405     else
01406     {
01407         strcpy (result, "");
01408         file_result = g_fopen (output, "r");
01409         e = atof (fgets (buffer, 512, file_result));
01410         fclose (file_result);
01411     }
01412
01413     // Removing files
01414     #if !DEBUG
01415     for (i = 0; i < calibrate->ninputs; ++i)
01416     {
01417         if (calibrate->file[i][0])
01418         {
01419             snprintf (buffer, 512, RM " %s", &input[i][0]);
01420             system (buffer);
01421         }
01422     }
01423     snprintf (buffer, 512, RM " %s %s", output, result);
01424     system (buffer);
01425     #endif
01426
01427     #if DEBUG
01428         fprintf (stderr, "calibrate_parse: end\n");
01429     #endif
01430
01431     // Returning the objective function
01432     return e * calibrate->weight[experiment];
01433 }

```

Here is the call graph for this function:



#### 5.5.2.15 void calibrate\_save\_variables ( unsigned int *simulation*, double *error* )

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

##### Parameters

<i>simulation</i>	Simulation number.
<i>error</i>	Error value.

Definition at line 1582 of file [mpcotool.c](#).

```

01583 {
01584     unsigned int i;
01585     char buffer[64];
01586     #if DEBUG
01587     fprintf (stderr, "calibrate_save_variables: start\n");
01588     #endif
01589     for (i = 0; i < calibrate->nvariables; ++i)
01590     {
01591         snprintf (buffer, 64, "%s ", format[calibrate->precision[i]]);
01592         fprintf (calibrate->file_variables, buffer,
01593                 calibrate->value[simulation * calibrate->
01594                             nvariables + i]);
01595     }
01596     fprintf (calibrate->file_variables, "%.14le\n", error);
01597     #if DEBUG
01598     fprintf (stderr, "calibrate_save_variables: end\n");
01599     #endif
01600 }
  
```

#### 5.5.2.16 void calibrate\_step\_gradient ( unsigned int *simulation* )

Function to do a step of the gradient based method.

##### Parameters

<i>simulation</i>	Simulation number.
-------------------	--------------------

Definition at line 2082 of file [mpcotool.c](#).

```

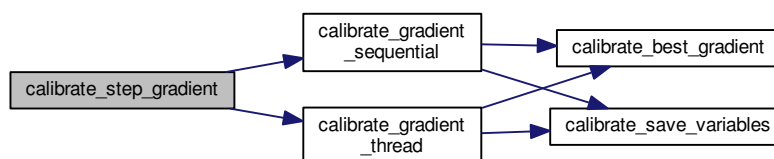
02083 {
02084     GThread *thread[nthreads_gradient];
02085     ParallelData data[nthreads_gradient];
02086     unsigned int i, j, k, b;
02087     #if DEBUG
02088     fprintf (stderr, "calibrate_step_gradient: start\n");
02089     #endif
02090     for (i = 0; i < calibrate->nestimates; ++i)
02091     {
02092         k = (simulation + i) * calibrate->nvariables;
02093         b = calibrate->simulation_best[0] * calibrate->
02094             nvariables;
02095         #if DEBUG
02096         fprintf (stderr, "calibrate_step_gradient: simulation=%u best=%u\n",
02097                 simulation + i, calibrate->simulation_best[0]);
02098         #endif
02099     }
  
```

```

02098     for (j = 0; j < calibrate->nvariables; ++j, ++k, ++b)
02099     {
02100 #if DEBUG
02101         fprintf (stderr,
02102                 "calibrate_step_gradient: estimate=%u best%u=%.14le\n",
02103                 i, j, calibrate->value[b]);
02104 #endif
02105         calibrate->value[k]
02106         = calibrate->value[b] + calibrate_estimate_gradient (j
02107 , i);
02108         calibrate->value[k] = fmin (fmax (calibrate->
02109 value[k],
02110                                     calibrate->rangeminabs[j]),
02111                                     calibrate->rangemaxabs[j]);
02112 #if DEBUG
02113         fprintf (stderr,
02114                 "calibrate_step_gradient: estimate=%u variable%u=%.14le\n",
02115                 i, j, calibrate->value[k]);
02116 #endif
02117     }
02118     if (nthreads_gradient == 1)
02119         calibrate_gradient_sequential (simulation);
02120     else
02121     {
02122         for (i = 0; i <= nthreads_gradient; ++i)
02123         {
02124             calibrate->thread_gradient[i]
02125             = simulation + calibrate->nstart_gradient
02126             + i * (calibrate->nend_gradient - calibrate->
02127 nstart_gradient)
02128             / nthreads_gradient;
02129 #if DEBUG
02130             fprintf (stderr,
02131                     "calibrate_step_gradient: i=%u thread_gradient=%u\n",
02132                     i, calibrate->thread_gradient[i]);
02133 #endif
02134         }
02135         for (i = 0; i < nthreads_gradient; ++i)
02136         {
02137             data[i].thread = i;
02138             thread[i] = g_thread_new
02139             (NULL, (void (*) ) calibrate_gradient_thread, &data[i]);
02140         }
02141         for (i = 0; i < nthreads_gradient; ++i)
02142             g_thread_join (thread[i]);
02143 #if DEBUG
02144         fprintf (stderr, "calibrate_step_gradient: end\n");
02145 #endif
02146     }

```

Here is the call graph for this function:



#### 5.5.2.17 void \* calibrate\_thread ( ParallelData \* data )

Function to calibrate on a thread.

## Parameters

<i>data</i>	Function data.
-------------	----------------

## Returns

NULL

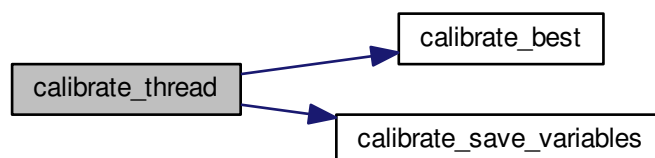
Definition at line 1682 of file [mpcotool.c](#).

```

01683 {
01684     unsigned int i, thread;
01685     double e;
01686     #if DEBUG
01687     fprintf (stderr, "calibrate_thread: start\n");
01688     #endif
01689     thread = data->thread;
01690     #if DEBUG
01691     fprintf (stderr, "calibrate_thread: thread=%u start=%u end=%u\n", thread,
01692             calibrate->thread[thread], calibrate->thread[thread + 1]);
01693     #endif
01694     for (i = calibrate->thread[thread]; i < calibrate->thread[thread + 1]; ++i)
01695     {
01696         e = calibrate_norm (i);
01697         g_mutex_lock (mutex);
01698         calibrate_best (i, e);
01699         calibrate_save_variables (i, e);
01700         g_mutex_unlock (mutex);
01701     #if DEBUG
01702     fprintf (stderr, "calibrate_thread: i=%u e=%lg\n", i, e);
01703     #endif
01704     }
01705     #if DEBUG
01706     fprintf (stderr, "calibrate_thread: end\n");
01707     #endif
01708     g_thread_exit (NULL);
01709     return NULL;
01710 }

```

Here is the call graph for this function:



### 5.5.2.18 int cores\_number ( )

Function to obtain the cores number.

## Returns

Cores number.

Definition at line 5140 of file [mpcotool.c](#).

```

05141 {
05142     #ifdef G_OS_WIN32

```

```

05143     SYSTEM_INFO sysinfo;
05144     GetSystemInfo (&sysinfo);
05145     return sysinfo.dwNumberOfProcessors;
05146 #else
05147     return (int) sysconf (_SC_NPROCESSORS_ONLN);
05148 #endif
05149 }

```

#### 5.5.2.19 unsigned int gtk\_array\_get\_active ( GtkRadioButton \* array[], unsigned int n )

Function to get the active GtkRadioButton.

##### Parameters

<i>array</i>	Array of GtkRadioButtons.
<i>n</i>	Number of GtkRadioButtons.

##### Returns

Active GtkRadioButton.

Definition at line 486 of file [mpcotool.c](#).

```

00487 {
00488     unsigned int i;
00489     for (i = 0; i < n; ++i)
00490         if (gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (array[i])))
00491             break;
00492     return i;
00493 }

```

#### 5.5.2.20 int input\_open ( char \* filename )

Function to open the input file.

##### Parameters

<i>filename</i>	<a href="#">Input</a> data file name.
-----------------	---------------------------------------

##### Returns

1 on success, 0 on error.

Definition at line 574 of file [mpcotool.c](#).

```

00575 {
00576     char buffer2[64];
00577     char *buffert[MAX_NINPUTS] =
00578         { NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL };
00579     xmlDoc *doc;
00580     xmlNode *node, *child;
00581     xmlChar *buffer;
00582     char *msg;
00583     int error_code;
00584     unsigned int i;
00585
00586     #if DEBUG
00587     fprintf (stderr, "input_open: start\n");
00588     #endif
00589
00590     // Resetting input data
00591     buffer = NULL;
00592     input_new ();
00593
00594     // Parsing the input file
00595     #if DEBUG
00596     fprintf (stderr, "input_open: parsing the input file %s\n", filename);
00597     #endif

```

```

00598     doc = xmlParseFile (filename);
00599     if (!doc)
00600     {
00601         msg = gettext ("Unable to parse the input file");
00602         goto exit_on_error;
00603     }
00604
00605     // Getting the root node
00606     #if DEBUG
00607     fprintf (stderr, "input_open: getting the root node\n");
00608     #endif
00609     node = xmlDocGetRootElement (doc);
00610     if (xmlStrcmp (node->name, XML_CALIBRATE))
00611     {
00612         msg = gettext ("Bad root XML node");
00613         goto exit_on_error;
00614     }
00615
00616     // Getting results file names
00617     input->result = (char *) xmlGetProp (node, XML_RESULT);
00618     if (!input->result)
00619         input->result = (char *) xmlStrdup (result_name);
00620     input->variables = (char *) xmlGetProp (node, XML_VARIABLES);
00621     if (!input->variables)
00622         input->variables = (char *) xmlStrdup (variables_name);
00623
00624     // Opening simulator program name
00625     input->simulator = (char *) xmlGetProp (node, XML_SIMULATOR);
00626     if (!input->simulator)
00627     {
00628         msg = gettext ("Bad simulator program");
00629         goto exit_on_error;
00630     }
00631
00632     // Opening evaluator program name
00633     input->evaluator = (char *) xmlGetProp (node, XML_EVALUATOR);
00634
00635     // Obtaining pseudo-random numbers generator seed
00636     input->seed
00637     = xml_node_get_uint_with_default (node,
00638     XML_SEED, DEFAULT_RANDOM_SEED,
00639     &error_code);
00640     if (error_code)
00641     {
00642         msg = gettext ("Bad pseudo-random numbers generator seed");
00643         goto exit_on_error;
00644     }
00645
00646     // Opening algorithm
00647     buffer = xmlGetProp (node, XML_ALGORITHM);
00648     if (!xmlStrcmp (buffer, XML_MONTE_CARLO))
00649     {
00650         input->algorithm = ALGORITHM_MONTE_CARLO;
00651
00652         // Obtaining simulations number
00653         input->nsimulations
00654         = xml_node_get_int (node, XML_NSIMULATIONS, &error_code);
00655         if (error_code)
00656         {
00657             msg = gettext ("Bad simulations number");
00658             goto exit_on_error;
00659         }
00660     }
00661     else if (!xmlStrcmp (buffer, XML_SWEEP))
00662         input->algorithm = ALGORITHM_SWEEP;
00663     else if (!xmlStrcmp (buffer, XML_GENETIC))
00664     {
00665         input->algorithm = ALGORITHM_GENETIC;
00666
00667         // Obtaining population
00668         if (xmlHasProp (node, XML_NPOPULATION))
00669         {
00670             input->nsimulations
00671             = xml_node_get_uint (node, XML_NPOPULATION, &error_code);
00672             if (error_code || input->nsimulations < 3)
00673             {
00674                 msg = gettext ("Invalid population number");
00675                 goto exit_on_error;
00676             }
00677         }
00678     }
00679     else
00680     {
00681         msg = gettext ("No population number");
00682         goto exit_on_error;
00683     }
00684
00685     // Obtaining generations

```



```

00684     if (xmlHasProp (node, XML_NGENERATIONS))
00685     {
00686         input->niterations
00687         = xml_node_get_uint (node, XML_NGENERATIONS, &error_code);
00688         if (error_code || !input->niterations)
00689         {
00690             msg = gettext ("Invalid generations number");
00691             goto exit_on_error;
00692         }
00693     }
00694     else
00695     {
00696         msg = gettext ("No generations number");
00697         goto exit_on_error;
00698     }
00699
00700     // Obtaining mutation probability
00701     if (xmlHasProp (node, XML_MUTATION))
00702     {
00703         input->mutation_ratio
00704         = xml_node_get_float (node, XML_MUTATION, &error_code);
00705         if (error_code || input->mutation_ratio < 0.
00706             || input->mutation_ratio >= 1.)
00707         {
00708             msg = gettext ("Invalid mutation probability");
00709             goto exit_on_error;
00710         }
00711     }
00712     else
00713     {
00714         msg = gettext ("No mutation probability");
00715         goto exit_on_error;
00716     }
00717
00718     // Obtaining reproduction probability
00719     if (xmlHasProp (node, XML_REPRODUCTION))
00720     {
00721         input->reproduction_ratio
00722         = xml_node_get_float (node, XML_REPRODUCTION, &error_code);
00723         if (error_code || input->reproduction_ratio < 0.
00724             || input->reproduction_ratio >= 1.0)
00725         {
00726             msg = gettext ("Invalid reproduction probability");
00727             goto exit_on_error;
00728         }
00729     }
00730     else
00731     {
00732         msg = gettext ("No reproduction probability");
00733         goto exit_on_error;
00734     }
00735
00736     // Obtaining adaptation probability
00737     if (xmlHasProp (node, XML_ADAPTATION))
00738     {
00739         input->adaptation_ratio
00740         = xml_node_get_float (node, XML_ADAPTATION, &error_code);
00741         if (error_code || input->adaptation_ratio < 0.
00742             || input->adaptation_ratio >= 1.)
00743         {
00744             msg = gettext ("Invalid adaptation probability");
00745             goto exit_on_error;
00746         }
00747     }
00748     else
00749     {
00750         msg = gettext ("No adaptation probability");
00751         goto exit_on_error;
00752     }
00753
00754     // Checking survivals
00755     i = input->mutation_ratio * input->nsimulations;
00756     i += input->reproduction_ratio * input->
00757     nsimulations;
00758     i += input->adaptation_ratio * input->
00759     nsimulations;
00760     if (i > input->nsimulations - 2)
00761     {
00762         msg = gettext
00763         ("No enough survival entities to reproduce the population");
00764         goto exit_on_error;
00765     }
00766     else
00767     {
00768         msg = gettext ("Unknown algorithm");
00769         goto exit_on_error;

```

```

00769     }
00770     xmlFree (buffer);
00771     buffer = NULL;
00772
00773     if (input->algorithm == ALGORITHM_MONTE_CARLO
00774         || input->algorithm == ALGORITHM_SWEEP)
00775     {
00776
00777         // Obtaining iterations number
00778         input->niterations
00779         = xml_node_get_uint (node, XML_NITERATIONS, &error_code);
00780         if (error_code == 1)
00781             input->niterations = 1;
00782         else if (error_code)
00783         {
00784             msg = gettext ("Bad iterations number");
00785             goto exit_on_error;
00786         }
00787
00788         // Obtaining best number
00789         input->nbest
00790         = xml_node_get_uint_with_default (node,
00791 XML_NBEST, 1, &error_code);
00792         if (error_code || !input->nbest)
00793         {
00794             msg = gettext ("Invalid best number");
00795             goto exit_on_error;
00796         }
00797
00798         // Obtaining tolerance
00799         input->tolerance
00800         = xml_node_get_float_with_default (node,
00801 XML_TOLERANCE, 0.,
00802                                         &error_code);
00803         if (error_code || input->tolerance < 0.)
00804         {
00805             msg = gettext ("Invalid tolerance");
00806             goto exit_on_error;
00807         }
00808
00809         // Getting gradient method parameters
00810         if (xmlHasProp (node, XML_NSTEPS))
00811         {
00812             input->nsteps = xml_node_get_uint (node,
00813 XML_NSTEPS, &error_code);
00814             if (error_code || !input->nsteps)
00815             {
00816                 msg = gettext ("Invalid steps number");
00817                 goto exit_on_error;
00818             }
00819             buffer = xmlGetProp (node, XML_GRADIENT_METHOD);
00820             if (!xmlStrcmp (buffer, XML_COORDINATES))
00821                 input->gradient_method =
00822 GRADIENT_METHOD_COORDINATES;
00823             else if (!xmlStrcmp (buffer, XML_RANDOM))
00824             {
00825                 input->gradient_method =
00826 GRADIENT_METHOD_RANDOM;
00827                 input->nestimates
00828                 = xml_node_get_uint (node, XML_NESTIMATES, &error_code);
00829                 if (error_code || !input->nestimates)
00830                 {
00831                     msg = gettext ("Invalid estimates number");
00832                     goto exit_on_error;
00833                 }
00834             }
00835             else
00836             {
00837                 msg = gettext ("Unknown method to estimate the gradient");
00838                 goto exit_on_error;
00839             }
00840             xmlFree (buffer);
00841             buffer = NULL;
00842             input->relaxation
00843             = xml_node_get_float_with_default (node,
00844 XML_RELAXATION,
00845 DEFAULT_RELAXATION, &error_code);
00846             if (error_code || input->relaxation < 0. || input->
00847 relaxation > 2.)
00848             {
00849                 msg = gettext ("Invalid relaxation parameter");
00850                 goto exit_on_error;
00851             }
00852         }
00853         else
00854             input->nsteps = 0;
00855     }

```

```

00849
00850 // Reading the experimental data
00851 for (child = node->children; child; child = child->next)
00852 {
00853     if (xmlStrcmp (child->name, XML_EXPERIMENT))
00854         break;
00855 #if DEBUG
00856     fprintf (stderr, "input_open: nexperiments=%u\n", input->nexperiments);
00857 #endif
00858     if (xmlHasProp (child, XML_NAME))
00859         buffer = xmlGetProp (child, XML_NAME);
00860     else
00861     {
00862         snprintf (buffer2, 64, "%s %u: %s",
00863             gettext ("Experiment"),
00864             input->nexperiments + 1, gettext ("no data file name"));
00865         msg = buffer2;
00866         goto exit_on_error;
00867     }
00868 #if DEBUG
00869     fprintf (stderr, "input_open: experiment=%s\n", buffer);
00870 #endif
00871     input->weight = g_realloc (input->weight,
00872         (1 + input->nexperiments) * sizeof (double));
00873     input->weight[input->nexperiments]
00874         = xml_node_get_float_with_default (child,
00875         XML_WEIGHT, 1., &error_code);
00876     if (error_code)
00877     {
00878         snprintf (buffer2, 64, "%s %s: %s",
00879             gettext ("Experiment"), buffer, gettext ("bad weight"));
00880         msg = buffer2;
00881         goto exit_on_error;
00882     }
00883 #if DEBUG
00884     fprintf (stderr, "input_open: weight=%lg\n",
00885         input->weight[input->nexperiments]);
00886 #endif
00887     if (!input->nexperiments)
00888         input->ninputs = 0;
00889 #if DEBUG
00890     fprintf (stderr, "input_open: template[0]\n");
00891 #endif
00892     if (xmlHasProp (child, XML_TEMPLATE1))
00893     {
00894         input->template[0]
00895             = (char **) g_realloc (input->template[0],
00896                 (1 + input->nexperiments) * sizeof (char *));
00897         buffert[0] = (char *) xmlGetProp (child, template[0]);
00898 #if DEBUG
00899         fprintf (stderr, "input_open: experiment=%u templatel=%s\n",
00900             input->nexperiments, buffert[0]);
00901 #endif
00902         if (!input->nexperiments)
00903             ++input->ninputs;
00904 #if DEBUG
00905         fprintf (stderr, "input_open: ninputs=%u\n", input->ninputs);
00906 #endif
00907     }
00908     else
00909     {
00910         snprintf (buffer2, 64, "%s %s: %s",
00911             gettext ("Experiment"), buffer, gettext ("no template"));
00912         msg = buffer2;
00913         goto exit_on_error;
00914     }
00915     for (i = 1; i < MAX_NINPUTS; ++i)
00916     {
00917         #if DEBUG
00918             fprintf (stderr, "input_open: template%u\n", i + 1);
00919         #endif
00920         if (xmlHasProp (child, template[i]))
00921         {
00922             if (input->nexperiments && input->ninputs <= i)
00923             {
00924                 snprintf (buffer2, 64, "%s %s: %s",
00925                     gettext ("Experiment"),
00926                     buffer, gettext ("bad templates number"));
00927                 msg = buffer2;
00928                 while (i-- > 0)
00929                     xmlFree (buffert[i]);
00930                 goto exit_on_error;
00931             }
00932             input->template[i] = (char **)
00933                 g_realloc (input->template[i],
00934                     (1 + input->nexperiments) * sizeof (char *));
00935             buffert[i] = (char *) xmlGetProp (child, template[i]);

```

```

00935 #if DEBUG
00936     fprintf (stderr, "input_open: experiment=%u template%u=%s\n",
00937             input->nexperiments, i + 1,
00938             input->template[i][input->nexperiments]);
00939 #endif
00940     if (!input->nexperiments)
00941         ++input->ninputs;
00942 #if DEBUG
00943     fprintf (stderr, "input_open: ninputs=%u\n", input->ninputs);
00944 #endif
00945     }
00946     else if (input->nexperiments && input->ninputs > i)
00947     {
00948         snprintf (buffer2, 64, "%s %s: %s",
00949                 gettext ("Experiment"),
00950                 buffer, gettext ("no template"), i + 1);
00951         msg = buffer2;
00952         while (i-- > 0)
00953             xmlFree (buffert[i]);
00954         goto exit_on_error;
00955     }
00956     else
00957         break;
00958 }
00959 input->experiment
00960 = g_realloc (input->experiment,
00961             (1 + input->nexperiments) * sizeof (char *));
00962 input->experiment[input->nexperiments] = (char *) buffer;
00963 for (i = 0; i < input->ninputs; ++i)
00964     input->template[i][input->nexperiments] = buffert[i];
00965 ++input->nexperiments;
00966 #if DEBUG
00967     fprintf (stderr, "input_open: nexperiments=%u\n", input->nexperiments);
00968 #endif
00969     }
00970     if (!input->nexperiments)
00971     {
00972         msg = gettext ("No calibration experiments");
00973         goto exit_on_error;
00974     }
00975     buffer = NULL;
00976
00977 // Reading the variables data
00978 for (; child; child = child->next)
00979 {
00980     if (xmlStrcmp (child->name, XML_VARIABLE))
00981     {
00982         snprintf (buffer2, 64, "%s %u: %s",
00983                 gettext ("Variable"),
00984                 input->nvariables + 1, gettext ("bad XML node"));
00985         msg = buffer2;
00986         goto exit_on_error;
00987     }
00988     if (xmlHasProp (child, XML_NAME))
00989         buffer = xmlGetProp (child, XML_NAME);
00990     else
00991     {
00992         snprintf (buffer2, 64, "%s %u: %s",
00993                 gettext ("Variable"),
00994                 input->nvariables + 1, gettext ("no name"));
00995         msg = buffer2;
00996         goto exit_on_error;
00997     }
00998     if (xmlHasProp (child, XML_MINIMUM))
00999     {
01000         input->rangemin = g_realloc
01001             (input->rangemin, (1 + input->nvariables) * sizeof (double));
01002         input->rangeminabs = g_realloc
01003             (input->rangeminabs, (1 + input->nvariables) * sizeof (double));
01004         input->rangemin[input->nvariables]
01005             = xml_node_get_float (child, XML_MINIMUM, &error_code);
01006         if (error_code)
01007         {
01008             snprintf (buffer2, 64, "%s %s: %s",
01009                     gettext ("Variable"), buffer, gettext ("bad minimum"));
01010             msg = buffer2;
01011             goto exit_on_error;
01012         }
01013         input->rangeminabs[input->nvariables]
01014             = xml_node_get_float_with_default (child,
01015             XML_ABSOLUTE_MINIMUM,
01016             -G_MAXDOUBLE, &error_code);
01017         if (error_code)
01018         {
01019             snprintf (buffer2, 64, "%s %s: %s", gettext ("Variable"), buffer,
01020                     gettext ("bad absolute minimum"));
01021             msg = buffer2;

```

```

01021         goto exit_on_error;
01022     }
01023     if (input->rangemin[input->nvariables]
01024         < input->rangeminabs[input->nvariables])
01025     {
01026         snprintf (buffer2, 64, "%s %s: %s",
01027                 gettext ("Variable"),
01028                 buffer, gettext ("minimum range not allowed"));
01029         msg = buffer2;
01030         goto exit_on_error;
01031     }
01032 }
01033 else
01034 {
01035     snprintf (buffer2, 64, "%s %s: %s",
01036             gettext ("Variable"), buffer, gettext ("no minimum range"));
01037     msg = buffer2;
01038     goto exit_on_error;
01039 }
01040 if (xmlHasProp (child, XML_MAXIMUM))
01041 {
01042     input->rangemax = g_realloc
01043         (input->rangemax, (1 + input->nvariables) * sizeof (double));
01044     input->rangemaxabs = g_realloc
01045         (input->rangemaxabs, (1 + input->nvariables) * sizeof (double));
01046     input->rangemax[input->nvariables]
01047         = xml_node_get_float (child, XML_MAXIMUM, &error_code);
01048     if (error_code)
01049     {
01050         snprintf (buffer2, 64, "%s %s: %s",
01051                 gettext ("Variable"), buffer, gettext ("bad maximum"));
01052         msg = buffer2;
01053         goto exit_on_error;
01054     }
01055     input->rangemaxabs[input->nvariables]
01056         = xml_node_get_float_with_default (child,
XML_ABSOLUTE_MAXIMUM,
01057                                         G_MAXDOUBLE, &error_code);
01058     if (error_code)
01059     {
01060         snprintf (buffer2, 64, "%s %s: %s", gettext ("Variable"), buffer,
01061                 gettext ("bad absolute maximum"));
01062         msg = buffer2;
01063         goto exit_on_error;
01064     }
01065     if (input->rangemax[input->nvariables]
01066         > input->rangemaxabs[input->nvariables])
01067     {
01068         snprintf (buffer2, 64, "%s %s: %s",
01069                 gettext ("Variable"),
01070                 buffer, gettext ("maximum range not allowed"));
01071         msg = buffer2;
01072         goto exit_on_error;
01073     }
01074 }
01075 else
01076 {
01077     snprintf (buffer2, 64, "%s %s: %s",
01078             gettext ("Variable"), buffer, gettext ("no maximum range"));
01079     msg = buffer2;
01080     goto exit_on_error;
01081 }
01082 if (input->rangemax[input->nvariables]
01083     < input->rangemin[input->nvariables])
01084 {
01085     snprintf (buffer2, 64, "%s %s: %s",
01086             gettext ("Variable"), buffer, gettext ("bad range"));
01087     msg = buffer2;
01088     goto exit_on_error;
01089 }
01090 input->precision = g_realloc
01091     (input->precision, (1 + input->nvariables) * sizeof (unsigned int));
01092 input->precision[input->nvariables]
01093     = xml_node_get_uint_with_default (child,
XML_PRECISION,
01094                                     DEFAULT_PRECISION, &error_code);
01095 if (error_code || input->precision[input->nvariables] >=
NPRECISIONS)
01096 {
01097     snprintf (buffer2, 64, "%s %s: %s", gettext ("Variable"), buffer,
01098             gettext ("bad precision"));
01099     msg = buffer2;
01100     goto exit_on_error;
01101 }
01102 if (input->algorithm == ALGORITHM_SWEEP)
01103 {
01104     if (xmlHasProp (child, XML_NSWEEPS))

```

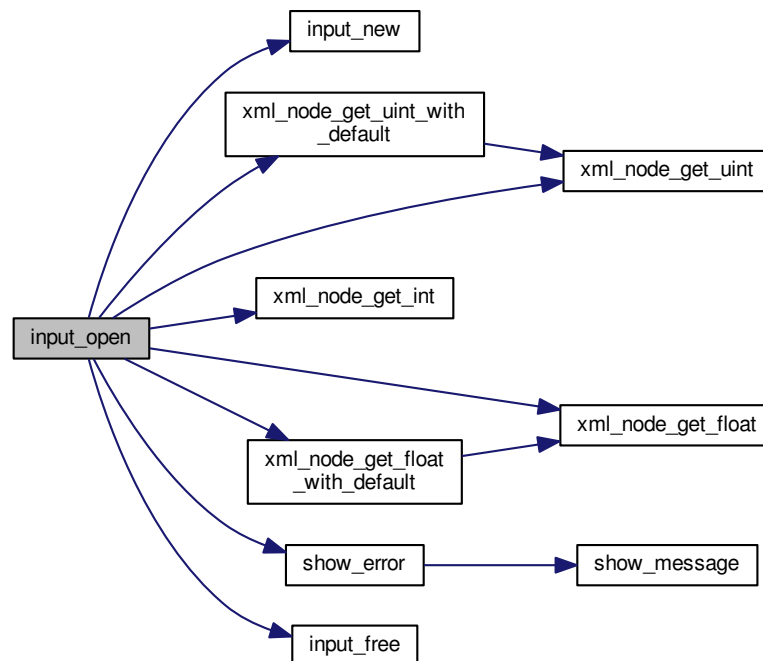
```

01105         {
01106             input->nsweeps = (unsigned int *)
01107                 g_realloc (input->nsweeps,
01108                     (1 + input->nvariables) * sizeof (unsigned int));
01109             input->nsweeps[input->nvariables]
01110                 = xml_node_get_uint (child, XML_NSWEEPS, &error_code);
01111             if (error_code || !input->nsweeps[input->
nvariables])
01112                 {
01113                     snprintf (buffer2, 64, "%s %s: %s",
01114                         gettext ("Variable"),
01115                         buffer, gettext ("bad sweeps"));
01116                     msg = buffer2;
01117                     goto exit_on_error;
01118                 }
01119             }
01120         else
01121             {
01122                 snprintf (buffer2, 64, "%s %s: %s", gettext ("Variable"), buffer,
01123                     gettext ("no sweeps number"));
01124                 msg = buffer2;
01125                 goto exit_on_error;
01126             }
01127     #if DEBUG
01128         fprintf (stderr, "input_open: nsweeps=%u nsimulations=%u\n",
01129             input->nsweeps[input->nvariables],
01130             input->nsimulations);
01131     #endif
01132     }
01133     if (input->algorithm == ALGORITHM_GENETIC)
01134     {
01135         // Obtaining bits representing each variable
01136         if (xmlHasProp (child, XML_NBITS))
01137         {
01138             input->nbits = (unsigned int *)
01139                 g_realloc (input->nbits,
01140                     (1 + input->nvariables) * sizeof (unsigned int));
01141             i = xml_node_get_uint (child, XML_NBITS, &error_code);
01142             if (error_code || !i)
01143             {
01144                 snprintf (buffer2, 64, "%s %s: %s",
01145                     gettext ("Variable"),
01146                     buffer, gettext ("invalid bits number"));
01147                 msg = buffer2;
01148                 goto exit_on_error;
01149             }
01150             input->nbits[input->nvariables] = i;
01151         }
01152         else
01153         {
01154             snprintf (buffer2, 64, "%s %s: %s",
01155                 gettext ("Variable"),
01156                 buffer, gettext ("no bits number"));
01157             msg = buffer2;
01158             goto exit_on_error;
01159         }
01160     }
01161     else if (input->nsteps)
01162     {
01163         input->step = (double *)
01164             g_realloc (input->step, (1 + input->nvariables) * sizeof (double));
01165         input->step[input->nvariables]
01166             = xml_node_get_float (child, XML_STEP, &error_code);
01167         if (error_code || input->step[input->nvariables] < 0.)
01168         {
01169             snprintf (buffer2, 64, "%s %s: %s",
01170                 gettext ("Variable"),
01171                 buffer, gettext ("bad step size"));
01172             msg = buffer2;
01173             goto exit_on_error;
01174         }
01175     }
01176     input->label = g_realloc
01177         (input->label, (1 + input->nvariables) * sizeof (char *));
01178     input->label[input->nvariables] = (char *) buffer;
01179     ++input->nvariables;
01180     }
01181     if (!input->nvariables)
01182     {
01183         msg = gettext ("No calibration variables");
01184         goto exit_on_error;
01185     }
01186     buffer = NULL;
01187     // Obtaining the error norm
01188     if (xmlHasProp (node, XML_NORM))
01189     {

```

```
01190     buffer = xmlGetProp (node, XML_NORM);
01191     if (!xmlStrcmp (buffer, XML_EUCLIDIAN))
01192         input->norm = ERROR_NORM_EUCLIDIAN;
01193     else if (!xmlStrcmp (buffer, XML_MAXIMUM))
01194         input->norm = ERROR_NORM_MAXIMUM;
01195     else if (!xmlStrcmp (buffer, XML_P))
01196     {
01197         input->norm = ERROR_NORM_P;
01198         input->p = xml_node_get_float (node, XML_P, &error_code);
01199         if (!error_code)
01200         {
01201             msg = gettext ("Bad P parameter");
01202             goto exit_on_error;
01203         }
01204     }
01205     else if (!xmlStrcmp (buffer, XML_TAXICAB))
01206         input->norm = ERROR_NORM_TAXICAB;
01207     else
01208     {
01209         msg = gettext ("Unknown error norm");
01210         goto exit_on_error;
01211     }
01212     xmlFree (buffer);
01213 }
01214 else
01215     input->norm = ERROR_NORM_EUCLIDIAN;
01216
01217 // Getting the working directory
01218 input->directory = g_path_get_dirname (filename);
01219 input->name = g_path_get_basename (filename);
01220
01221 // Closing the XML document
01222 xmlFreeDoc (doc);
01223
01224 #if DEBUG
01225 fprintf (stderr, "input_open: end\n");
01226 #endif
01227 return 1;
01228
01229 exit_on_error:
01230 xmlFree (buffer);
01231 xmlFreeDoc (doc);
01232 show_error (msg);
01233 input_free ();
01234 #if DEBUG
01235 fprintf (stderr, "input_open: end\n");
01236 #endif
01237 return 0;
01238 }
```

Here is the call graph for this function:



#### 5.5.2.21 void input\_save ( char \* filename )

Function to save the input file.

##### Parameters

<i>filename</i>	Input file name.
-----------------	------------------

Definition at line 2874 of file [mpcotool.c](#).

```

02875 {
02876     unsigned int i, j;
02877     char *buffer;
02878     xmlDoc *doc;
02879     xmlNode *node, *child;
02880     GFile *file, *file2;
02881
02882     #if DEBUG
02883         fprintf (stderr, "input_save: start\n");
02884     #endif
02885
02886     // Getting the input file directory
02887     input->name = g_path_get_basename (filename);
02888     input->directory = g_path_get_dirname (filename);
02889     file = g_file_new_for_path (input->directory);
02890
02891     // Opening the input file
02892     doc = xmlNewDoc ((const xmlChar *) "1.0");
02893
02894     // Setting root XML node
02895     node = xmlNewDocNode (doc, 0, XML_CALIBRATE, 0);
02896     xmlDocSetRootElement (doc, node);
02897
02898     // Adding properties to the root XML node
02899     if (xmlStrcmp ((const xmlChar *) input->result, result_name))
02900         xmlSetProp (node, XML_RESULT, (xmlChar *) input->result);
02901     if (xmlStrcmp ((const xmlChar *) input->variables,

```



```

    variables_name))
02902     xmlSetProp (node, XML_VARIABLES, (xmlChar *) input->
variables);
02903     file2 = g_file_new_for_path (input->simulator);
02904     buffer = g_file_get_relative_path (file, file2);
02905     g_object_unref (file2);
02906     xmlSetProp (node, XML_SIMULATOR, (xmlChar *) buffer);
02907     g_free (buffer);
02908     if (input->evaluator)
02909     {
02910         file2 = g_file_new_for_path (input->evaluator);
02911         buffer = g_file_get_relative_path (file, file2);
02912         g_object_unref (file2);
02913         if (xmlStrlen ((xmlChar *) buffer))
02914             xmlSetProp (node, XML_EVALUATOR, (xmlChar *) buffer);
02915         g_free (buffer);
02916     }
02917     if (input->seed != DEFAULT_RANDOM_SEED)
02918         xml_node_set_uint (node, XML_SEED, input->seed);
02919
02920     // Setting the algorithm
02921     buffer = (char *) g_malloc (64);
02922     switch (input->algorithm)
02923     {
02924     case ALGORITHM_MONTE_CARLO:
02925         xmlSetProp (node, XML_ALGORITHM, XML_MONTE_CARLO);
02926         snprintf (buffer, 64, "%u", input->nsimulations);
02927         xmlSetProp (node, XML_NSIMULATIONS, (xmlChar *) buffer);
02928         snprintf (buffer, 64, "%u", input->niterations);
02929         xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02930         snprintf (buffer, 64, "%.3lg", input->tolerance);
02931         xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02932         snprintf (buffer, 64, "%u", input->nbest);
02933         xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02934         input_save_gradient (node);
02935         break;
02936     case ALGORITHM_SWEEP:
02937         xmlSetProp (node, XML_ALGORITHM, XML_SWEEP);
02938         snprintf (buffer, 64, "%u", input->niterations);
02939         xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02940         snprintf (buffer, 64, "%.3lg", input->tolerance);
02941         xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02942         snprintf (buffer, 64, "%u", input->nbest);
02943         xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02944         input_save_gradient (node);
02945         break;
02946     default:
02947         xmlSetProp (node, XML_ALGORITHM, XML_GENETIC);
02948         snprintf (buffer, 64, "%u", input->nsimulations);
02949         xmlSetProp (node, XML_NPOPULATION, (xmlChar *) buffer);
02950         snprintf (buffer, 64, "%u", input->niterations);
02951         xmlSetProp (node, XML_NGENERATIONS, (xmlChar *) buffer);
02952         snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
02953         xmlSetProp (node, XML_MUTATION, (xmlChar *) buffer);
02954         snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
02955         xmlSetProp (node, XML_REPRODUCTION, (xmlChar *) buffer);
02956         snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
02957         xmlSetProp (node, XML_ADAPTATION, (xmlChar *) buffer);
02958         break;
02959     }
02960     g_free (buffer);
02961
02962     // Setting the experimental data
02963     for (i = 0; i < input->nexperiments; ++i)
02964     {
02965         child = xmlNewChild (node, 0, XML_EXPERIMENT, 0);
02966         xmlSetProp (child, XML_NAME, (xmlChar *) input->experiment[i]);
02967         if (input->weight[i] != 1.)
02968             xml_node_set_float (child, XML_WEIGHT, input->
weight[i]);
02969         for (j = 0; j < input->ninputs; ++j)
02970             xmlSetProp (child, template[j], (xmlChar *) input->template[j][i]);
02971     }
02972
02973     // Setting the variables data
02974     for (i = 0; i < input->nvariables; ++i)
02975     {
02976         child = xmlNewChild (node, 0, XML_VARIABLE, 0);
02977         xmlSetProp (child, XML_NAME, (xmlChar *) input->label[i]);
02978         xml_node_set_float (child, XML_MINIMUM, input->
rangemin[i]);
02979         if (input->rangeminabs[i] != -G_MAXDOUBLE)
02980             xml_node_set_float (child, XML_ABSOLUTE_MINIMUM,
input->rangeminabs[i]);
02981         xml_node_set_float (child, XML_MAXIMUM, input->
rangemax[i]);
02982         if (input->rangemaxabs[i] != G_MAXDOUBLE)

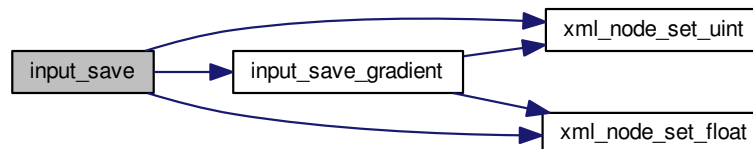
```

```

02983     xml_node_set_float (child, XML_ABSOLUTE_MAXIMUM,
input->rangemaxabs[i]);
02984     if (input->precision[i] != DEFAULT_PRECISION)
02985         xml_node_set_uint (child, XML_PRECISION,
input->precision[i]);
02986     if (input->algorithm == ALGORITHM_SWEEP)
02987         xml_node_set_uint (child, XML_NSWEEPS, input->
nsweeps[i]);
02988     else if (input->algorithm == ALGORITHM_GENETIC)
02989         xml_node_set_uint (child, XML_NBITS, input->
nbits[i]);
02990     if (input->nsteps)
02991         xml_node_set_float (child, XML_STEP, input->
step[i]);
02992 }
02993
02994 // Saving the error norm
02995 switch (input->norm)
02996 {
02997     case ERROR_NORM_MAXIMUM:
02998         xmlSetProp (node, XML_NORM, XML_MAXIMUM);
02999         break;
03000     case ERROR_NORM_P:
03001         xmlSetProp (node, XML_NORM, XML_P);
03002         xml_node_set_float (node, XML_P, input->p);
03003         break;
03004     case ERROR_NORM_TAXICAB:
03005         xmlSetProp (node, XML_NORM, XML_TAXICAB);
03006 }
03007
03008 // Saving the XML file
03009 xmlSaveFormatFile (filename, doc, 1);
03010
03011 // Freeing memory
03012 xmlFreeDoc (doc);
03013
03014 #if DEBUG
03015     fprintf (stderr, "input_save: end\n");
03016 #endif
03017 }

```

Here is the call graph for this function:



#### 5.5.2.22 void input\_save\_gradient ( xmlNode \* node )

Function to save the gradient based method data in a XML node.

##### Parameters

<i>node</i>	XML node.
-------------	-----------

Definition at line 2842 of file [mpcotool.c](#).

```

02843 {
02844     #if DEBUG
02845         fprintf (stderr, "input_save_gradient: start\n");
02846     #endif
02847     if (input->nsteps)
02848     {
02849         xml_node_set_uint (node, XML_NSTEPS, input->
nsteps);

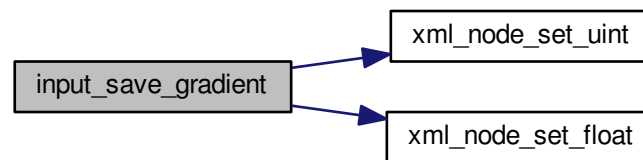
```

```

02850     if (input->relaxation != DEFAULT_RELAXATION)
02851         xml_node_set_float (node, XML_RELAXATION,
input->relaxation);
02852     switch (input->gradient_method)
02853     {
02854         case GRADIENT_METHOD_COORDINATES:
02855             xmlSetProp (node, XML_GRADIENT_METHOD,
XML_COORDINATES);
02856             break;
02857         default:
02858             xmlSetProp (node, XML_GRADIENT_METHOD, XML_RANDOM);
02859             xml_node_set_uint (node, XML_NESTIMATES,
input->nestimates);
02860     }
02861 }
02862 #if DEBUG
02863 fprintf (stderr, "input_save_gradient: end\n");
02864 #endif
02865 }

```

Here is the call graph for this function:



#### 5.5.2.23 int main ( int *argn*, char \*\* *argc* )

Main function.

##### Parameters

<i>argn</i>	Arguments number.
<i>argc</i>	Arguments pointer.

##### Returns

0 on success, >0 on error.

Definition at line 5161 of file [mpcotool.c](#).

```

05162 {
05163     #if HAVE_GTK
05164         char *buffer;
05165     #endif
05166
05167     // Starting pseudo-random numbers generator
05168     calibrate->rng = gsl_rng_alloc (gsl_rng_taus2);
05169     calibrate->seed = DEFAULT_RANDOM_SEED;
05170
05171     // Allowing spaces in the XML data file
05172     xmlKeepBlanksDefault (0);
05173
05174     // Starting MPI
05175     #if HAVE_MPI
05176         MPI_Init (&argn, &argc);
05177         MPI_Comm_size (MPI_COMM_WORLD, &ntasks);
05178         MPI_Comm_rank (MPI_COMM_WORLD, &calibrate->mpi_rank);
05179         printf ("rank=%d tasks=%d\n", calibrate->mpi_rank, ntasks);
05180     #else

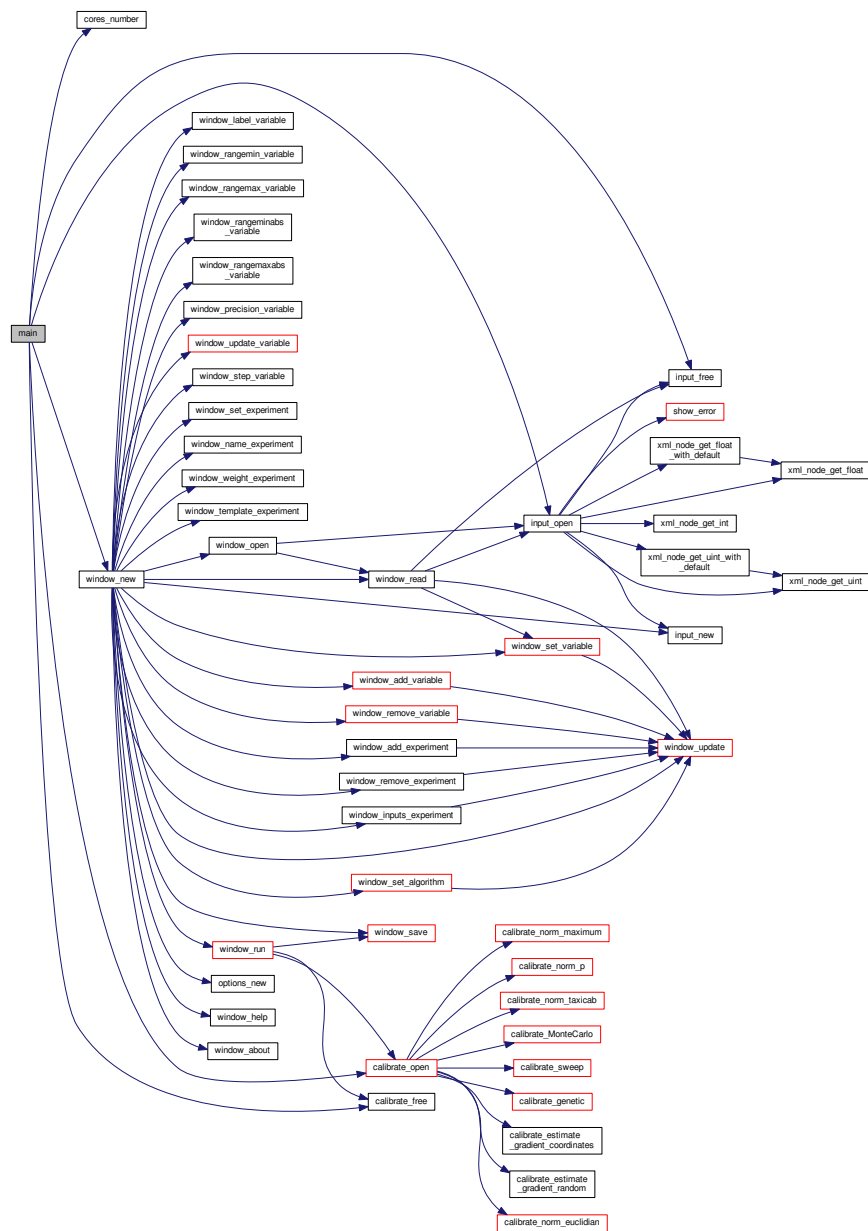
```

```

05181     ntasks = 1;
05182 #endif
05183
05184 #if HAVE_GTK
05185
05186     // Getting threads number
05187     nthreads_gradient = nthreads = cores_number ();
05188
05189     // Setting local language and international floating point numbers notation
05190     setlocale (LC_ALL, "");
05191     setlocale (LC_NUMERIC, "C");
05192     window->application_directory = g_get_current_dir ();
05193     buffer = g_build_filename (window->application_directory,
05194                               LOCALE_DIR, NULL);
05194     bindtextdomain (PROGRAM_INTERFACE, buffer);
05195     bind_textdomain_codeset (PROGRAM_INTERFACE, "UTF-8");
05196     textdomain (PROGRAM_INTERFACE);
05197
05198     // Initing GTK+
05199     gtk_disable_setlocale ();
05200     gtk_init (&argn, &argc);
05201
05202     // Opening the main window
05203     window_new ();
05204     gtk_main ();
05205
05206     // Freeing memory
05207     input_free ();
05208     g_free (buffer);
05209     gtk_widget_destroy (GTK_WIDGET (window->window));
05210     g_free (window->application_directory);
05211
05212 #else
05213
05214     // Checking syntax
05215     if (!(argn == 2 || (argn == 4 && !strcmp (argc[1], "-nthreads"))))
05216     {
05217         printf ("The syntax is:\nmpcotoolbin [-nthreads x] data_file\n");
05218         return 1;
05219     }
05220
05221     // Getting threads number
05222     if (argn == 2)
05223         nthreads_gradient = nthreads = cores_number ();
05224     else
05225     {
05226         nthreads_gradient = nthreads = atoi (argc[2]);
05227         if (!nthreads)
05228         {
05229             printf ("Bad threads number\n");
05230             return 2;
05231         }
05232     }
05233     printf ("nthreads=%u\n", nthreads);
05234
05235     // Making calibration
05236     if (input_open (argc[argn - 1]))
05237         calibrate_open ();
05238
05239     // Freeing memory
05240     calibrate_free ();
05241
05242 #endif
05243
05244     // Closing MPI
05245     #if HAVE_MPI
05246     MPI_Finalize ();
05247     #endif
05248
05249     // Freeing memory
05250     gsl_rng_free (calibrate->rng);
05251
05252     // Closing
05253     return 0;
05254 }

```

Here is the call graph for this function:



### 5.5.2.24 void show\_error ( char \* msg )

Function to show a dialog with an error message.

#### Parameters

<i>msg</i>	Error message.
------------	----------------

Definition at line 259 of file [mpcotool.c](#).

```
00260 {
00261     show_message (gettext ("ERROR!"), msg, ERROR_TYPE);
00262 }
```

Here is the call graph for this function:



#### 5.5.2.25 void show\_message ( char \* title, char \* msg, int type )

Function to show a dialog with a message.

##### Parameters

<i>title</i>	Title.
<i>msg</i>	Message.
<i>type</i>	Message type.

Definition at line 229 of file [mpcotool.c](#).

```

00230 {
00231     #if HAVE_GTK
00232         GtkMessageDialog *dlg;
00233
00234         // Creating the dialog
00235         dlg = (GtkMessageDialog *) gtk_message_dialog_new
00236             (window->window, GTK_DIALOG_MODAL, type, GTK_BUTTONS_OK, "%s", msg);
00237
00238         // Setting the dialog title
00239         gtk_window_set_title (GTK_WINDOW (dlg), title);
00240
00241         // Showing the dialog and waiting response
00242         gtk_dialog_run (GTK_DIALOG (dlg));
00243
00244         // Closing and freeing memory
00245         gtk_widget_destroy (GTK_WIDGET (dlg));
00246
00247     #else
00248         printf ("%s: %s\n", title, msg);
00249     #endif
00250 }
  
```

#### 5.5.2.26 unsigned int window\_get\_algorithm ( )

Function to get the stochastic algorithm number.

##### Returns

Stochastic algorithm number.

Definition at line 3121 of file [mpcotool.c](#).

```

03122 {
03123     unsigned int i;
03124     #if DEBUG
03125         fprintf (stderr, "window_get_algorithm: start\n");
03126     #endif
03127     i = gtk_array_get_active (window->button_algorithm,
03128                             NALGORITHMS);
03129     #if DEBUG
03129         fprintf (stderr, "window_get_algorithm: %u\n", i);
03130         fprintf (stderr, "window_get_algorithm: end\n");
03131     #endif
03132 }
  
```

```
03131 #endif
03132     return i;
03133 }
```

Here is the call graph for this function:



#### 5.5.2.27 unsigned int window\_get\_gradient ( )

Function to get the gradient base method number.

##### Returns

Gradient base method number.

Definition at line 3141 of file [mpcotool.c](#).

```
03142 {
03143     unsigned int i;
03144     #if DEBUG
03145     fprintf (stderr, "window_get_gradient: start\n");
03146     #endif
03147     i = gtk_array_get_active (window->button_gradient ,
03148                             NGRADIENTS);
03149     #if DEBUG
03149     fprintf (stderr, "window_get_gradient: %u\n", i);
03150     fprintf (stderr, "window_get_gradient: end\n");
03151     #endif
03152     return i;
03153 }
```

Here is the call graph for this function:



#### 5.5.2.28 unsigned int window\_get\_norm ( )

Function to get the norm base method number.

**Returns**

Gradient base method number.

Definition at line 3161 of file [mpcotool.c](#).

```

03162 {
03163     unsigned int i;
03164     #if DEBUG
03165     fprintf (stderr, "window_get_norm: start\n");
03166     #endif
03167     i = gtk_array_get_active (window->button_norm ,
03168                             NNORMS);
03169     #if DEBUG
03170     fprintf (stderr, "window_get_norm: %u\n", i);
03171     fprintf (stderr, "window_get_norm: end\n");
03172     #endif
03173     return i;
03174 }
```

Here is the call graph for this function:

**5.5.2.29 int window\_read ( char \* filename )**

Function to read the input data of a file.

**Parameters**

<i>filename</i>	File name.
-----------------	------------

**Returns**

1 on succes, 0 on error.

Definition at line 4264 of file [mpcotool.c](#).

```

04265 {
04266     unsigned int i;
04267     char *buffer;
04268     #if DEBUG
04269     fprintf (stderr, "window_read: start\n");
04270     #endif
04271
04272     // Reading new input file
04273     input_free ();
04274     if (!input_open (filename))
04275         return 0;
04276
04277     // Setting GTK+ widgets data
04278     gtk_entry_set_text (window->entry_result, input->result);
04279     gtk_entry_set_text (window->entry_variables, input->
04280     variables);
04281     buffer = g_build_filename (input->directory, input->
04282     simulator, NULL);
04283     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
04284     (window->button_simulator), buffer);
04285     g_free (buffer);
04286     gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
04287     (size_t) input->evaluator);
04288 }
```



```

04286     if (input->evaluator)
04287     {
04288         buffer = g_build_filename (input->directory, input->
evaluator, NULL);
04289         gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
04290             (window->button_evaluator), buffer);
04291         g_free (buffer);
04292     }
04293     gtk_toggle_button_set_active
04294     (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
algorithm]), TRUE);
04295     switch (input->algorithm)
04296     {
04297         case ALGORITHM_MONTE_CARLO:
04298             gtk_spin_button_set_value (window->spin_simulations,
04299                 (gdouble) input->nsimulations);
04300         case ALGORITHM_SWEEP:
04301             gtk_spin_button_set_value (window->spin_iterations,
04302                 (gdouble) input->niterations);
04303             gtk_spin_button_set_value (window->spin_bests, (gdouble)
input->nbest);
04304             gtk_spin_button_set_value (window->spin_tolerance,
input->tolerance);
04305             gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->
check_gradient),
04306                 input->nsteps);
04307             if (input->nsteps)
04308             {
04309                 gtk_toggle_button_set_active
04310                 (GTK_TOGGLE_BUTTON (window->button_gradient
[input->gradient_method]), TRUE);
04311                 gtk_spin_button_set_value (window->spin_steps,
04312                     (gdouble) input->nsteps);
04313                 gtk_spin_button_set_value (window->spin_relaxation,
04314                     (gdouble) input->relaxation);
04315                 switch (input->gradient_method)
04316                 {
04317                     case GRADIENT_METHOD_RANDOM:
04318                         gtk_spin_button_set_value (window->spin_estimates,
04319                             (gdouble) input->nestimates);
04320                     }
04321                 }
04322             }
04323             break;
04324             default:
04325                 gtk_spin_button_set_value (window->spin_population,
04326                     (gdouble) input->nsimulations);
04327                 gtk_spin_button_set_value (window->spin_generations,
04328                     (gdouble) input->niterations);
04329                 gtk_spin_button_set_value (window->spin_mutation, input->
mutation_ratio);
04330                 gtk_spin_button_set_value (window->spin_reproduction,
input->reproduction_ratio);
04331                 gtk_spin_button_set_value (window->spin_adaptation,
input->adaptation_ratio);
04332             }
04333             }
04334             gtk_toggle_button_set_active
04335             (GTK_TOGGLE_BUTTON (window->button_norm[input->norm]), TRUE);
04336             gtk_spin_button_set_value (window->spin_p, input->p);
04337             g_signal_handler_block (window->combo_experiment, window->
id_experiment);
04338             g_signal_handler_block (window->button_experiment,
window->id_experiment_name);
04339             gtk_combo_box_text_remove_all (window->combo_experiment);
04340             for (i = 0; i < input->nexperiments; ++i)
04341                 gtk_combo_box_text_append_text (window->combo_experiment,
input->experiment[i]);
04342             g_signal_handler_unblock
04343             (window->button_experiment, window->
id_experiment_name);
04344             g_signal_handler_unblock (window->combo_experiment,
window->id_experiment);
04345             gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
04346             g_signal_handler_block (window->combo_variable, window->
id_variable);
04347             g_signal_handler_block (window->entry_variable, window->
id_variable_label);
04348             gtk_combo_box_text_remove_all (window->combo_variable);
04349             for (i = 0; i < input->nvariables; ++i)
04350                 gtk_combo_box_text_append_text (window->combo_variable,
input->label[i]);
04351             g_signal_handler_unblock (window->entry_variable, window->
id_variable_label);
04352             g_signal_handler_unblock (window->combo_variable, window->
id_variable);
04353             gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
04354             window_set_variable ();
04355             window_update ();

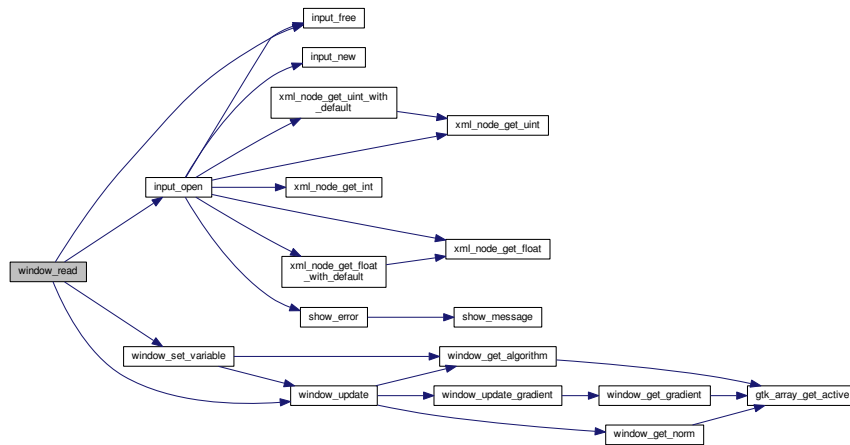
```

```

04359
04360 #if DEBUG
04361     fprintf (stderr, "window_read: end\n");
04362 #endif
04363     return 1;
04364 }

```

Here is the call graph for this function:



### 5.5.2.30 int window\_save ( )

Function to save the input file.

#### Returns

1 on OK, 0 on Cancel.

Definition at line 3213 of file [mpcotool.c](#).

```

03214 {
03215     GtkFileChooserDialog *dlg;
03216     GtkFileFilter *filter;
03217     char *buffer;
03218
03219 #if DEBUG
03220     fprintf (stderr, "window_save: start\n");
03221 #endif
03222
03223     // Opening the saving dialog
03224     dlg = (GtkFileChooserDialog *)
03225         gtk_file_chooser_dialog_new (gettext ("Save file"),
03226                                     window->window,
03227                                     GTK_FILE_CHOOSER_ACTION_SAVE,
03228                                     gettext ("_Cancel"),
03229                                     GTK_RESPONSE_CANCEL,
03230                                     gettext ("_OK"), GTK_RESPONSE_OK, NULL);
03231     gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
03232     buffer = g_build_filename (input->directory, input->name, NULL);
03233     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER (dlg), buffer);
03234     g_free (buffer);
03235
03236     // Adding XML filter
03237     filter = (GtkFileFilter *) gtk_file_filter_new ();
03238     gtk_file_filter_set_name (filter, "XML");
03239     gtk_file_filter_add_pattern (filter, "*.xml");
03240     gtk_file_filter_add_pattern (filter, "*.XML");
03241     gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter);
03242
03243     // If OK response then saving
03244     if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)

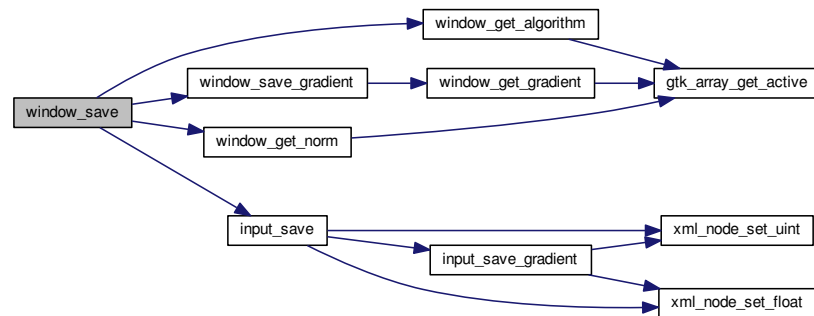
```

```

03245     {
03246
03247         // Adding properties to the root XML node
03248         input->simulator = gtk_file_chooser_get_filename
03249             (GTK_FILE_CHOOSER (window->button_simulator));
03250         if (gtk_toggle_button_get_active
03251             (GTK_TOGGLE_BUTTON (window->check_evaluator)))
03252             input->evaluator = gtk_file_chooser_get_filename
03253                 (GTK_FILE_CHOOSER (window->button_evaluator));
03254         else
03255             input->evaluator = NULL;
03256         input->result
03257             = (char *) xmlStrdup ((const xmlChar *)
03258                 gtk_entry_get_text (window->entry_result));
03259         input->variables
03260             = (char *) xmlStrdup ((const xmlChar *)
03261                 gtk_entry_get_text (window->entry_variables));
03262
03263         // Setting the algorithm
03264         switch (window_get_algorithm ())
03265         {
03266             case ALGORITHM_MONTE_CARLO:
03267                 input->algorithm = ALGORITHM_MONTE_CARLO;
03268                 input->nsimulations
03269                     = gtk_spin_button_get_value_as_int (window->spin_simulations);
03270                 input->niterations
03271                     = gtk_spin_button_get_value_as_int (window->spin_iterations);
03272                 input->tolerance = gtk_spin_button_get_value (window->
03273 spin_tolerance);
03274                 input->nbest = gtk_spin_button_get_value_as_int (window->
03275 spin_bests);
03276                 window_save_gradient ();
03277                 break;
03278             case ALGORITHM_SWEEP:
03279                 input->algorithm = ALGORITHM_SWEEP;
03280                 input->niterations
03281                     = gtk_spin_button_get_value_as_int (window->spin_iterations);
03282                 input->tolerance = gtk_spin_button_get_value (window->
03283 spin_tolerance);
03284                 input->nbest = gtk_spin_button_get_value_as_int (window->
03285 spin_bests);
03286                 window_save_gradient ();
03287                 break;
03288             default:
03289                 input->algorithm = ALGORITHM_GENETIC;
03290                 input->nsimulations
03291                     = gtk_spin_button_get_value_as_int (window->spin_population);
03292                 input->niterations
03293                     = gtk_spin_button_get_value_as_int (window->spin_generations);
03294                 input->mutation_ratio
03295                     = gtk_spin_button_get_value (window->spin_mutation);
03296                 input->reproduction_ratio
03297                     = gtk_spin_button_get_value (window->spin_reproduction);
03298                 input->adaptation_ratio
03299                     = gtk_spin_button_get_value (window->spin_adaptation);
03300                 break;
03301         }
03302         input->norm = window_get_norm ();
03303         input->p = gtk_spin_button_get_value (window->spin_p);
03304
03305         // Saving the XML file
03306         buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
03307         input_save (buffer);
03308
03309         // Closing and freeing memory
03310         g_free (buffer);
03311         gtk_widget_destroy (GTK_WIDGET (dlg));
03312         #if DEBUG
03313             fprintf (stderr, "window_save: end\n");
03314         #endif
03315         return 1;
03316     }
03317
03318     // Closing and freeing memory
03319     gtk_widget_destroy (GTK_WIDGET (dlg));
03320     #if DEBUG
03321         fprintf (stderr, "window_save: end\n");
03322     #endif
03323     return 0;
03324 }

```

Here is the call graph for this function:



#### 5.5.2.31 void window\_template\_experiment ( void \* data )

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

##### Parameters

<i>data</i>	Callback data (i-th input template).
-------------	--------------------------------------

Definition at line 3868 of file [mpcotool.c](#).

```

03869 {
03870     unsigned int i, j;
03871     char *buffer;
03872     GFile *file1, *file2;
03873     #if DEBUG
03874     fprintf (stderr, "window_template_experiment: start\n");
03875     #endif
03876     i = (size_t) data;
03877     j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
03878     file1
03879     = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
03880     file2 = g_file_new_for_path (input->directory);
03881     buffer = g_file_get_relative_path (file2, file1);
03882     input->template[i][j] = (char *) xmlStrdup ((xmlChar *) buffer);
03883     g_free (buffer);
03884     g_object_unref (file2);
03885     g_object_unref (file1);
03886     #if DEBUG
03887     fprintf (stderr, "window_template_experiment: end\n");
03888     #endif
03889 }

```

#### 5.5.2.32 double xml\_node\_get\_float ( xmlNode \* node, const xmlChar \* prop, int \* error\_code )

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

##### Parameters

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>error_code</i>	Error code.

**Returns**

Floating point number value.

Definition at line 369 of file [mpcotool.c](#).

```

00370 {
00371     double x = 0.;
00372     xmlChar *buffer;
00373     buffer = xmlGetProp (node, prop);
00374     if (!buffer)
00375         *error_code = 1;
00376     else
00377     {
00378         if (sscanf ((char *) buffer, "%lf", &x) != 1)
00379             *error_code = 2;
00380         else
00381             *error_code = 0;
00382         xmlFree (buffer);
00383     }
00384     return x;
00385 }
```

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

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

**Parameters**

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>default_value</i>	default value.
<i>error_code</i>	Error code.

**Returns**

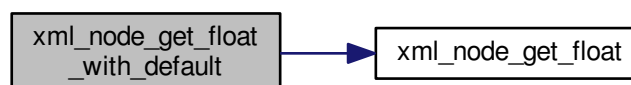
Floating point number value.

Definition at line 403 of file [mpcotool.c](#).

```

00405 {
00406     double x;
00407     if (xmlHasProp (node, prop))
00408         x = xml_node_get_float (node, prop, error_code);
00409     else
00410     {
00411         x = default_value;
00412         *error_code = 0;
00413     }
00414     return x;
00415 }
```

Here is the call graph for this function:



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

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

## Parameters

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>error_code</i>	Error code.

## Returns

Integer number value.

Definition at line 277 of file [mpcotool.c](#).

```

00278 {
00279     int i = 0;
00280     xmlChar *buffer;
00281     buffer = xmlGetProp (node, prop);
00282     if (!buffer)
00283         *error_code = 1;
00284     else
00285     {
00286         if (sscanf ((char *) buffer, "%d", &i) != 1)
00287             *error_code = 2;
00288         else
00289             *error_code = 0;
00290         xmlFree (buffer);
00291     }
00292     return i;
00293 }
```

#### 5.5.2.35 int xml\_node\_get\_uint ( xmlNode \* *node*, const xmlChar \* *prop*, int \* *error\_code* )

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

## Parameters

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>error_code</i>	Error code.

## Returns

Unsigned integer number value.

Definition at line 308 of file [mpcotool.c](#).

```

00309 {
00310     unsigned int i = 0;
00311     xmlChar *buffer;
00312     buffer = xmlGetProp (node, prop);
00313     if (!buffer)
00314         *error_code = 1;
00315     else
00316     {
00317         if (sscanf ((char *) buffer, "%u", &i) != 1)
00318             *error_code = 2;
00319         else
00320             *error_code = 0;
00321         xmlFree (buffer);
00322     }
00323     return i;
00324 }
```

#### 5.5.2.36 int xml\_node\_get\_uint\_with\_default ( xmlNode \* *node*, const xmlChar \* *prop*, unsigned int *default\_value*, int \* *error\_code* )

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

**Parameters**

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>default_value</i>	default value.
<i>error_code</i>	Error code.

**Returns**

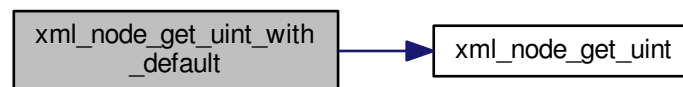
Unsigned integer number value.

Definition at line 342 of file [mpcotool.c](#).

```

00344 {
00345     unsigned int i;
00346     if (xmlHasProp (node, prop))
00347         i = xml_node_get_uint (node, prop, error_code);
00348     else
00349     {
00350         i = default_value;
00351         *error_code = 0;
00352     }
00353     return i;
00354 }
```

Here is the call graph for this function:



### 5.5.2.37 void xml\_node\_set\_float ( xmlNode \* *node*, const xmlChar \* *prop*, double *value* )

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

**Parameters**

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>value</i>	Floating point number value.

Definition at line 466 of file [mpcotool.c](#).

```

00467 {
00468     xmlChar buffer[64];
00469     snprintf ((char *) buffer, 64, "%.14lg", value);
00470     xmlSetProp (node, prop, buffer);
00471 }
```

### 5.5.2.38 void xml\_node\_set\_int ( xmlNode \* *node*, const xmlChar \* *prop*, int *value* )

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



## Parameters

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>value</i>	Integer number value.

Definition at line 428 of file [mpcotool.c](#).

```
00429 {
00430     xmlChar buffer[64];
00431     snprintf ((char *) buffer, 64, "%d", value);
00432     xmlSetProp (node, prop, buffer);
00433 }
```

### 5.5.2.39 void xml\_node\_set\_uint ( xmlNode \* *node*, const xmlChar \* *prop*, unsigned int *value* )

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

## Parameters

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>value</i>	Unsigned integer number value.

Definition at line 447 of file [mpcotool.c](#).

```
00448 {
00449     xmlChar buffer[64];
00450     snprintf ((char *) buffer, 64, "%u", value);
00451     xmlSetProp (node, prop, buffer);
00452 }
```

## 5.5.3 Variable Documentation

### 5.5.3.1 const char\* format[NPRECISIONS]

## Initial value:

```
= {
    "%.01f", "%.11f", "%.21f", "%.31f", "%.41f", "%.51f", "%.61f", "%.71f",
    "%.81f", "%.91f", "%.101f", "%.111f", "%.121f", "%.131f", "%.141f"
}
```

Array of C-strings with variable formats.

Definition at line 120 of file [mpcotool.c](#).

### 5.5.3.2 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 125 of file [mpcotool.c](#).

### 5.5.3.3 const xmlChar\* template[MAX\_NINPUTS]

**Initial value:**

```
= {
    XML_TEMPLATE1, XML_TEMPLATE2, XML_TEMPLATE3,
    XML_TEMPLATE4,
    XML_TEMPLATE5, XML_TEMPLATE6, XML_TEMPLATE7,
    XML_TEMPLATE8
}
```

Array of xmlChar strings with template labels.

Definition at line 113 of file [mpcotool.c](#).

## 5.6 mpcotool.c

```
00001 /*
00002 MPCOTool: a software to make calibrations of empirical parameters.
00003
00004 AUTHORS: Javier Burguete and Borja Latorre.
00005
00006 Copyright 2012-2016, AUTHORS.
00007
00008 Redistribution and use in source and binary forms, with or without modification,
00009 are permitted provided that the following conditions are met:
00010
00011     1. Redistributions of source code must retain the above copyright notice,
00012        this list of conditions and the following disclaimer.
00013
00014     2. Redistributions in binary form must reproduce the above copyright notice,
00015        this list of conditions and the following disclaimer in the
00016        documentation and/or other materials provided with the distribution.
00017
00018 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00019 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00020 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00021 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00022 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00023 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00024 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00025 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00026 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00027 OF SUCH DAMAGE.
00028 */
00029
00036 #define _GNU_SOURCE
00037 #include "config.h"
00038 #include <stdio.h>
00039 #include <stdlib.h>
00040 #include <string.h>
00041 #include <math.h>
00042 #include <unistd.h>
00043 #include <locale.h>
00044 #include <gsl/gsl_rng.h>
00045 #include <libxml/parser.h>
00046 #include <libintl.h>
00047 #include <glib.h>
00048 #include <glib/gstdio.h>
00049 #ifdef G_OS_WIN32
00050 #include <windows.h>
00051 #elif (!__BSD_VISIBLE)
00052 #include <alloca.h>
00053 #endif
00054 #if HAVE_MPI
00055 #include <mpi.h>
00056 #endif
00057 #include "genetic/genetic.h"
00058 #include "mpcotool.h"
00059 #if HAVE_GTK
00060 #include <gio/gio.h>
00061 #include <gtk/gtk.h>
00062 #include "interface.h"
00063 #endif
00064
00065 #define DEBUG 0
00066
00067
00077 #if HAVE_GTK
00078 #define ERROR_TYPE GTK_MESSAGE_ERROR
```

```

00079 #define INFO_TYPE GTK_MESSAGE_INFO
00080 #else
00081 #define ERROR_TYPE 0
00082 #define INFO_TYPE 0
00083 #endif
00084 #ifdef G_OS_WIN32
00085 #define INPUT_FILE "test-ga-win.xml"
00086 #define RM "del"
00087 #else
00088 #define INPUT_FILE "test-ga.xml"
00089 #define RM "rm"
00090 #endif
00091
00092 int ntasks;
00093 unsigned int nthreads;
00094 unsigned int nthreads_gradient;
00096 GMutex mutex[1];
00097 void (*calibrate_algorithm) ();
00099 double (*calibrate_estimate_gradient) (unsigned int variable,
00100                                       unsigned int estimate);
00102 double (*calibrate_norm) (unsigned int simulation);
00104 Input input[1];
00106 Calibrate calibrate[1];
00107
00108 const xmlChar *result_name = (xmlChar *) "result";
00110 const xmlChar *variables_name = (xmlChar *) "variables";
00112
00113 const xmlChar *template[MAX_NINPUTS] = {
00114     XML_TEMPLATE1, XML_TEMPLATE2, XML_TEMPLATE3,
00115     XML_TEMPLATE4,
00116     XML_TEMPLATE5, XML_TEMPLATE6, XML_TEMPLATE7,
00117     XML_TEMPLATE8
00118 };
00119
00120 const char *format[NPRECISIONS] = {
00121     "%.01f", "%.11f", "%.21f", "%.31f", "%.41f", "%.51f", "%.61f", "%.71f",
00122     "%.81f", "%.91f", "%.101f", "%.111f", "%.121f", "%.131f", "%.141f"
00123 };
00124
00125 const double precision[NPRECISIONS] = {
00126     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,
00127     1e-13, 1e-14
00128 };
00129
00130 const char *logo[] = {
00131     "32 32 3 1",
00132     "      c None",
00133     ".      c #0000FF",
00134     "+      c #FF0000",
00135     "      ",
00136     "      ",
00137     "      ",
00138     ".      .      .      .      ",
00139     ".      .      .      .      ",
00140     ".      .      .      .      ",
00141     ".      .      .      .      ",
00142     ".      .      +++      .      ",
00143     ".      .      +++++      .      ",
00144     ".      .      +++++      .      ",
00145     ".      .      +++++      .      ",
00146     "      +++      .      +++      ",
00147     "      +++++      .      +++++      ",
00148     "      +++++      .      +++++      ",
00149     "      +++++      .      +++++      ",
00150     "      +++      .      +++      ",
00151     ".      .      .      .      ",
00152     ".      .      .      .      ",
00153     ".      +++++      .      .      ",
00154     ".      +++++      .      .      ",
00155     ".      +++++      .      .      ",
00156     ".      .      .      .      ",
00157     ".      .      .      .      ",
00158     ".      .      .      .      ",
00159     ".      .      .      .      ",
00160     ".      .      .      .      ",
00161     ".      .      .      .      ",
00162     ".      .      .      .      ",
00163     ".      .      .      .      ",
00164     "      ",
00165     "      ",
00166     "      ",
00167 };
00168
00169 /*
00170 const char * logo[] = {
00171     "32 32 3 1",

```

```

00172 "      c #FFFFFFFFFFFF",
00173 ".      c #00000000FFFF",
00174 "X      c #FFF00000000",
00175 "      ",
00176 "      ",
00177 "      ",
00178 "      .      .      .      .      ",
00179 "      .      .      .      .      ",
00180 "      .      .      .      .      ",
00181 "      .      .      .      .      ",
00182 "      .      .      XXX      .      ",
00183 "      .      .      XXXXX      .      ",
00184 "      .      .      XXXXX      .      ",
00185 "      .      .      XXXXX      .      ",
00186 "      XXX      .      XXX      XXX      ",
00187 "      XXXXX      .      .      XXXXX      ",
00188 "      XXXXX      .      .      XXXXX      ",
00189 "      XXXXX      .      .      XXXXX      ",
00190 "      XXX      .      .      XXX      ",
00191 "      .      .      .      .      ",
00192 "      .      XXX      .      .      ",
00193 "      .      XXXXX      .      .      ",
00194 "      .      XXXXX      .      .      ",
00195 "      .      XXXXX      .      .      ",
00196 "      .      XXX      .      .      ",
00197 "      .      .      .      .      ",
00198 "      .      .      .      .      ",
00199 "      .      .      .      .      ",
00200 "      .      .      .      .      ",
00201 "      .      .      .      .      ",
00202 "      .      .      .      .      ",
00203 "      .      .      .      .      ",
00204 "      ",
00205 "      ",
00206 "      "};
00207 */
00208
00209 #if HAVE_GTK
00210 Options options[1];
00212 Running running[1];
00214 Window window[1];
00216 #endif
00217
00228 void
00229 show_message (char *title, char *msg, int type)
00230 {
00231     #if HAVE_GTK
00232         GtkMessageDialog *dlg;
00233
00234         // Creating the dialog
00235         dlg = (GtkMessageDialog *) gtk_message_dialog_new
00236             (window->window, GTK_DIALOG_MODAL, type, GTK_BUTTONS_OK, "%s", msg);
00237
00238         // Setting the dialog title
00239         gtk_window_set_title (GTK_WINDOW (dlg), title);
00240
00241         // Showing the dialog and waiting response
00242         gtk_dialog_run (GTK_DIALOG (dlg));
00243
00244         // Closing and freeing memory
00245         gtk_widget_destroy (GTK_WIDGET (dlg));
00246
00247     #else
00248         printf ("%s: %s\n", title, msg);
00249     #endif
00250 }
00251
00258 void
00259 show_error (char *msg)
00260 {
00261     show_message (gettext ("ERROR!"), msg, ERROR_TYPE);
00262 }
00263
00276 int
00277 xml_node_get_int (xmlNode * node, const xmlChar * prop, int *error_code)
00278 {
00279     int i = 0;
00280     xmlChar *buffer;
00281     buffer = xmlGetProp (node, prop);
00282     if (!buffer)
00283         *error_code = 1;
00284     else
00285     {
00286         if (sscanf ((char *) buffer, "%d", &i) != 1)
00287             *error_code = 2;
00288         else
00289             *error_code = 0;

```

```

00290     xmlFree (buffer);
00291 }
00292 return i;
00293 }
00294
00307 unsigned int
00308 xml_node_get_uint (xmlNode * node, const xmlChar * prop, int *error_code)
00309 {
00310     unsigned int i = 0;
00311     xmlChar *buffer;
00312     buffer = xmlGetProp (node, prop);
00313     if (!buffer)
00314         *error_code = 1;
00315     else
00316     {
00317         if (sscanf ((char *) buffer, "%u", &i) != 1)
00318             *error_code = 2;
00319         else
00320             *error_code = 0;
00321         xmlFree (buffer);
00322     }
00323     return i;
00324 }
00325
00341 unsigned int
00342 xml_node_get_uint_with_default (xmlNode * node, const xmlChar * prop,
00343                                unsigned int default_value, int *error_code)
00344 {
00345     unsigned int i;
00346     if (xmlHasProp (node, prop))
00347         i = xml_node_get_uint (node, prop, error_code);
00348     else
00349     {
00350         i = default_value;
00351         *error_code = 0;
00352     }
00353     return i;
00354 }
00355
00368 double
00369 xml_node_get_float (xmlNode * node, const xmlChar * prop, int *error_code)
00370 {
00371     double x = 0.;
00372     xmlChar *buffer;
00373     buffer = xmlGetProp (node, prop);
00374     if (!buffer)
00375         *error_code = 1;
00376     else
00377     {
00378         if (sscanf ((char *) buffer, "%lf", &x) != 1)
00379             *error_code = 2;
00380         else
00381             *error_code = 0;
00382         xmlFree (buffer);
00383     }
00384     return x;
00385 }
00386
00402 double
00403 xml_node_get_float_with_default (xmlNode * node, const xmlChar * prop,
00404                                 double default_value, int *error_code)
00405 {
00406     double x;
00407     if (xmlHasProp (node, prop))
00408         x = xml_node_get_float (node, prop, error_code);
00409     else
00410     {
00411         x = default_value;
00412         *error_code = 0;
00413     }
00414     return x;
00415 }
00416
00427 void
00428 xml_node_set_int (xmlNode * node, const xmlChar * prop, int value)
00429 {
00430     xmlChar buffer[64];
00431     snprintf ((char *) buffer, 64, "%d", value);
00432     xmlSetProp (node, prop, buffer);
00433 }
00434
00446 void
00447 xml_node_set_uint (xmlNode * node, const xmlChar * prop, unsigned int value)
00448 {
00449     xmlChar buffer[64];
00450     snprintf ((char *) buffer, 64, "%u", value);
00451     xmlSetProp (node, prop, buffer);

```

```

00452 }
00453
00465 void
00466 xml_node_set_float (xmlNode * node, const xmlChar * prop, double value)
00467 {
00468     xmlChar buffer[64];
00469     snprintf ((char *) buffer, 64, "%.14lg", value);
00470     xmlSetProp (node, prop, buffer);
00471 }
00472
00473 #if HAVE_GTK
00474
00485 unsigned int
00486 gtk_array_get_active (GtkRadioButton * array[], unsigned int n)
00487 {
00488     unsigned int i;
00489     for (i = 0; i < n; ++i)
00490         if (gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (array[i])))
00491             break;
00492     return i;
00493 }
00494
00495 #endif
00496
00500 void
00501 input_new ()
00502 {
00503     unsigned int i;
00504     #if DEBUG
00505     fprintf (stderr, "input_new: start\n");
00506     #endif
00507     input->nvariables = input->nexperiments = input->ninputs = input->
nsteps = 0;
00508     input->simulator = input->evaluator = input->directory = input->
name
00509         = input->result = input->variables = NULL;
00510     input->experiment = input->label = NULL;
00511     input->precision = input->nsweeps = input->nbits = NULL;
00512     input->rangemin = input->rangemax = input->rangeminabs = input->
rangemaxabs
00513         = input->weight = input->step = NULL;
00514     for (i = 0; i < MAX_NINPUTS; ++i)
00515         input->template[i] = NULL;
00516     #if DEBUG
00517     fprintf (stderr, "input_new: end\n");
00518     #endif
00519 }
00520
00525 void
00526 input_free ()
00527 {
00528     unsigned int i, j;
00529     #if DEBUG
00530     fprintf (stderr, "input_free: start\n");
00531     #endif
00532     g_free (input->name);
00533     g_free (input->directory);
00534     for (i = 0; i < input->nexperiments; ++i)
00535     {
00536         xmlFree (input->experiment[i]);
00537         for (j = 0; j < input->ninputs; ++j)
00538             xmlFree (input->template[j][i]);
00539         g_free (input->template[j]);
00540     }
00541     g_free (input->experiment);
00542     for (i = 0; i < input->ninputs; ++i)
00543         g_free (input->template[i]);
00544     for (i = 0; i < input->nvariables; ++i)
00545         xmlFree (input->label[i]);
00546     g_free (input->label);
00547     g_free (input->precision);
00548     g_free (input->rangemin);
00549     g_free (input->rangemax);
00550     g_free (input->rangeminabs);
00551     g_free (input->rangemaxabs);
00552     g_free (input->weight);
00553     g_free (input->step);
00554     g_free (input->nsweeps);
00555     g_free (input->nbits);
00556     xmlFree (input->evaluator);
00557     xmlFree (input->simulator);
00558     xmlFree (input->result);
00559     xmlFree (input->variables);
00560     input->nexperiments = input->ninputs = input->nvariables = input->
nsteps = 0;
00561     #if DEBUG
00562     fprintf (stderr, "input_free: end\n");

```

```

00563 #endif
00564 }
00565
00573 int
00574 input_open (char *filename)
00575 {
00576     char buffer2[64];
00577     char *buffert[MAX_NINPUTS] =
00578         { NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL };
00579     xmlDoc *doc;
00580     xmlNode *node, *child;
00581     xmlChar *buffer;
00582     char *msg;
00583     int error_code;
00584     unsigned int i;
00585
00586     #if DEBUG
00587         fprintf (stderr, "input_open: start\n");
00588     #endif
00589
00590     // Resetting input data
00591     buffer = NULL;
00592     input_new ();
00593
00594     // Parsing the input file
00595     #if DEBUG
00596         fprintf (stderr, "input_open: parsing the input file %s\n", filename);
00597     #endif
00598     doc = xmlParseFile (filename);
00599     if (!doc)
00600     {
00601         msg = gettext ("Unable to parse the input file");
00602         goto exit_on_error;
00603     }
00604
00605     // Getting the root node
00606     #if DEBUG
00607         fprintf (stderr, "input_open: getting the root node\n");
00608     #endif
00609     node = xmlDocGetRootElement (doc);
00610     if (xmlStrcmp (node->name, XML_CALIBRATE))
00611     {
00612         msg = gettext ("Bad root XML node");
00613         goto exit_on_error;
00614     }
00615
00616     // Getting results file names
00617     input->result = (char *) xmlGetProp (node, XML_RESULT);
00618     if (!input->result)
00619         input->result = (char *) xmlStrdup (result_name);
00620     input->variables = (char *) xmlGetProp (node, XML_VARIABLES);
00621     if (!input->variables)
00622         input->variables = (char *) xmlStrdup (variables_name);
00623
00624     // Opening simulator program name
00625     input->simulator = (char *) xmlGetProp (node, XML_SIMULATOR);
00626     if (!input->simulator)
00627     {
00628         msg = gettext ("Bad simulator program");
00629         goto exit_on_error;
00630     }
00631
00632     // Opening evaluator program name
00633     input->evaluator = (char *) xmlGetProp (node, XML_EVALUATOR);
00634
00635     // Obtaining pseudo-random numbers generator seed
00636     input->seed
00637         = xml_node_get_uint_with_default (node,
00638         XML_SEED, DEFAULT_RANDOM_SEED,
00639         &error_code);
00640     if (error_code)
00641     {
00642         msg = gettext ("Bad pseudo-random numbers generator seed");
00643         goto exit_on_error;
00644     }
00645
00646     // Opening algorithm
00647     buffer = xmlGetProp (node, XML_ALGORITHM);
00648     if (!xmlStrcmp (buffer, XML_MONTE_CARLO))
00649     {
00650         input->algorithm = ALGORITHM_MONTE_CARLO;
00651
00652         // Obtaining simulations number
00653         input->nsimulations
00654             = xml_node_get_int (node, XML_NSIMULATIONS, &error_code);
00655         if (error_code)
00656         {

```

```

00656         msg = gettext ("Bad simulations number");
00657         goto exit_on_error;
00658     }
00659 }
00660 else if (!xmlStrcmp (buffer, XML_SWEEP))
00661     input->algorithm = ALGORITHM_SWEEP;
00662 else if (!xmlStrcmp (buffer, XML_GENETIC))
00663 {
00664     input->algorithm = ALGORITHM_GENETIC;
00665
00666     // Obtaining population
00667     if (xmlHasProp (node, XML_NPOPULATION))
00668     {
00669         input->nsimulations
00670             = xml_node_get_uint (node, XML_NPOPULATION, &error_code);
00671         if (error_code || input->nsimulations < 3)
00672         {
00673             msg = gettext ("Invalid population number");
00674             goto exit_on_error;
00675         }
00676     }
00677 else
00678 {
00679     msg = gettext ("No population number");
00680     goto exit_on_error;
00681 }
00682
00683 // Obtaining generations
00684 if (xmlHasProp (node, XML_NGENERATIONS))
00685 {
00686     input->niterations
00687         = xml_node_get_uint (node, XML_NGENERATIONS, &error_code);
00688     if (error_code || !input->niterations)
00689     {
00690         msg = gettext ("Invalid generations number");
00691         goto exit_on_error;
00692     }
00693 }
00694 else
00695 {
00696     msg = gettext ("No generations number");
00697     goto exit_on_error;
00698 }
00699
00700 // Obtaining mutation probability
00701 if (xmlHasProp (node, XML_MUTATION))
00702 {
00703     input->mutation_ratio
00704         = xml_node_get_float (node, XML_MUTATION, &error_code);
00705     if (error_code || input->mutation_ratio < 0.
00706         || input->mutation_ratio >= 1.)
00707     {
00708         msg = gettext ("Invalid mutation probability");
00709         goto exit_on_error;
00710     }
00711 }
00712 else
00713 {
00714     msg = gettext ("No mutation probability");
00715     goto exit_on_error;
00716 }
00717
00718 // Obtaining reproduction probability
00719 if (xmlHasProp (node, XML_REPRODUCTION))
00720 {
00721     input->reproduction_ratio
00722         = xml_node_get_float (node, XML_REPRODUCTION, &error_code);
00723     if (error_code || input->reproduction_ratio < 0.
00724         || input->reproduction_ratio >= 1.0)
00725     {
00726         msg = gettext ("Invalid reproduction probability");
00727         goto exit_on_error;
00728     }
00729 }
00730 else
00731 {
00732     msg = gettext ("No reproduction probability");
00733     goto exit_on_error;
00734 }
00735
00736 // Obtaining adaptation probability
00737 if (xmlHasProp (node, XML_ADAPTATION))
00738 {
00739     input->adaptation_ratio
00740         = xml_node_get_float (node, XML_ADAPTATION, &error_code);
00741     if (error_code || input->adaptation_ratio < 0.
00742         || input->adaptation_ratio >= 1.)

```



```

00743         {
00744             msg = gettext ("Invalid adaptation probability");
00745             goto exit_on_error;
00746         }
00747     }
00748     else
00749     {
00750         msg = gettext ("No adaptation probability");
00751         goto exit_on_error;
00752     }
00753
00754     // Checking survivals
00755     i = input->mutation_ratio * input->nsimulations;
00756     i += input->reproduction_ratio * input->nsimulations;
00757     i += input->adaptation_ratio * input->nsimulations;
00758     if (i > input->nsimulations - 2)
00759     {
00760         msg = gettext
00761             ("No enough survival entities to reproduce the population");
00762         goto exit_on_error;
00763     }
00764 }
00765 else
00766 {
00767     msg = gettext ("Unknown algorithm");
00768     goto exit_on_error;
00769 }
00770 xmlFree (buffer);
00771 buffer = NULL;
00772
00773 if (input->algorithm == ALGORITHM_MONTE_CARLO
00774     || input->algorithm == ALGORITHM_SWEEP)
00775 {
00776     // Obtaining iterations number
00777     input->niterations
00778         = xml_node_get_uint (node, XML_NITERATIONS, &error_code);
00779     if (error_code == 1)
00780         input->niterations = 1;
00781     else if (error_code)
00782     {
00783         msg = gettext ("Bad iterations number");
00784         goto exit_on_error;
00785     }
00786 }
00787
00788 // Obtaining best number
00789 input->nbest
00790     = xml_node_get_uint_with_default (node,
XML_NBEST, 1, &error_code);
00791 if (error_code || !input->nbest)
00792 {
00793     msg = gettext ("Invalid best number");
00794     goto exit_on_error;
00795 }
00796
00797 // Obtaining tolerance
00798 input->tolerance
00799     = xml_node_get_float_with_default (node,
XML_TOLERANCE, 0.,
&error_code);
00800 if (error_code || input->tolerance < 0.)
00801 {
00802     msg = gettext ("Invalid tolerance");
00803     goto exit_on_error;
00804 }
00805
00806 // Getting gradient method parameters
00807 if (xmlHasProp (node, XML_NSTEPS))
00808 {
00809     input->nsteps = xml_node_get_uint (node,
XML_NSTEPS, &error_code);
00810 if (error_code || !input->nsteps)
00811 {
00812     msg = gettext ("Invalid steps number");
00813     goto exit_on_error;
00814 }
00815
00816 buffer = xmlGetProp (node, XML_GRADIENT_METHOD);
00817 if (!xmlStrcmp (buffer, XML_COORDINATES))
00818     input->gradient_method = GRADIENT_METHOD_COORDINATES;
00819 else if (!xmlStrcmp (buffer, XML_RANDOM))
00820 {
00821     input->gradient_method = GRADIENT_METHOD_RANDOM;
00822     input->nestimates
00823         = xml_node_get_uint (node, XML_NESTIMATES, &error_code);
00824     if (error_code || !input->nestimates)
00825     {
00826         msg = gettext ("Invalid estimates number");

```

```

00827         goto exit_on_error;
00828     }
00829 }
00830 else
00831 {
00832     msg = gettext ("Unknown method to estimate the gradient");
00833     goto exit_on_error;
00834 }
00835 xmlFree (buffer);
00836 buffer = NULL;
00837 input->relaxation
00838     = xml_node_get_float_with_default (node,
XML_RELAXATION,
00839     DEFAULT_RELAXATION, &error_code);
00840 if (error_code || input->relaxation < 0. || input->
relaxation > 2.)
00841 {
00842     msg = gettext ("Invalid relaxation parameter");
00843     goto exit_on_error;
00844 }
00845 }
00846 else
00847     input->nsteps = 0;
00848 }
00849
00850 // Reading the experimental data
00851 for (child = node->children; child; child = child->next)
00852 {
00853     if (xmlStrcmp (child->name, XML_EXPERIMENT))
00854         break;
00855 #if DEBUG
00856     fprintf (stderr, "input_open: nexperiments=%u\n", input->nexperiments);
00857 #endif
00858     if (xmlHasProp (child, XML_NAME))
00859         buffer = xmlGetProp (child, XML_NAME);
00860     else
00861     {
00862         snprintf (buffer2, 64, "%s %u: %s",
00863             gettext ("Experiment"),
00864             input->nexperiments + 1, gettext ("no data file name"));
00865         msg = buffer2;
00866         goto exit_on_error;
00867     }
00868 #if DEBUG
00869     fprintf (stderr, "input_open: experiment=%s\n", buffer);
00870 #endif
00871     input->weight = g_realloc (input->weight,
00872         (1 + input->nexperiments) * sizeof (double));
00873     input->weight[input->nexperiments]
00874     = xml_node_get_float_with_default (child,
XML_WEIGHT, 1., &error_code);
00875     if (error_code)
00876     {
00877         snprintf (buffer2, 64, "%s %s: %s",
00878             gettext ("Experiment"), buffer, gettext ("bad weight"));
00879         msg = buffer2;
00880         goto exit_on_error;
00881     }
00882 #if DEBUG
00883     fprintf (stderr, "input_open: weight=%lg\n",
00884         input->weight[input->nexperiments]);
00885 #endif
00886     if (!input->nexperiments)
00887         input->ninputs = 0;
00888 #if DEBUG
00889     fprintf (stderr, "input_open: template[0]\n");
00890 #endif
00891     if (xmlHasProp (child, XML_TEMPLATE1))
00892     {
00893         input->template[0]
00894         = (char **) g_realloc (input->template[0],
00895             (1 + input->nexperiments) * sizeof (char *));
00896         buffert[0] = (char *) xmlGetProp (child, template[0]);
00897 #if DEBUG
00898         fprintf (stderr, "input_open: experiment=%u templatel=%s\n",
00899             input->nexperiments, buffert[0]);
00900 #endif
00901         if (!input->nexperiments)
00902             ++input->ninputs;
00903 #if DEBUG
00904         fprintf (stderr, "input_open: ninputs=%u\n", input->ninputs);
00905 #endif
00906     }
00907     else
00908     {
00909         snprintf (buffer2, 64, "%s %s: %s",
00910             gettext ("Experiment"), buffer, gettext ("no template"));

```

```

00911         msg = buffer2;
00912         goto exit_on_error;
00913     }
00914     for (i = 1; i < MAX_NINPUTS; ++i)
00915     {
00916 #if DEBUG
00917         fprintf (stderr, "input_open: template%u\n", i + 1);
00918 #endif
00919         if (xmlHasProp (child, template[i]))
00920         {
00921             if (input->nexperiments && input->ninputs <= i)
00922             {
00923                 snprintf (buffer2, 64, "%s %s: %s",
00924                     gettext ("Experiment"),
00925                     buffer, gettext ("bad templates number"));
00926                 msg = buffer2;
00927                 while (i-- > 0)
00928                     xmlFree (buffert[i]);
00929                 goto exit_on_error;
00930             }
00931             input->template[i] = (char **)
00932                 g_realloc (input->template[i],
00933                     (1 + input->nexperiments) * sizeof (char *));
00934             buffert[i] = (char *) xmlGetProp (child, template[i]);
00935 #if DEBUG
00936             fprintf (stderr, "input_open: experiment=%u template%u=%s\n",
00937                 input->nexperiments, i + 1,
00938                 input->template[i][input->nexperiments]);
00939 #endif
00940             if (!input->nexperiments)
00941                 ++input->ninputs;
00942 #if DEBUG
00943             fprintf (stderr, "input_open: ninputs=%u\n", input->ninputs);
00944 #endif
00945         }
00946         else if (input->nexperiments && input->ninputs > i)
00947         {
00948             snprintf (buffer2, 64, "%s %s: %s%u",
00949                 gettext ("Experiment"),
00950                 buffer, gettext ("no template"), i + 1);
00951             msg = buffer2;
00952             while (i-- > 0)
00953                 xmlFree (buffert[i]);
00954             goto exit_on_error;
00955         }
00956         else
00957             break;
00958     }
00959     input->experiment
00960     = g_realloc (input->experiment,
00961         (1 + input->nexperiments) * sizeof (char *));
00962     input->experiment[input->nexperiments] = (char *) buffer;
00963     for (i = 0; i < input->ninputs; ++i)
00964         input->template[i][input->nexperiments] = buffert[i];
00965     ++input->nexperiments;
00966 #if DEBUG
00967     fprintf (stderr, "input_open: nexperiments=%u\n", input->nexperiments);
00968 #endif
00969     }
00970     if (!input->nexperiments)
00971     {
00972         msg = gettext ("No calibration experiments");
00973         goto exit_on_error;
00974     }
00975     buffer = NULL;
00976
00977     // Reading the variables data
00978     for (; child; child = child->next)
00979     {
00980         if (xmlStrcmp (child->name, XML_VARIABLE))
00981         {
00982             snprintf (buffer2, 64, "%s %u: %s",
00983                 gettext ("Variable"),
00984                 input->nvariables + 1, gettext ("bad XML node"));
00985             msg = buffer2;
00986             goto exit_on_error;
00987         }
00988         if (xmlHasProp (child, XML_NAME))
00989             buffer = xmlGetProp (child, XML_NAME);
00990         else
00991         {
00992             snprintf (buffer2, 64, "%s %u: %s",
00993                 gettext ("Variable"),
00994                 input->nvariables + 1, gettext ("no name"));
00995             msg = buffer2;
00996             goto exit_on_error;
00997         }

```

```

00998     if (xmlHasProp (child, XML_MINIMUM))
00999     {
01000         input->rangemin = g_realloc
01001             (input->rangemin, (1 + input->nvariables) * sizeof (double));
01002         input->rangeminabs = g_realloc
01003             (input->rangeminabs, (1 + input->nvariables) * sizeof (double));
01004         input->rangemin[input->nvariables]
01005             = xml_node_get_float (child, XML_MINIMUM, &error_code);
01006         if (error_code)
01007         {
01008             snprintf (buffer2, 64, "%s %s: %s",
01009                 gettext ("Variable"), buffer, gettext ("bad minimum"));
01010             msg = buffer2;
01011             goto exit_on_error;
01012         }
01013         input->rangeminabs[input->nvariables]
01014             = xml_node_get_float_with_default (child,
XML_ABSOLUTE_MINIMUM,
01015                 -G_MAXDOUBLE, &error_code);
01016         if (error_code)
01017         {
01018             snprintf (buffer2, 64, "%s %s: %s", gettext ("Variable"), buffer,
01019                 gettext ("bad absolute minimum"));
01020             msg = buffer2;
01021             goto exit_on_error;
01022         }
01023         if (input->rangemin[input->nvariables]
01024             < input->rangeminabs[input->nvariables])
01025         {
01026             snprintf (buffer2, 64, "%s %s: %s",
01027                 gettext ("Variable"),
01028                 buffer, gettext ("minimum range not allowed"));
01029             msg = buffer2;
01030             goto exit_on_error;
01031         }
01032     }
01033     else
01034     {
01035         snprintf (buffer2, 64, "%s %s: %s",
01036             gettext ("Variable"), buffer, gettext ("no minimum range"));
01037         msg = buffer2;
01038         goto exit_on_error;
01039     }
01040     if (xmlHasProp (child, XML_MAXIMUM))
01041     {
01042         input->rangemax = g_realloc
01043             (input->rangemax, (1 + input->nvariables) * sizeof (double));
01044         input->rangemaxabs = g_realloc
01045             (input->rangemaxabs, (1 + input->nvariables) * sizeof (double));
01046         input->rangemax[input->nvariables]
01047             = xml_node_get_float (child, XML_MAXIMUM, &error_code);
01048         if (error_code)
01049         {
01050             snprintf (buffer2, 64, "%s %s: %s",
01051                 gettext ("Variable"), buffer, gettext ("bad maximum"));
01052             msg = buffer2;
01053             goto exit_on_error;
01054         }
01055         input->rangemaxabs[input->nvariables]
01056             = xml_node_get_float_with_default (child,
XML_ABSOLUTE_MAXIMUM,
01057                 G_MAXDOUBLE, &error_code);
01058         if (error_code)
01059         {
01060             snprintf (buffer2, 64, "%s %s: %s", gettext ("Variable"), buffer,
01061                 gettext ("bad absolute maximum"));
01062             msg = buffer2;
01063             goto exit_on_error;
01064         }
01065         if (input->rangemax[input->nvariables]
01066             > input->rangemaxabs[input->nvariables])
01067         {
01068             snprintf (buffer2, 64, "%s %s: %s",
01069                 gettext ("Variable"),
01070                 buffer, gettext ("maximum range not allowed"));
01071             msg = buffer2;
01072             goto exit_on_error;
01073         }
01074     }
01075     else
01076     {
01077         snprintf (buffer2, 64, "%s %s: %s",
01078             gettext ("Variable"), buffer, gettext ("no maximum range"));
01079         msg = buffer2;
01080         goto exit_on_error;
01081     }
01082     if (input->rangemax[input->nvariables]

```

```

01083         < input->rangemin[input->nvariables])
01084     {
01085         snprintf (buffer2, 64, "%s %s: %s",
01086             gettext ("Variable"), buffer, gettext ("bad range"));
01087         msg = buffer2;
01088         goto exit_on_error;
01089     }
01090     input->precision = g_realloc
01091         (input->precision, (1 + input->nvariables) * sizeof (unsigned int));
01092     input->precision[input->nvariables]
01093         = xml_node_get_uint_with_default (child,
XML_PRECISION,
01094             DEFAULT_PRECISION, &error_code);
01095     if (error_code || input->precision[input->nvariables] >=
NPRECISIONS)
01096     {
01097         snprintf (buffer2, 64, "%s %s: %s", gettext ("Variable"), buffer,
01098             gettext ("bad precision"));
01099         msg = buffer2;
01100         goto exit_on_error;
01101     }
01102     if (input->algorithm == ALGORITHM_SWEEP)
01103     {
01104         if (xmlHasProp (child, XML_NSWEEPS))
01105         {
01106             input->nsweeps = (unsigned int *)
01107                 g_realloc (input->nsweeps,
01108                     (1 + input->nvariables) * sizeof (unsigned int));
01109             input->nsweeps[input->nvariables]
01110                 = xml_node_get_uint (child, XML_NSWEEPS, &error_code);
01111             if (error_code || !input->nsweeps[input->nvariables])
01112             {
01113                 snprintf (buffer2, 64, "%s %s: %s",
01114                     gettext ("Variable"),
01115                     buffer, gettext ("bad sweeps"));
01116                 msg = buffer2;
01117                 goto exit_on_error;
01118             }
01119         }
01120         else
01121         {
01122             snprintf (buffer2, 64, "%s %s: %s", gettext ("Variable"), buffer,
01123                 gettext ("no sweeps number"));
01124             msg = buffer2;
01125             goto exit_on_error;
01126         }
01127     }
01128     #if DEBUG
01129     fprintf (stderr, "input_open: nsweeps=%u nsimulations=%u\n",
01130         input->nsweeps[input->nvariables], input->
nsimulations);
01131     #endif
01132     if (input->algorithm == ALGORITHM_GENETIC)
01133     {
01134         // Obtaining bits representing each variable
01135         if (xmlHasProp (child, XML_NBITS))
01136         {
01137             input->nbits = (unsigned int *)
01138                 g_realloc (input->nbits,
01139                     (1 + input->nvariables) * sizeof (unsigned int));
01140             i = xml_node_get_uint (child, XML_NBITS, &error_code);
01141             if (error_code || !i)
01142             {
01143                 snprintf (buffer2, 64, "%s %s: %s",
01144                     gettext ("Variable"),
01145                     buffer, gettext ("invalid bits number"));
01146                 msg = buffer2;
01147                 goto exit_on_error;
01148             }
01149             input->nbits[input->nvariables] = i;
01150         }
01151         else
01152         {
01153             snprintf (buffer2, 64, "%s %s: %s",
01154                 gettext ("Variable"),
01155                 buffer, gettext ("no bits number"));
01156             msg = buffer2;
01157             goto exit_on_error;
01158         }
01159     }
01160     else if (input->nsteps)
01161     {
01162         input->step = (double *)
01163             g_realloc (input->step, (1 + input->nvariables) * sizeof (double));
01164         input->step[input->nvariables]
01165             = xml_node_get_float (child, XML_STEP, &error_code);
01166         if (error_code || input->step[input->nvariables] < 0.)

```

```

01167         {
01168             snprintf (buffer2, 64, "%s %s: %s",
01169                     gettext ("Variable"),
01170                     buffer, gettext ("bad step size"));
01171             msg = buffer2;
01172             goto exit_on_error;
01173         }
01174     }
01175     input->label = g_realloc
01176     (input->label, (1 + input->nvariables) * sizeof (char *));
01177     input->label[input->nvariables] = (char *) buffer;
01178     ++input->nvariables;
01179 }
01180 if (!input->nvariables)
01181 {
01182     msg = gettext ("No calibration variables");
01183     goto exit_on_error;
01184 }
01185 buffer = NULL;
01186
01187 // Obtaining the error norm
01188 if (xmlHasProp (node, XML_NORM))
01189 {
01190     buffer = xmlGetProp (node, XML_NORM);
01191     if (!xmlStrcmp (buffer, XML_EUCLIDIAN))
01192         input->norm = ERROR_NORM_EUCLIDIAN;
01193     else if (!xmlStrcmp (buffer, XML_MAXIMUM))
01194         input->norm = ERROR_NORM_MAXIMUM;
01195     else if (!xmlStrcmp (buffer, XML_P))
01196     {
01197         input->norm = ERROR_NORM_P;
01198         input->p = xml_node_get_float (node, XML_P, &error_code);
01199         if (!error_code)
01200         {
01201             msg = gettext ("Bad P parameter");
01202             goto exit_on_error;
01203         }
01204     }
01205     else if (!xmlStrcmp (buffer, XML_TAXICAB))
01206         input->norm = ERROR_NORM_TAXICAB;
01207     else
01208     {
01209         msg = gettext ("Unknown error norm");
01210         goto exit_on_error;
01211     }
01212     xmlFree (buffer);
01213 }
01214 else
01215     input->norm = ERROR_NORM_EUCLIDIAN;
01216
01217 // Getting the working directory
01218 input->directory = g_path_get_dirname (filename);
01219 input->name = g_path_get_basename (filename);
01220
01221 // Closing the XML document
01222 xmlFreeDoc (doc);
01223
01224 #if DEBUG
01225 fprintf (stderr, "input_open: end\n");
01226 #endif
01227 return 1;
01228
01229 exit_on_error:
01230 xmlFree (buffer);
01231 xmlFreeDoc (doc);
01232 show_error (msg);
01233 input_free ();
01234 #if DEBUG
01235 fprintf (stderr, "input_open: end\n");
01236 #endif
01237 return 0;
01238 }
01239
01251 void
01252 calibrate_input (unsigned int simulation, char *input, GMappedFile * template)
01253 {
01254     unsigned int i;
01255     char buffer[32], value[32], *buffer2, *buffer3, *content;
01256     FILE *file;
01257     gsize length;
01258     GRegex *regex;
01259
01260 #if DEBUG
01261 fprintf (stderr, "calibrate_input: start\n");
01262 #endif
01263
01264 // Checking the file

```

```

01265     if (!template)
01266         goto calibrate_input_end;
01267
01268     // Opening template
01269     content = g_mapped_file_get_contents (template);
01270     length = g_mapped_file_get_length (template);
01271     #if DEBUG
01272     fprintf (stderr, "calibrate_input: length=%lu\ncontent:\n%s", length,
01273             content);
01274     #endif
01275     file = g_fopen (input, "w");
01276
01277     // Parsing template
01278     for (i = 0; i < calibrate->nvariables; ++i)
01279     {
01280     #if DEBUG
01281     fprintf (stderr, "calibrate_input: variable=%u\n", i);
01282     #endif
01283     snprintf (buffer, 32, "@variable%u@", i + 1);
01284     regex = g_regex_new (buffer, 0, 0, NULL);
01285     if (i == 0)
01286     {
01287         buffer2 = g_regex_replace_literal (regex, content, length, 0,
01288                                           calibrate->label[i], 0, NULL);
01289     #if DEBUG
01290     fprintf (stderr, "calibrate_input: buffer2\n%s", buffer2);
01291     #endif
01292     }
01293     else
01294     {
01295         length = strlen (buffer3);
01296         buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
01297                                           calibrate->label[i], 0, NULL);
01298         g_free (buffer3);
01299     }
01300     g_regex_unref (regex);
01301     length = strlen (buffer2);
01302     snprintf (buffer, 32, "@value%u@", i + 1);
01303     regex = g_regex_new (buffer, 0, 0, NULL);
01304     snprintf (value, 32, format[calibrate->precision[i]],
01305             calibrate->value[simulation * calibrate->nvariables + i]);
01306     #if DEBUG
01307     fprintf (stderr, "calibrate_input: value=%s\n", value);
01308     #endif
01309     buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
01310                                       0, NULL);
01311     g_free (buffer2);
01312     g_regex_unref (regex);
01313     }
01314
01315     // Saving input file
01316     fwrite (buffer3, strlen (buffer3), sizeof (char), file);
01317     g_free (buffer3);
01318     fclose (file);
01319
01320 calibrate_input_end:
01321     #if DEBUG
01322     fprintf (stderr, "calibrate_input: end\n");
01323     #endif
01324     return;
01325 }
01326
01327 double
01328 calibrate_parse (unsigned int simulation, unsigned int experiment)
01329 {
01330     unsigned int i;
01331     double e;
01332     char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
01333           *buffer3, *buffer4;
01334     FILE *file_result;
01335
01336     #if DEBUG
01337     fprintf (stderr, "calibrate_parse: start\n");
01338     fprintf (stderr, "calibrate_parse: simulation=%u experiment=%u\n", simulation,
01339             experiment);
01340     #endif
01341
01342     // Opening input files
01343     for (i = 0; i < calibrate->ninputs; ++i)
01344     {
01345         snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
01346     #if DEBUG
01347     fprintf (stderr, "calibrate_parse: i=%u input=%s\n", i, &input[i][0]);
01348     #endif
01349     calibrate_input (simulation, &input[i][0],
01350                     calibrate->file[i][experiment]);
01351 }

```

```

01362     }
01363     for (; i < MAX_NINPUTS; ++i)
01364         strcpy (&input[i][0], "");
01365 #if DEBUG
01366     fprintf (stderr, "calibrate_parse: parsing end\n");
01367 #endif
01368
01369     // Performing the simulation
01370     snprintf (output, 32, "output-%u-%u", simulation, experiment);
01371     buffer2 = g_path_get_dirname (calibrate->simulator);
01372     buffer3 = g_path_get_basename (calibrate->simulator);
01373     buffer4 = g_build_filename (buffer2, buffer3, NULL);
01374     snprintf (buffer, 512, "\"%s\" %s %s %s %s %s %s %s %s",
01375             buffer4, input[0], input[1], input[2], input[3], input[4], input[5],
01376             input[6], input[7], output);
01377     g_free (buffer4);
01378     g_free (buffer3);
01379     g_free (buffer2);
01380 #if DEBUG
01381     fprintf (stderr, "calibrate_parse: %s\n", buffer);
01382 #endif
01383     system (buffer);
01384
01385     // Checking the objective value function
01386     if (calibrate->evaluator)
01387     {
01388         snprintf (result, 32, "result-%u-%u", simulation, experiment);
01389         buffer2 = g_path_get_dirname (calibrate->evaluator);
01390         buffer3 = g_path_get_basename (calibrate->evaluator);
01391         buffer4 = g_build_filename (buffer2, buffer3, NULL);
01392         snprintf (buffer, 512, "\"%s\" %s %s %s",
01393             buffer4, output, calibrate->experiment[experiment], result);
01394         g_free (buffer4);
01395         g_free (buffer3);
01396         g_free (buffer2);
01397 #if DEBUG
01398         fprintf (stderr, "calibrate_parse: %s\n", buffer);
01399 #endif
01400         system (buffer);
01401         file_result = g_fopen (result, "r");
01402         e = atof (fgets (buffer, 512, file_result));
01403         fclose (file_result);
01404     }
01405     else
01406     {
01407         strcpy (result, "");
01408         file_result = g_fopen (output, "r");
01409         e = atof (fgets (buffer, 512, file_result));
01410         fclose (file_result);
01411     }
01412
01413     // Removing files
01414 #if !DEBUG
01415     for (i = 0; i < calibrate->ninputs; ++i)
01416     {
01417         if (calibrate->file[i][0])
01418         {
01419             snprintf (buffer, 512, RM " %s", &input[i][0]);
01420             system (buffer);
01421         }
01422     }
01423     snprintf (buffer, 512, RM " %s %s", output, result);
01424     system (buffer);
01425 #endif
01426
01427 #if DEBUG
01428     fprintf (stderr, "calibrate_parse: end\n");
01429 #endif
01430
01431     // Returning the objective function
01432     return e * calibrate->weight[experiment];
01433 }
01434
01442 double
01443 calibrate_norm_euclidian (unsigned int simulation)
01444 {
01445     double e, ei;
01446     unsigned int i;
01447 #if DEBUG
01448     fprintf (stderr, "calibrate_norm_euclidian: start\n");
01449 #endif
01450     e = 0.;
01451     for (i = 0; i < calibrate->nexperiments; ++i)
01452     {
01453         ei = calibrate_parse (simulation, i);
01454         e += ei * ei;
01455     }

```



```

01456     e = sqrt (e);
01457     #if DEBUG
01458     fprintf (stderr, "calibrate_norm_euclidian: error=%lg\n", e);
01459     fprintf (stderr, "calibrate_norm_euclidian: end\n");
01460     #endif
01461     return e;
01462 }
01463
01471 double
01472 calibrate_norm_maximum (unsigned int simulation)
01473 {
01474     double e, ei;
01475     unsigned int i;
01476     #if DEBUG
01477     fprintf (stderr, "calibrate_norm_maximum: start\n");
01478     #endif
01479     e = 0.;
01480     for (i = 0; i < calibrate->nexperiments; ++i)
01481     {
01482         ei = fabs (calibrate_parse (simulation, i));
01483         e = fmax (e, ei);
01484     }
01485     #if DEBUG
01486     fprintf (stderr, "calibrate_norm_maximum: error=%lg\n", e);
01487     fprintf (stderr, "calibrate_norm_maximum: end\n");
01488     #endif
01489     return e;
01490 }
01491
01499 double
01500 calibrate_norm_p (unsigned int simulation)
01501 {
01502     double e, ei;
01503     unsigned int i;
01504     #if DEBUG
01505     fprintf (stderr, "calibrate_norm_p: start\n");
01506     #endif
01507     e = 0.;
01508     for (i = 0; i < calibrate->nexperiments; ++i)
01509     {
01510         ei = fabs (calibrate_parse (simulation, i));
01511         e += pow (ei, calibrate->p);
01512     }
01513     e = pow (e, 1. / calibrate->p);
01514     #if DEBUG
01515     fprintf (stderr, "calibrate_norm_p: error=%lg\n", e);
01516     fprintf (stderr, "calibrate_norm_p: end\n");
01517     #endif
01518     return e;
01519 }
01520
01528 double
01529 calibrate_norm_taxicab (unsigned int simulation)
01530 {
01531     double e;
01532     unsigned int i;
01533     #if DEBUG
01534     fprintf (stderr, "calibrate_norm_taxicab: start\n");
01535     #endif
01536     e = 0.;
01537     for (i = 0; i < calibrate->nexperiments; ++i)
01538         e += fabs (calibrate_parse (simulation, i));
01539     #if DEBUG
01540     fprintf (stderr, "calibrate_norm_taxicab: error=%lg\n", e);
01541     fprintf (stderr, "calibrate_norm_taxicab: end\n");
01542     #endif
01543     return e;
01544 }
01545
01550 void
01551 calibrate_print ()
01552 {
01553     unsigned int i;
01554     char buffer[512];
01555     #if HAVE_MPI
01556     if (calibrate->mpi_rank)
01557         return;
01558     #endif
01559     printf ("%s\n", gettext ("Best result"));
01560     printf (calibrate->file_result, "%s\n", gettext ("Best result"));
01561     printf ("error = %.15le\n", calibrate->error_old[0]);
01562     printf (calibrate->file_result, "error = %.15le\n", calibrate->
error_old[0]);
01563     for (i = 0; i < calibrate->nvariables; ++i)
01564     {
01565         snprintf (buffer, 512, "%s = %s\n",
calibrate->label[i], format[calibrate->precision[i]]);
01566

```

```

01567     printf (buffer, calibrate->value_old[i]);
01568     fprintf (calibrate->file_result, buffer, calibrate->value_old[i]);
01569 }
01570 fflush (calibrate->file_result);
01571 }
01572
01581 void
01582 calibrate_save_variables (unsigned int simulation, double error)
01583 {
01584     unsigned int i;
01585     char buffer[64];
01586     #if DEBUG
01587     fprintf (stderr, "calibrate_save_variables: start\n");
01588     #endif
01589     for (i = 0; i < calibrate->nvariables; ++i)
01590     {
01591         snprintf (buffer, 64, "%s ", format[calibrate->precision[i]]);
01592         fprintf (calibrate->file_variables, buffer,
01593             calibrate->value[simulation * calibrate->nvariables + i]);
01594     }
01595     fprintf (calibrate->file_variables, "%.14le\n", error);
01596     #if DEBUG
01597     fprintf (stderr, "calibrate_save_variables: end\n");
01598     #endif
01599 }
01600
01609 void
01610 calibrate_best (unsigned int simulation, double value)
01611 {
01612     unsigned int i, j;
01613     double e;
01614     #if DEBUG
01615     fprintf (stderr, "calibrate_best: start\n");
01616     fprintf (stderr, "calibrate_best: nsaveds=%u nbest=%u\n",
01617         calibrate->nsaveds, calibrate->nbest);
01618     #endif
01619     if (calibrate->nsaveds < calibrate->nbest
01620         || value < calibrate->error_best[calibrate->nsaveds - 1])
01621     {
01622         if (calibrate->nsaveds < calibrate->nbest)
01623             ++calibrate->nsaveds;
01624         calibrate->error_best[calibrate->nsaveds - 1] = value;
01625         calibrate->simulation_best[calibrate->nsaveds - 1] = simulation;
01626         for (i = calibrate->nsaveds; --i;)
01627         {
01628             if (calibrate->error_best[i] < calibrate->error_best[i - 1])
01629             {
01630                 j = calibrate->simulation_best[i];
01631                 e = calibrate->error_best[i];
01632                 calibrate->simulation_best[i] = calibrate->
simulation_best[i - 1];
01633                 calibrate->error_best[i] = calibrate->error_best[i - 1];
01634                 calibrate->simulation_best[i - 1] = j;
01635                 calibrate->error_best[i - 1] = e;
01636             }
01637             else
01638                 break;
01639         }
01640     }
01641     #if DEBUG
01642     fprintf (stderr, "calibrate_best: end\n");
01643     #endif
01644 }
01645
01650 void
01651 calibrate_sequential ()
01652 {
01653     unsigned int i;
01654     double e;
01655     #if DEBUG
01656     fprintf (stderr, "calibrate_sequential: start\n");
01657     fprintf (stderr, "calibrate_sequential: nstart=%u nend=%u\n",
01658         calibrate->nstart, calibrate->nend);
01659     #endif
01660     for (i = calibrate->nstart; i < calibrate->nend; ++i)
01661     {
01662         e = calibrate_norm (i);
01663         calibrate_best (i, e);
01664         calibrate_save_variables (i, e);
01665         #if DEBUG
01666         fprintf (stderr, "calibrate_sequential: i=%u e=%lg\n", i, e);
01667         #endif
01668     }
01669     #if DEBUG
01670     fprintf (stderr, "calibrate_sequential: end\n");
01671     #endif
01672 }

```

```

01673
01681 void *
01682 calibrate_thread (ParallelData * data)
01683 {
01684     unsigned int i, thread;
01685     double e;
01686     #if DEBUG
01687         fprintf (stderr, "calibrate_thread: start\n");
01688     #endif
01689     thread = data->thread;
01690     #if DEBUG
01691         fprintf (stderr, "calibrate_thread: thread=%u start=%u end=%u\n", thread,
01692                 calibrate->thread[thread], calibrate->thread[thread + 1]);
01693     #endif
01694     for (i = calibrate->thread[thread]; i < calibrate->thread[thread + 1]; ++i)
01695     {
01696         e = calibrate_norm (i);
01697         g_mutex_lock (mutex);
01698         calibrate_best (i, e);
01699         calibrate_save_variables (i, e);
01700         g_mutex_unlock (mutex);
01701     #if DEBUG
01702         fprintf (stderr, "calibrate_thread: i=%u e=%lg\n", i, e);
01703     #endif
01704     }
01705     #if DEBUG
01706         fprintf (stderr, "calibrate_thread: end\n");
01707     #endif
01708     g_thread_exit (NULL);
01709     return NULL;
01710 }
01711
01723 void
01724 calibrate_merge (unsigned int nsaveds, unsigned int *simulation_best,
01725                  double *error_best)
01726 {
01727     unsigned int i, j, k, s[calibrate->nbest];
01728     double e[calibrate->nbest];
01729     #if DEBUG
01730         fprintf (stderr, "calibrate_merge: start\n");
01731     #endif
01732     i = j = k = 0;
01733     do
01734     {
01735         if (i == calibrate->nsaveds)
01736         {
01737             s[k] = simulation_best[j];
01738             e[k] = error_best[j];
01739             ++j;
01740             ++k;
01741             if (j == nsaveds)
01742                 break;
01743         }
01744         else if (j == nsaveds)
01745         {
01746             s[k] = calibrate->simulation_best[i];
01747             e[k] = calibrate->error_best[i];
01748             ++i;
01749             ++k;
01750             if (i == calibrate->nsaveds)
01751                 break;
01752         }
01753         else if (calibrate->error_best[i] > error_best[j])
01754         {
01755             s[k] = simulation_best[j];
01756             e[k] = error_best[j];
01757             ++j;
01758             ++k;
01759         }
01760         else
01761         {
01762             s[k] = calibrate->simulation_best[i];
01763             e[k] = calibrate->error_best[i];
01764             ++i;
01765             ++k;
01766         }
01767     }
01768     while (k < calibrate->nbest);
01769     calibrate->nsaveds = k;
01770     memcpy (calibrate->simulation_best, s, k * sizeof (unsigned int));
01771     memcpy (calibrate->error_best, e, k * sizeof (double));
01772     #if DEBUG
01773         fprintf (stderr, "calibrate_merge: end\n");
01774     #endif
01775 }
01776
01781 #if HAVE_MPI

```

```

01782 void
01783 calibrate_synchronise ()
01784 {
01785     unsigned int i, nsaveds, simulation_best[calibrate->nbest];
01786     double error_best[calibrate->nbest];
01787     MPI_Status mpi_stat;
01788     #if DEBUG
01789     fprintf (stderr, "calibrate_synchronise: start\n");
01790     #endif
01791     if (calibrate->mpi_rank == 0)
01792     {
01793         for (i = 1; i < ntasks; ++i)
01794         {
01795             MPI_Recv (&nsaveds, 1, MPI_INT, i, 1, MPI_COMM_WORLD, &mpi_stat);
01796             MPI_Recv (simulation_best, nsaveds, MPI_INT, i, 1,
01797                     MPI_COMM_WORLD, &mpi_stat);
01798             MPI_Recv (error_best, nsaveds, MPI_DOUBLE, i, 1,
01799                     MPI_COMM_WORLD, &mpi_stat);
01800             calibrate_merge (nsaveds, simulation_best, error_best);
01801         }
01802     }
01803     else
01804     {
01805         MPI_Send (&calibrate->nsaveds, 1, MPI_INT, 0, 1, MPI_COMM_WORLD);
01806         MPI_Send (calibrate->simulation_best, calibrate->nsaveds, MPI_INT, 0, 1,
01807                 MPI_COMM_WORLD);
01808         MPI_Send (calibrate->error_best, calibrate->nsaveds, MPI_DOUBLE, 0, 1,
01809                 MPI_COMM_WORLD);
01810     }
01811     #if DEBUG
01812     fprintf (stderr, "calibrate_synchronise: end\n");
01813     #endif
01814 }
01815 #endif
01816
01821 void
01822 calibrate_sweep ()
01823 {
01824     unsigned int i, j, k, l;
01825     double e;
01826     GThread *thread[nthreads];
01827     ParallelData data[nthreads];
01828     #if DEBUG
01829     fprintf (stderr, "calibrate_sweep: start\n");
01830     #endif
01831     for (i = 0; i < calibrate->nsimulations; ++i)
01832     {
01833         k = i;
01834         for (j = 0; j < calibrate->nvariables; ++j)
01835         {
01836             l = k % calibrate->nsweeps[j];
01837             k /= calibrate->nsweeps[j];
01838             e = calibrate->rangemin[j];
01839             if (calibrate->nsweeps[j] > 1)
01840                 e += 1 * (calibrate->rangemax[j] - calibrate->rangemin[j])
01841                     / (calibrate->nsweeps[j] - 1);
01842             calibrate->value[i * calibrate->nvariables + j] = e;
01843         }
01844     }
01845     calibrate->nsaveds = 0;
01846     if (nthreads <= 1)
01847         calibrate_sequential ();
01848     else
01849     {
01850         for (i = 0; i < nthreads; ++i)
01851         {
01852             data[i].thread = i;
01853             thread[i]
01854                 = g_thread_new (NULL, (void (*)(void*)) calibrate_thread, &data[i]);
01855         }
01856         for (i = 0; i < nthreads; ++i)
01857             g_thread_join (thread[i]);
01858     }
01859     #if HAVE_MPI
01860     // Communicating tasks results
01861     calibrate_synchronise ();
01862     #endif
01863     #if DEBUG
01864     fprintf (stderr, "calibrate_sweep: end\n");
01865     #endif
01866 }
01867
01872 void
01873 calibrate_MonteCarlo ()
01874 {
01875     unsigned int i, j;
01876     GThread *thread[nthreads];

```

```

01877 ParallelData data[nthreads];
01878 #if DEBUG
01879 fprintf (stderr, "calibrate_MonteCarlo: start\n");
01880 #endif
01881 for (i = 0; i < calibrate->nsimulations; ++i)
01882     for (j = 0; j < calibrate->nvariables; ++j)
01883         calibrate->value[i * calibrate->nvariables + j]
01884             = calibrate->rangemin[j] + gsl_rng_uniform (calibrate->rng)
01885               * (calibrate->rangemax[j] - calibrate->rangemin[j]);
01886 calibrate->nsaveds = 0;
01887 if (nthreads <= 1)
01888     calibrate_sequential ();
01889 else
01890     {
01891         for (i = 0; i < nthreads; ++i)
01892             {
01893                 data[i].thread = i;
01894                 thread[i]
01895                     = g_thread_new (NULL, (void (*)(void*)) calibrate_thread, &data[i]);
01896             }
01897         for (i = 0; i < nthreads; ++i)
01898             g_thread_join (thread[i]);
01899     }
01900 #if HAVE_MPI
01901 // Communicating tasks results
01902 calibrate_synchronise ();
01903 #endif
01904 #if DEBUG
01905 fprintf (stderr, "calibrate_MonteCarlo: end\n");
01906 #endif
01907 }
01908 void
01909 calibrate_best_gradient (unsigned int simulation, double value)
01910 {
01911     #if DEBUG
01912     fprintf (stderr, "calibrate_best_gradient: start\n");
01913     fprintf (stderr,
01914             "calibrate_best_gradient: simulation=%u value=%.14le best=%.14le\n",
01915             simulation, value, calibrate->error_best[0]);
01916     #endif
01917     if (value < calibrate->error_best[0])
01918     {
01919         calibrate->error_best[0] = value;
01920         calibrate->simulation_best[0] = simulation;
01921     }
01922     #if DEBUG
01923     fprintf (stderr,
01924             "calibrate_best_gradient: BEST simulation=%u value=%.14le\n",
01925             simulation, value);
01926     #endif
01927 }
01928 #if DEBUG
01929 fprintf (stderr, "calibrate_best_gradient: end\n");
01930 #endif
01931 }
01932 void
01933 calibrate_gradient_sequential (unsigned int simulation)
01934 {
01935     unsigned int i, j;
01936     double e;
01937     #if DEBUG
01938     fprintf (stderr, "calibrate_gradient_sequential: start\n");
01939     fprintf (stderr, "calibrate_gradient_sequential: nstart_gradient=%u "
01940             "nend_gradient=%u\n",
01941             calibrate->nstart_gradient, calibrate->nend_gradient);
01942     #endif
01943     for (i = calibrate->nstart_gradient; i < calibrate->nend_gradient; ++i)
01944     {
01945         j = simulation + i;
01946         e = calibrate_norm (j);
01947         calibrate_best_gradient (j, e);
01948         calibrate_save_variables (j, e);
01949     }
01950     #if DEBUG
01951     fprintf (stderr, "calibrate_gradient_sequential: i=%u e=%lg\n", i, e);
01952     #endif
01953 }
01954 #if DEBUG
01955 fprintf (stderr, "calibrate_gradient_sequential: end\n");
01956 #endif
01957 }
01958 void *
01959 calibrate_gradient_thread (ParallelData * data)
01960 {
01961     unsigned int i, thread;
01962     double e;

```

```

01986 #if DEBUG
01987     fprintf (stderr, "calibrate_gradient_thread: start\n");
01988 #endif
01989     thread = data->thread;
01990 #if DEBUG
01991     fprintf (stderr, "calibrate_gradient_thread: thread=%u start=%u end=%u\n",
01992             thread,
01993             calibrate->thread_gradient[thread],
01994             calibrate->thread_gradient[thread + 1]);
01995 #endif
01996     for (i = calibrate->thread_gradient[thread];
01997          i < calibrate->thread_gradient[thread + 1]; ++i)
01998     {
01999         e = calibrate_norm (i);
02000         g_mutex_lock (mutex);
02001         calibrate_best_gradient (i, e);
02002         calibrate_save_variables (i, e);
02003         g_mutex_unlock (mutex);
02004 #if DEBUG
02005         fprintf (stderr, "calibrate_gradient_thread: i=%u e=%lg\n", i, e);
02006 #endif
02007     }
02008 #if DEBUG
02009     fprintf (stderr, "calibrate_gradient_thread: end\n");
02010 #endif
02011     g_thread_exit (NULL);
02012     return NULL;
02013 }
02014
02024 double
02025 calibrate_estimate_gradient_random (unsigned int variable,
02026                                     unsigned int estimate)
02027 {
02028     double x;
02029 #if DEBUG
02030     fprintf (stderr, "calibrate_estimate_gradient_random: start\n");
02031 #endif
02032     x = calibrate->gradient[variable]
02033         + (1. - 2. * gsl_rng_uniform (calibrate->rng)) * calibrate->step[variable];
02034 #if DEBUG
02035     fprintf (stderr, "calibrate_estimate_gradient_random: gradient%u=%lg\n",
02036             variable, x);
02037     fprintf (stderr, "calibrate_estimate_gradient_random: end\n");
02038 #endif
02039     return x;
02040 }
02041
02051 double
02052 calibrate_estimate_gradient_coordinates (unsigned int variable,
02053                                         unsigned int estimate)
02054 {
02055     double x;
02056 #if DEBUG
02057     fprintf (stderr, "calibrate_estimate_gradient_coordinates: start\n");
02058 #endif
02059     x = calibrate->gradient[variable];
02060     if (estimate >= (2 * variable) && estimate < (2 * variable + 2))
02061     {
02062         if (estimate & 1)
02063             x += calibrate->step[variable];
02064         else
02065             x -= calibrate->step[variable];
02066     }
02067 #if DEBUG
02068     fprintf (stderr, "calibrate_estimate_gradient_coordinates: gradient%u=%lg\n",
02069             variable, x);
02070     fprintf (stderr, "calibrate_estimate_gradient_coordinates: end\n");
02071 #endif
02072     return x;
02073 }
02074
02081 void
02082 calibrate_step_gradient (unsigned int simulation)
02083 {
02084     GThread *thread[nthreads_gradient];
02085     ParallelData data[nthreads_gradient];
02086     unsigned int i, j, k, b;
02087 #if DEBUG
02088     fprintf (stderr, "calibrate_step_gradient: start\n");
02089 #endif
02090     for (i = 0; i < calibrate->nestimates; ++i)
02091     {
02092         k = (simulation + i) * calibrate->nvariables;
02093         b = calibrate->simulation_best[0] * calibrate->nvariables;
02094 #if DEBUG
02095         fprintf (stderr, "calibrate_step_gradient: simulation=%u best=%u\n",
02096                 simulation + i, calibrate->simulation_best[0]);

```

```

02097 #endif
02098     for (j = 0; j < calibrate->nvariables; ++j, ++k, ++b)
02099     {
02100     #if DEBUG
02101         fprintf (stderr,
02102             "calibrate_step_gradient: estimate=%u best%u=%.14le\n",
02103             i, j, calibrate->value[b]);
02104     #endif
02105         calibrate->value[k]
02106             = calibrate->value[b] + calibrate_estimate_gradient (j, i);
02107         calibrate->value[k] = fmin (fmax (calibrate->value[k],
02108             calibrate->rangeminabs[j]),
02109             calibrate->rangemaxabs[j]);
02110     #if DEBUG
02111         fprintf (stderr,
02112             "calibrate_step_gradient: estimate=%u variable%u=%.14le\n",
02113             i, j, calibrate->value[k]);
02114     #endif
02115     }
02116     }
02117     if (nthreads_gradient == 1)
02118         calibrate_gradient_sequential (simulation);
02119     else
02120     {
02121         for (i = 0; i <= nthreads_gradient; ++i)
02122         {
02123             calibrate->thread_gradient[i]
02124                 = simulation + calibrate->nstart_gradient
02125                 + i * (calibrate->nend_gradient - calibrate->
02126                     nstart_gradient)
02127                 / nthreads_gradient;
02128     #if DEBUG
02129         fprintf (stderr,
02130             "calibrate_step_gradient: i=%u thread_gradient=%u\n",
02131             i, calibrate->thread_gradient[i]);
02132     #endif
02133         for (i = 0; i < nthreads_gradient; ++i)
02134         {
02135             data[i].thread = i;
02136             thread[i] = g_thread_new
02137                 (NULL, (void *) calibrate_gradient_thread, &data[i]);
02138         }
02139         for (i = 0; i < nthreads_gradient; ++i)
02140             g_thread_join (thread[i]);
02141     }
02142     #if DEBUG
02143     fprintf (stderr, "calibrate_step_gradient: end\n");
02144     #endif
02145     }
02146
02151 void
02152 calibrate_gradient ()
02153 {
02154     unsigned int i, j, k, b, s, adjust;
02155     #if DEBUG
02156     fprintf (stderr, "calibrate_gradient: start\n");
02157     #endif
02158     for (i = 0; i < calibrate->nvariables; ++i)
02159         calibrate->gradient[i] = 0.;
02160     b = calibrate->simulation_best[0] * calibrate->nvariables;
02161     s = calibrate->nsimulations;
02162     adjust = 1;
02163     for (i = 0; i < calibrate->nsteps; ++i, s += calibrate->nestimates, b = k)
02164     {
02165     #if DEBUG
02166         fprintf (stderr, "calibrate_gradient: step=%u old_best=%u\n",
02167             i, calibrate->simulation_best[0]);
02168     #endif
02169         calibrate_step_gradient (s);
02170         k = calibrate->simulation_best[0] * calibrate->nvariables;
02171     #if DEBUG
02172         fprintf (stderr, "calibrate_gradient: step=%u best=%u\n",
02173             i, calibrate->simulation_best[0]);
02174     #endif
02175         if (k == b)
02176         {
02177             if (adjust)
02178                 for (j = 0; j < calibrate->nvariables; ++j)
02179                     calibrate->step[j] *= 0.5;
02180             for (j = 0; j < calibrate->nvariables; ++j)
02181                 calibrate->gradient[j] = 0.;
02182             adjust = 1;
02183         }
02184         else
02185         {
02186             for (j = 0; j < calibrate->nvariables; ++j)

```

```

02187     {
02188     #if DEBUG
02189         fprintf (stderr,
02190             "calibrate_gradient: best%u=%.14le old%u=%.14le\n",
02191             j, calibrate->value[k + j], j, calibrate->value[b + j]);
02192     #endif
02193         calibrate->gradient[j]
02194             = (1. - calibrate->relaxation) * calibrate->gradient[j]
02195             + calibrate->relaxation
02196             * (calibrate->value[k + j] - calibrate->value[b + j]);
02197     #if DEBUG
02198         fprintf (stderr, "calibrate_gradient: gradient%u=%.14le\n",
02199             j, calibrate->gradient[j]);
02200     #endif
02201     }
02202     adjust = 0;
02203 }
02204 }
02205 #if DEBUG
02206     fprintf (stderr, "calibrate_gradient: end\n");
02207 #endif
02208 }
02209
02210 double
02211 calibrate_genetic_objective (Entity * entity)
02212 {
02213     unsigned int j;
02214     double objective;
02215     char buffer[64];
02216     #if DEBUG
02217         fprintf (stderr, "calibrate_genetic_objective: start\n");
02218     #endif
02219     for (j = 0; j < calibrate->nvariables; ++j)
02220     {
02221         calibrate->value[entity->id * calibrate->nvariables + j]
02222             = genetic_get_variable (entity, calibrate->genetic_variable + j);
02223     }
02224     objective = calibrate_norm (entity->id);
02225     g_mutex_lock (mutex);
02226     for (j = 0; j < calibrate->nvariables; ++j)
02227     {
02228         snprintf (buffer, 64, "%s ", format[calibrate->precision[j]]);
02229         fprintf (calibrate->file_variables, buffer,
02230             genetic_get_variable (entity, calibrate->genetic_variable + j));
02231     }
02232     fprintf (calibrate->file_variables, "%.14le\n", objective);
02233     g_mutex_unlock (mutex);
02234     #if DEBUG
02235         fprintf (stderr, "calibrate_genetic_objective: end\n");
02236     #endif
02237     return objective;
02238 }
02239
02240 void
02241 calibrate_genetic ()
02242 {
02243     char *best_genome;
02244     double best_objective, *best_variable;
02245     #if DEBUG
02246         fprintf (stderr, "calibrate_genetic: start\n");
02247         fprintf (stderr, "calibrate_genetic: ntasks=%u nthreads=%u\n", ntasks,
02248             nthreads);
02249         fprintf (stderr,
02250             "calibrate_genetic: nvariables=%u population=%u generations=%u\n",
02251             calibrate->nvariables, calibrate->nsimulations,
02252             calibrate->niterations);
02253         fprintf (stderr,
02254             "calibrate_genetic: mutation=%lg reproduction=%lg adaptation=%lg\n",
02255             calibrate->mutation_ratio, calibrate->
02256             reproduction_ratio,
02257             calibrate->adaptation_ratio);
02258     #endif
02259     genetic_algorithm_default (calibrate->nvariables,
02260         calibrate->genetic_variable,
02261         calibrate->nsimulations,
02262         calibrate->niterations,
02263         calibrate->mutation_ratio,
02264         calibrate->reproduction_ratio,
02265         calibrate->adaptation_ratio,
02266         &calibrate_genetic_objective,
02267         &best_genome, &best_variable, &best_objective);
02268     #if DEBUG
02269         fprintf (stderr, "calibrate_genetic: the best\n");
02270     #endif
02271     calibrate->error_old = (double *) g_malloc (sizeof (double));
02272     calibrate->value_old
02273         = (double *) g_malloc (calibrate->nvariables * sizeof (double));

```



```

02284     calibrate->error_old[0] = best_objective;
02285     memcpy (calibrate->value_old, best_variable,
02286             calibrate->nvariables * sizeof (double));
02287     g_free (best_genome);
02288     g_free (best_variable);
02289     calibrate_print ();
02290 #if DEBUG
02291     fprintf (stderr, "calibrate_genetic: end\n");
02292 #endif
02293 }
02294
02295 void
02300 calibrate_save_old ()
02301 {
02302     unsigned int i, j;
02303 #if DEBUG
02304     fprintf (stderr, "calibrate_save_old: start\n");
02305     fprintf (stderr, "calibrate_save_old: nsaveds=%u\n", calibrate->nsaveds);
02306 #endif
02307     memcpy (calibrate->error_old, calibrate->error_best,
02308             calibrate->nbest * sizeof (double));
02309     for (i = 0; i < calibrate->nbest; ++i)
02310     {
02311         j = calibrate->simulation_best[i];
02312 #if DEBUG
02313         fprintf (stderr, "calibrate_save_old: i=%u j=%u\n", i, j);
02314 #endif
02315         memcpy (calibrate->value_old + i * calibrate->nvariables,
02316                 calibrate->value + j * calibrate->nvariables,
02317                 calibrate->nvariables * sizeof (double));
02318     }
02319 #if DEBUG
02320     for (i = 0; i < calibrate->nvariables; ++i)
02321         fprintf (stderr, "calibrate_save_old: best variable %u=%lg\n",
02322                 i, calibrate->value_old[i]);
02323     fprintf (stderr, "calibrate_save_old: end\n");
02324 #endif
02325 }
02326
02327 void
02333 calibrate_merge_old ()
02334 {
02335     unsigned int i, j, k;
02336     double v[calibrate->nbest * calibrate->nvariables], e[calibrate->
02337         nbest],
02338         *enew, *eold;
02339 #if DEBUG
02340     fprintf (stderr, "calibrate_merge_old: start\n");
02341 #endif
02342     enew = calibrate->error_best;
02343     eold = calibrate->error_old;
02344     i = j = k = 0;
02345     do
02346     {
02347         if (*enew < *eold)
02348         {
02349             memcpy (v + k * calibrate->nvariables,
02350                     calibrate->value
02351                     + calibrate->simulation_best[i] * calibrate->
02352                     nvariables,
02353                     calibrate->nvariables * sizeof (double));
02354             e[k] = *enew;
02355             ++k;
02356             ++enew;
02357             ++i;
02358         }
02359         else
02360         {
02361             memcpy (v + k * calibrate->nvariables,
02362                     calibrate->value_old + j * calibrate->nvariables,
02363                     calibrate->nvariables * sizeof (double));
02364             e[k] = *eold;
02365             ++k;
02366             ++eold;
02367             ++j;
02368         }
02369     } while (k < calibrate->nbest);
02370     memcpy (calibrate->value_old, v, k * calibrate->nvariables * sizeof (double));
02371     memcpy (calibrate->error_old, e, k * sizeof (double));
02372 #if DEBUG
02373     fprintf (stderr, "calibrate_merge_old: end\n");
02374 #endif
02375 }
02376
02377 void
02382 calibrate_refine ()

```

```

02383 {
02384     unsigned int i, j;
02385     double d;
02386     #if HAVE_MPI
02387     MPI_Status mpi_stat;
02388     #endif
02389     #if DEBUG
02390     fprintf (stderr, "calibrate_refine: start\n");
02391     #endif
02392     #if HAVE_MPI
02393     if (!calibrate->mpi_rank)
02394     {
02395     #endif
02396         for (j = 0; j < calibrate->nvariables; ++j)
02397         {
02398             calibrate->rangemin[j] = calibrate->rangemax[j]
02399             = calibrate->value_old[j];
02400         }
02401         for (i = 0; ++i < calibrate->nbest;)
02402         {
02403             for (j = 0; j < calibrate->nvariables; ++j)
02404             {
02405                 calibrate->rangemin[j]
02406                 = fmin (calibrate->rangemin[j],
02407                     calibrate->value_old[i * calibrate->nvariables + j]);
02408                 calibrate->rangemax[j]
02409                 = fmax (calibrate->rangemax[j],
02410                     calibrate->value_old[i * calibrate->nvariables + j]);
02411             }
02412         }
02413         for (j = 0; j < calibrate->nvariables; ++j)
02414         {
02415             d = calibrate->tolerance
02416             * (calibrate->rangemax[j] - calibrate->rangemin[j]);
02417             switch (calibrate->algorithm)
02418             {
02419             case ALGORITHM_MONTE_CARLO:
02420                 d *= 0.5;
02421                 break;
02422             default:
02423                 if (calibrate->nsweeps[j] > 1)
02424                     d /= calibrate->nsweeps[j] - 1;
02425                 else
02426                     d = 0.;
02427             }
02428             calibrate->rangemin[j] -= d;
02429             calibrate->rangemin[j]
02430             = fmax (calibrate->rangemin[j], calibrate->rangeminabs[j]);
02431             calibrate->rangemax[j] += d;
02432             calibrate->rangemax[j]
02433             = fmin (calibrate->rangemax[j], calibrate->rangemaxabs[j]);
02434             printf ("%s min=%lg max=%lg\n", calibrate->label[j],
02435                 calibrate->rangemin[j], calibrate->rangemax[j]);
02436             fprintf (calibrate->file_result, "%s min=%lg max=%lg\n",
02437                 calibrate->label[j], calibrate->rangemin[j],
02438                 calibrate->rangemax[j]);
02439         }
02440     #if HAVE_MPI
02441         for (i = 1; i < ntasks; ++i)
02442         {
02443             MPI_Send (calibrate->rangemin, calibrate->nvariables, MPI_DOUBLE, i,
02444                 1, MPI_COMM_WORLD);
02445             MPI_Send (calibrate->rangemax, calibrate->nvariables, MPI_DOUBLE, i,
02446                 1, MPI_COMM_WORLD);
02447         }
02448     }
02449     else
02450     {
02451         MPI_Recv (calibrate->rangemin, calibrate->nvariables, MPI_DOUBLE, 0, 1,
02452             MPI_COMM_WORLD, &mpi_stat);
02453         MPI_Recv (calibrate->rangemax, calibrate->nvariables, MPI_DOUBLE, 0, 1,
02454             MPI_COMM_WORLD, &mpi_stat);
02455     }
02456     #endif
02457     #if DEBUG
02458     fprintf (stderr, "calibrate_refine: end\n");
02459     #endif
02460 }
02461
02462 void
02463 calibrate_step ()
02464 {
02465     #if DEBUG
02466     fprintf (stderr, "calibrate_step: start\n");
02467     #endif
02468     calibrate_algorithm ();
02469     if (calibrate->nsteps)

```

```

02474     calibrate_gradient ();
02475 #if DEBUG
02476     fprintf (stderr, "calibrate_step: end\n");
02477 #endif
02478 }
02479
02484 void
02485 calibrate_iterate ()
02486 {
02487     unsigned int i;
02488 #if DEBUG
02489     fprintf (stderr, "calibrate_iterate: start\n");
02490 #endif
02491     calibrate->error_old
02492     = (double *) g_malloc (calibrate->nbest * sizeof (double));
02493     calibrate->value_old = (double *)
02494     g_malloc (calibrate->nbest * calibrate->nvariables * sizeof (double));
02495     calibrate_step ();
02496     calibrate_save_old ();
02497     calibrate_refine ();
02498     calibrate_print ();
02499     for (i = 1; i < calibrate->niterations; ++i)
02500     {
02501         calibrate_step ();
02502         calibrate_merge_old ();
02503         calibrate_refine ();
02504         calibrate_print ();
02505     }
02506 #if DEBUG
02507     fprintf (stderr, "calibrate_iterate: end\n");
02508 #endif
02509 }
02510
02515 void
02516 calibrate_free ()
02517 {
02518     unsigned int i, j;
02519 #if DEBUG
02520     fprintf (stderr, "calibrate_free: start\n");
02521 #endif
02522     for (j = 0; j < calibrate->ninputs; ++j)
02523     {
02524         for (i = 0; i < calibrate->nexperiments; ++i)
02525             g_mapped_file_unref (calibrate->file[j][i]);
02526         g_free (calibrate->file[j]);
02527     }
02528     g_free (calibrate->error_old);
02529     g_free (calibrate->value_old);
02530     g_free (calibrate->value);
02531     g_free (calibrate->genetic_variable);
02532     g_free (calibrate->rangemax);
02533     g_free (calibrate->rangemin);
02534 #if DEBUG
02535     fprintf (stderr, "calibrate_free: end\n");
02536 #endif
02537 }
02538
02543 void
02544 calibrate_open ()
02545 {
02546     GTimeZone *tz;
02547     GDateTime *t0, *t;
02548     unsigned int i, j, *nbits;
02549
02550 #if DEBUG
02551     char *buffer;
02552     fprintf (stderr, "calibrate_open: start\n");
02553 #endif
02554
02555     // Getting initial time
02556 #if DEBUG
02557     fprintf (stderr, "calibrate_open: getting initial time\n");
02558 #endif
02559     tz = g_time_zone_new_utc ();
02560     t0 = g_date_time_new_now (tz);
02561
02562     // Obtaining and initing the pseudo-random numbers generator seed
02563 #if DEBUG
02564     fprintf (stderr, "calibrate_open: getting initial seed\n");
02565 #endif
02566     calibrate->seed = input->seed;
02567     gsl_rng_set (calibrate->rng, calibrate->seed);
02568
02569     // Replacing the working directory
02570 #if DEBUG
02571     fprintf (stderr, "calibrate_open: replacing the working directory\n");
02572 #endif

```

```

02573 g_chdir (input->directory);
02574
02575 // Getting results file names
02576 calibrate->result = input->result;
02577 calibrate->variables = input->variables;
02578
02579 // Obtaining the simulator file
02580 calibrate->simulator = input->simulator;
02581
02582 // Obtaining the evaluator file
02583 calibrate->evaluator = input->evaluator;
02584
02585 // Reading the algorithm
02586 calibrate->algorithm = input->algorithm;
02587 switch (calibrate->algorithm)
02588 {
02589     case ALGORITHM_MONTE_CARLO:
02590         calibrate_algorithm = calibrate_MonteCarlo;
02591         break;
02592     case ALGORITHM_SWEEP:
02593         calibrate_algorithm = calibrate_sweep;
02594         break;
02595     default:
02596         calibrate_algorithm = calibrate_genetic;
02597         calibrate->mutation_ratio = input->mutation_ratio;
02598         calibrate->reproduction_ratio = input->
reproduction_ratio;
02599         calibrate->adaptation_ratio = input->adaptation_ratio;
02600     }
02601     calibrate->nvariables = input->nvariables;
02602     calibrate->nsimulations = input->nsimulations;
02603     calibrate->niterations = input->niterations;
02604     calibrate->nbest = input->nbest;
02605     calibrate->tolerance = input->tolerance;
02606     calibrate->nsteps = input->nsteps;
02607     calibrate->nestimates = 0;
02608     if (input->nsteps)
02609     {
02610         calibrate->gradient_method = input->gradient_method;
02611         calibrate->relaxation = input->relaxation;
02612         switch (input->gradient_method)
02613         {
02614             case GRADIENT_METHOD_COORDINATES:
02615                 calibrate->nestimates = 2 * calibrate->nvariables;
02616                 calibrate_estimate_gradient =
calibrate_estimate_gradient_coordinates;
02617                 break;
02618             default:
02619                 calibrate->nestimates = input->nestimates;
02620                 calibrate_estimate_gradient =
calibrate_estimate_gradient_random;
02621         }
02622     }
02623
02624 #if DEBUG
02625 fprintf (stderr, "calibrate_open: nbest=%u\n", calibrate->nbest);
02626 #endif
02627 calibrate->simulation_best
02628     = (unsigned int *) alloca (calibrate->nbest * sizeof (unsigned int));
02629 calibrate->error_best
02630     = (double *) alloca (calibrate->nbest * sizeof (double));
02631
02632 // Reading the experimental data
02633 #if DEBUG
02634 buffer = g_get_current_dir ();
02635 fprintf (stderr, "calibrate_open: current directory=%s\n", buffer);
02636 g_free (buffer);
02637 #endif
02638 calibrate->nexperiments = input->nexperiments;
02639 calibrate->ninputs = input->ninputs;
02640 calibrate->experiment = input->experiment;
02641 calibrate->weight = input->weight;
02642 for (i = 0; i < input->ninputs; ++i)
02643 {
02644     calibrate->template[i] = input->template[i];
02645     calibrate->file[i]
02646         = g_malloc (input->nexperiments * sizeof (GMappedFile *));
02647 }
02648 for (i = 0; i < input->nexperiments; ++i)
02649 {
02650 #if DEBUG
02651     fprintf (stderr, "calibrate_open: i=%u\n", i);
02652     fprintf (stderr, "calibrate_open: experiment=%s\n",
calibrate->experiment[i]);
02653     fprintf (stderr, "calibrate_open: weight=%lg\n", calibrate->weight[i]);
02654 #endif
02655     for (j = 0; j < input->ninputs; ++j)

```

```

02657     {
02658     #if DEBUG
02659         fprintf (stderr, "calibrate_open: template%u\n", j + 1);
02660         fprintf (stderr, "calibrate_open: experiment=%u template%u=%s\n",
02661             i, j + 1, calibrate->template[j][i]);
02662     #endif
02663         calibrate->file[j][i]
02664             = g_mapped_file_new (input->template[j][i], 0, NULL);
02665     }
02666     }
02667
02668     // Reading the variables data
02669     #if DEBUG
02670     fprintf (stderr, "calibrate_open: reading variables\n");
02671     #endif
02672     calibrate->label = input->label;
02673     j = input->nvariables * sizeof (double);
02674     calibrate->rangemin = (double *) g_malloc (j);
02675     calibrate->rangemax = (double *) g_malloc (j);
02676     memcpy (calibrate->rangemin, input->rangemin, j);
02677     memcpy (calibrate->rangemax, input->rangemax, j);
02678     calibrate->rangeminabs = input->rangeminabs;
02679     calibrate->rangemaxabs = input->rangemaxabs;
02680     calibrate->precision = input->precision;
02681     calibrate->nsweeps = input->nsweeps;
02682     calibrate->step = input->step;
02683     nbits = input->nbits;
02684     if (input->algorithm == ALGORITHM_SWEEP)
02685     {
02686         calibrate->nsimulations = 1;
02687         for (i = 0; i < input->nvariables; ++i)
02688         {
02689             if (input->algorithm == ALGORITHM_SWEEP)
02690             {
02691                 calibrate->nsimulations *= input->nsweeps[i];
02692             }
02693             #if DEBUG
02694             fprintf (stderr, "calibrate_open: nsweeps=%u nsimulations=%u\n",
02695                 calibrate->nsweeps[i], calibrate->nsimulations);
02696             #endif
02697         }
02698     }
02699     if (calibrate->nsteps)
02700     {
02701         calibrate->gradient
02702             = (double *) alloca (calibrate->nvariables * sizeof (double));
02703     }
02704     // Setting error norm
02705     switch (input->norm)
02706     {
02707     case ERROR_NORM_EUCLIDIAN:
02708         calibrate_norm = calibrate_norm_euclidian;
02709         break;
02710     case ERROR_NORM_MAXIMUM:
02711         calibrate_norm = calibrate_norm_maximum;
02712         break;
02713     case ERROR_NORM_P:
02714         calibrate_norm = calibrate_norm_p;
02715         calibrate->p = input->p;
02716         break;
02717     default:
02718         calibrate_norm = calibrate_norm_taxicab;
02719     }
02720     // Allocating values
02721     #if DEBUG
02722     fprintf (stderr, "calibrate_open: allocating variables\n");
02723     fprintf (stderr, "calibrate_open: nvariables=%u\n", calibrate->nvariables);
02724     #endif
02725     calibrate->genetic_variable = NULL;
02726     if (calibrate->algorithm == ALGORITHM_GENETIC)
02727     {
02728         calibrate->genetic_variable = (GeneticVariable *)
02729             g_malloc (calibrate->nvariables * sizeof (GeneticVariable));
02730         for (i = 0; i < calibrate->nvariables; ++i)
02731         {
02732             #if DEBUG
02733             fprintf (stderr, "calibrate_open: i=%u min=%lg max=%lg nbits=%u\n",
02734                 i, calibrate->rangemin[i], calibrate->rangemax[i], nbits[i]);
02735             #endif
02736             calibrate->genetic_variable[i].minimum = calibrate->
02737                 rangemin[i];
02738             calibrate->genetic_variable[i].maximum = calibrate->
02739                 rangemax[i];
02740             calibrate->genetic_variable[i].nbits = nbits[i];
02741         }
02742     }
02743     #if DEBUG

```

```

02742     fprintf (stderr, "calibrate_open: nvariables=%u nsimulations=%u\n",
02743             calibrate->nvariables, calibrate->nsimulations);
02744 #endif
02745     calibrate->value = (double *)
02746         g_malloc ((calibrate->nsimulations
02747                 + calibrate->nestimates * calibrate->nsteps)
02748                 * calibrate->nvariables * sizeof (double));
02749
02750     // Calculating simulations to perform for each task
02751 #if HAVE_MPI
02752 #if DEBUG
02753     fprintf (stderr, "calibrate_open: rank=%u ntasks=%u\n",
02754             calibrate->mpi_rank, ntasks);
02755 #endif
02756     calibrate->nstart = calibrate->mpi_rank * calibrate->
02757         nsimulations / ntasks;
02758     calibrate->nend
02759         = (1 + calibrate->mpi_rank) * calibrate->nsimulations /
02760         ntasks;
02761     if (calibrate->nsteps)
02762     {
02763         calibrate->nstart_gradient
02764             = calibrate->mpi_rank * calibrate->nestimates / ntasks;
02765         calibrate->nend_gradient
02766             = (1 + calibrate->mpi_rank) * calibrate->nestimates /
02767             ntasks;
02768     }
02769 #else
02770     calibrate->nstart = 0;
02771     calibrate->nend = calibrate->nsimulations;
02772     if (calibrate->nsteps)
02773     {
02774         calibrate->nstart_gradient = 0;
02775         calibrate->nend_gradient = calibrate->nestimates;
02776     }
02777 #endif
02778 #if DEBUG
02779     fprintf (stderr, "calibrate_open: nstart=%u nend=%u\n", calibrate->nstart,
02780             calibrate->nend);
02781 #endif
02782
02783     // Calculating simulations to perform for each thread
02784     calibrate->thread
02785         = (unsigned int *) alloca ((1 + nthreads) * sizeof (unsigned int));
02786     for (i = 0; i <= nthreads; ++i)
02787     {
02788         calibrate->thread[i] = calibrate->nstart
02789             + i * (calibrate->nend - calibrate->nstart) / nthreads;
02790 #if DEBUG
02791         fprintf (stderr, "calibrate_open: i=%u thread=%u\n", i,
02792                 calibrate->thread[i]);
02793 #endif
02794     }
02795     if (calibrate->nsteps)
02796     {
02797         calibrate->thread_gradient = (unsigned int *)
02798             alloca ((1 + nthreads_gradient) * sizeof (unsigned int));
02799     }
02800     // Opening result files
02801     calibrate->file_result = g_fopen (calibrate->result, "w");
02802     calibrate->file_variables = g_fopen (calibrate->variables, "w");
02803
02804     // Performing the algorithm
02805     switch (calibrate->algorithm)
02806     {
02807         // Genetic algorithm
02808         case ALGORITHM_GENETIC:
02809             calibrate_genetic ();
02810             break;
02811         // Iterative algorithm
02812         default:
02813             calibrate_iterate ();
02814     }
02815
02816     // Getting calculation time
02817     t = g_date_time_new_now (tz);
02818     calibrate->calculation_time = 0.000001 * g_date_time_difference (t, t0);
02819     g_date_time_unref (t);
02820     g_date_time_unref (t0);
02821     g_time_zone_unref (tz);
02822     printf ("%s = %.6lg s\n",
02823             gettext ("Calculation time"), calibrate->calculation_time);
02824     fprintf (calibrate->file_result, "%s = %.6lg s\n",
02825             gettext ("Calculation time"), calibrate->calculation_time);
02826
02827     // Closing result files
02828     fclose (calibrate->file_variables);

```

```

02826     fclose (calibrate->file_result);
02827
02828     #if DEBUG
02829     fprintf (stderr, "calibrate_open: end\n");
02830     #endif
02831 }
02832
02833 #if HAVE_GTK
02834
02841 void
02842 input_save_gradient (xmlNode * node)
02843 {
02844     #if DEBUG
02845     fprintf (stderr, "input_save_gradient: start\n");
02846     #endif
02847     if (input->nsteps)
02848     {
02849         xml_node_set_uint (node, XML_NSTEPS, input->
nsteps);
02850         if (input->relaxation != DEFAULT_RELAXATION)
02851             xml_node_set_float (node, XML_RELAXATION, input->
relaxation);
02852         switch (input->gradient_method)
02853         {
02854             case GRADIENT_METHOD_COORDINATES:
02855                 xmlSetProp (node, XML_GRADIENT_METHOD,
XML_COORDINATES);
02856                 break;
02857             default:
02858                 xmlSetProp (node, XML_GRADIENT_METHOD, XML_RANDOM);
02859                 xml_node_set_uint (node, XML_NESTIMATES, input->
nestimates);
02860             }
02861         }
02862     #if DEBUG
02863     fprintf (stderr, "input_save_gradient: end\n");
02864     #endif
02865 }
02866
02873 void
02874 input_save (char *filename)
02875 {
02876     unsigned int i, j;
02877     char *buffer;
02878     xmlDoc *doc;
02879     xmlNode *node, *child;
02880     GFile *file, *file2;
02881
02882     #if DEBUG
02883     fprintf (stderr, "input_save: start\n");
02884     #endif
02885
02886     // Getting the input file directory
02887     input->name = g_path_get_basename (filename);
02888     input->directory = g_path_get_dirname (filename);
02889     file = g_file_new_for_path (input->directory);
02890
02891     // Opening the input file
02892     doc = xmlNewDoc ((const xmlChar *) "1.0");
02893
02894     // Setting root XML node
02895     node = xmlNewDocNode (doc, 0, XML_CALIBRATE, 0);
02896     xmlDocSetRootElement (doc, node);
02897
02898     // Adding properties to the root XML node
02899     if (xmlStrcmp ((const xmlChar *) input->result, result_name))
02900         xmlSetProp (node, XML_RESULT, (xmlChar *) input->result);
02901     if (xmlStrcmp ((const xmlChar *) input->variables, variables_name))
02902         xmlSetProp (node, XML_VARIABLES, (xmlChar *) input->variables);
02903     file2 = g_file_new_for_path (input->simulator);
02904     buffer = g_file_get_relative_path (file, file2);
02905     g_object_unref (file2);
02906     xmlSetProp (node, XML_SIMULATOR, (xmlChar *) buffer);
02907     g_free (buffer);
02908     if (input->evaluator)
02909     {
02910         file2 = g_file_new_for_path (input->evaluator);
02911         buffer = g_file_get_relative_path (file, file2);
02912         g_object_unref (file2);
02913         if (xmlStrlen ((xmlChar *) buffer))
02914             xmlSetProp (node, XML_EVALUATOR, (xmlChar *) buffer);
02915         g_free (buffer);
02916     }
02917     if (input->seed != DEFAULT_RANDOM_SEED)
02918         xml_node_set_uint (node, XML_SEED, input->seed);
02919
02920     // Setting the algorithm

```

```

02921     buffer = (char *) g_malloc (64);
02922     switch (input->algorithm)
02923     {
02924         case ALGORITHM_MONTE_CARLO:
02925             xmlSetProp (node, XML_ALGORITHM, XML_MONTE_CARLO);
02926             snprintf (buffer, 64, "%u", input->nsimulations);
02927             xmlSetProp (node, XML_NSIMULATIONS, (xmlChar *) buffer);
02928             snprintf (buffer, 64, "%u", input->niterations);
02929             xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02930             snprintf (buffer, 64, "%.3lg", input->tolerance);
02931             xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02932             snprintf (buffer, 64, "%u", input->nbest);
02933             xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02934             input_save_gradient (node);
02935             break;
02936         case ALGORITHM_SWEEP:
02937             xmlSetProp (node, XML_ALGORITHM, XML_SWEEP);
02938             snprintf (buffer, 64, "%u", input->niterations);
02939             xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02940             snprintf (buffer, 64, "%.3lg", input->tolerance);
02941             xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02942             snprintf (buffer, 64, "%u", input->nbest);
02943             xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02944             input_save_gradient (node);
02945             break;
02946         default:
02947             xmlSetProp (node, XML_ALGORITHM, XML_GENETIC);
02948             snprintf (buffer, 64, "%u", input->nsimulations);
02949             xmlSetProp (node, XML_NPOPULATION, (xmlChar *) buffer);
02950             snprintf (buffer, 64, "%u", input->niterations);
02951             xmlSetProp (node, XML_NGENERATIONS, (xmlChar *) buffer);
02952             snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
02953             xmlSetProp (node, XML_MUTATION, (xmlChar *) buffer);
02954             snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
02955             xmlSetProp (node, XML_REPRODUCTION, (xmlChar *) buffer);
02956             snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
02957             xmlSetProp (node, XML_ADAPTATION, (xmlChar *) buffer);
02958             break;
02959     }
02960     g_free (buffer);
02961
02962     // Setting the experimental data
02963     for (i = 0; i < input->nexperiments; ++i)
02964     {
02965         child = xmlNewChild (node, 0, XML_EXPERIMENT, 0);
02966         xmlSetProp (child, XML_NAME, (xmlChar *) input->experiment[i]);
02967         if (input->weight[i] != 1.)
02968             xml_node_set_float (child, XML_WEIGHT, input->
weight[i]);
02969         for (j = 0; j < input->ninputs; ++j)
02970             xmlSetProp (child, template[j], (xmlChar *) input->template[j][i]);
02971     }
02972
02973     // Setting the variables data
02974     for (i = 0; i < input->nvariables; ++i)
02975     {
02976         child = xmlNewChild (node, 0, XML_VARIABLE, 0);
02977         xmlSetProp (child, XML_NAME, (xmlChar *) input->label[i]);
02978         xml_node_set_float (child, XML_MINIMUM, input->
rangemin[i]);
02979         if (input->rangeminabs[i] != -G_MAXDOUBLE)
02980             xml_node_set_float (child, XML_ABSOLUTE_MINIMUM, input->
rangeminabs[i]);
02981         xml_node_set_float (child, XML_MAXIMUM, input->
rangemax[i]);
02982         if (input->rangemaxabs[i] != G_MAXDOUBLE)
02983             xml_node_set_float (child, XML_ABSOLUTE_MAXIMUM, input->
rangemaxabs[i]);
02984         if (input->precision[i] != DEFAULT_PRECISION)
02985             xml_node_set_uint (child, XML_PRECISION, input->
precision[i]);
02986         if (input->algorithm == ALGORITHM_SWEEP)
02987             xml_node_set_uint (child, XML_NSWEEPS, input->
nsweeps[i]);
02988         else if (input->algorithm == ALGORITHM_GENETIC)
02989             xml_node_set_uint (child, XML_NBITS, input->
nbits[i]);
02990         if (input->nsteps)
02991             xml_node_set_float (child, XML_STEP, input->
step[i]);
02992     }
02993
02994     // Saving the error norm
02995     switch (input->norm)
02996     {
02997         case ERROR_NORM_MAXIMUM:
02998             xmlSetProp (node, XML_NORM, XML_MAXIMUM);

```



```

02999         break;
03000     case ERROR_NORM_P:
03001         xmlSetProp (node, XML_NORM, XML_P);
03002         xml_node_set_float (node, XML_P, input->p);
03003         break;
03004     case ERROR_NORM_TAXICAB:
03005         xmlSetProp (node, XML_NORM, XML_TAXICAB);
03006     }
03007
03008     // Saving the XML file
03009     xmlSaveFormatFile (filename, doc, 1);
03010
03011     // Freeing memory
03012     xmlFreeDoc (doc);
03013
03014 #if DEBUG
03015     fprintf (stderr, "input_save: end\n");
03016 #endif
03017 }
03018
03023 void
03024 options_new ()
03025 {
03026     #if DEBUG
03027         fprintf (stderr, "options_new: start\n");
03028     #endif
03029     options->label_seed = (GtkLabel *)
03030         gtk_label_new (gettext ("Pseudo-random numbers generator seed"));
03031     options->spin_seed = (GtkSpinButton *)
03032         gtk_spin_button_new_with_range (0., (gdouble) G_MAXULONG, 1.);
03033     gtk_widget_set_tooltip_text
03034         (GTK_WIDGET (options->spin_seed),
03035          gettext ("Seed to init the pseudo-random numbers generator"));
03036     gtk_spin_button_set_value (options->spin_seed, (gdouble) input->seed);
03037     options->label_threads = (GtkLabel *)
03038         gtk_label_new (gettext ("Threads number for the stochastic algorithm"));
03039     options->spin_threads
03040         = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
03041     gtk_widget_set_tooltip_text
03042         (GTK_WIDGET (options->spin_threads),
03043          gettext ("Number of threads to perform the calibration/optimization for "
03044                  "the stochastic algorithm"));
03045     gtk_spin_button_set_value (options->spin_threads, (gdouble)
nthreads);
03046     options->label_gradient = (GtkLabel *)
03047         gtk_label_new (gettext ("Threads number for the gradient based method"));
03048     options->spin_gradient
03049         = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
03050     gtk_widget_set_tooltip_text
03051         (GTK_WIDGET (options->spin_gradient),
03052          gettext ("Number of threads to perform the calibration/optimization for "
03053                  "the gradient based method"));
03054     gtk_spin_button_set_value (options->spin_gradient,
03055                               (gdouble) nthreads_gradient);
03056     options->grid = (GtkGrid *) gtk_grid_new ();
03057     gtk_grid_attach (options->grid, GTK_WIDGET (options->label_seed), 0, 0, 1, 1);
03058     gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_seed), 1, 0, 1, 1);
03059     gtk_grid_attach (options->grid, GTK_WIDGET (options->label_threads),
03060                     0, 1, 1, 1);
03061     gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_threads),
03062                     1, 1, 1, 1);
03063     gtk_grid_attach (options->grid, GTK_WIDGET (options->label_gradient),
03064                     0, 2, 1, 1);
03065     gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_gradient),
03066                     1, 2, 1, 1);
03067     gtk_widget_show_all (GTK_WIDGET (options->grid));
03068     options->dialog = (GtkDialog *)
03069         gtk_dialog_new_with_buttons (gettext ("Options"),
03070                                     window->window,
03071                                     GTK_DIALOG_MODAL,
03072                                     gettext ("OK"), GTK_RESPONSE_OK,
03073                                     gettext ("Cancel"), GTK_RESPONSE_CANCEL,
03074                                     NULL);
03075     gtk_container_add
03076         (GTK_CONTAINER (gtk_dialog_get_content_area (options->dialog)),
03077          GTK_WIDGET (options->grid));
03078     if (gtk_dialog_run (options->dialog) == GTK_RESPONSE_OK)
03079     {
03080         input->seed
03081             = (unsigned long int) gtk_spin_button_get_value (options->spin_seed);
03082         nthreads = gtk_spin_button_get_value_as_int (options->spin_threads);
03083         nthreads_gradient
03084             = gtk_spin_button_get_value_as_int (options->spin_gradient);
03085     }
03086     gtk_widget_destroy (GTK_WIDGET (options->dialog));
03087 #if DEBUG
03088     fprintf (stderr, "options_new: end\n");

```

```

03089 #endif
03090 }
03091
03096 void
03097 running_new ()
03098 {
03099     #if DEBUG
03100         fprintf (stderr, "running_new: start\n");
03101     #endif
03102     running->label = (GtkLabel *) gtk_label_new (gettext ("Calculating ..."));
03103     running->dialog = (GtkDialog *)
03104         gtk_dialog_new_with_buttons (gettext ("Calculating"),
03105                                     window->window, GTK_DIALOG_MODAL, NULL, NULL);
03106     gtk_container_add
03107         (GTK_CONTAINER (gtk_dialog_get_content_area (running->dialog)),
03108          GTK_WIDGET (running->label));
03109     gtk_widget_show_all (GTK_WIDGET (running->dialog));
03110     #if DEBUG
03111         fprintf (stderr, "running_new: end\n");
03112     #endif
03113 }
03114
03120 unsigned int
03121 window_get_algorithm ()
03122 {
03123     unsigned int i;
03124     #if DEBUG
03125         fprintf (stderr, "window_get_algorithm: start\n");
03126     #endif
03127     i = gtk_array_get_active (window->button_algorithm,
03128                             NALGORITHMS);
03129     #if DEBUG
03130         fprintf (stderr, "window_get_algorithm: %u\n", i);
03131     #endif
03132     return i;
03133 }
03134
03140 unsigned int
03141 window_get_gradient ()
03142 {
03143     unsigned int i;
03144     #if DEBUG
03145         fprintf (stderr, "window_get_gradient: start\n");
03146     #endif
03147     i = gtk_array_get_active (window->button_gradient ,
03148                             NGRADIENTS);
03149     #if DEBUG
03150         fprintf (stderr, "window_get_gradient: %u\n", i);
03151     #endif
03152     return i;
03153 }
03154
03160 unsigned int
03161 window_get_norm ()
03162 {
03163     unsigned int i;
03164     #if DEBUG
03165         fprintf (stderr, "window_get_norm: start\n");
03166     #endif
03167     i = gtk_array_get_active (window->button_norm ,
03168                             NNORMS);
03169     #if DEBUG
03170         fprintf (stderr, "window_get_norm: %u\n", i);
03171     #endif
03172     return i;
03173 }
03174
03179 void
03180 window_save_gradient ()
03181 {
03182     #if DEBUG
03183         fprintf (stderr, "window_save_gradient: start\n");
03184     #endif
03185     if (gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (window->check_gradient)))
03186     {
03187         input->nsteps = gtk_spin_button_get_value_as_int (window->spin_steps);
03188         input->relaxation = gtk_spin_button_get_value (window->
03189 spin_relaxation);
03190         switch (window_get_gradient ())
03191         {
03192             case GRADIENT_METHOD_COORDINATES:
03193                 input->gradient_method = GRADIENT_METHOD_COORDINATES;
03194                 break;
03195             default:

```

```

03195         input->gradient_method = GRADIENT_METHOD_RANDOM;
03196         input->nestimates
03197             = gtk_spin_button_get_value_as_int (window->spin_estimates);
03198     }
03199 }
03200 else
03201     input->nsteps = 0;
03202 #if DEBUG
03203     fprintf (stderr, "window_save_gradient: end\n");
03204 #endif
03205 }
03206
03212 int
03213 window_save ()
03214 {
03215     GtkFileChooserDialog *dlg;
03216     GtkFileFilter *filter;
03217     char *buffer;
03218
03219 #if DEBUG
03220     fprintf (stderr, "window_save: start\n");
03221 #endif
03222
03223     // Opening the saving dialog
03224     dlg = (GtkFileChooserDialog *)
03225         gtk_file_chooser_dialog_new (gettext ("Save file"),
03226                                     window->window,
03227                                     GTK_FILE_CHOOSER_ACTION_SAVE,
03228                                     gettext ("Cancel"),
03229                                     GTK_RESPONSE_CANCEL,
03230                                     gettext ("OK"), GTK_RESPONSE_OK, NULL);
03231     gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
03232     buffer = g_build_filename (input->directory, input->name, NULL);
03233     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER (dlg), buffer);
03234     g_free (buffer);
03235
03236     // Adding XML filter
03237     filter = (GtkFileFilter *) gtk_file_filter_new ();
03238     gtk_file_filter_set_name (filter, "XML");
03239     gtk_file_filter_add_pattern (filter, "*.xml");
03240     gtk_file_filter_add_pattern (filter, "*.XML");
03241     gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter);
03242
03243     // If OK response then saving
03244     if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
03245     {
03246         // Adding properties to the root XML node
03247         input->simulator = gtk_file_chooser_get_filename
03248             (GTK_FILE_CHOOSER (window->button_simulator));
03249         if (gtk_toggle_button_get_active
03250             (GTK_TOGGLE_BUTTON (window->check_evaluator)))
03251             input->evaluator = gtk_file_chooser_get_filename
03252                 (GTK_FILE_CHOOSER (window->button_evaluator));
03253         else
03254             input->evaluator = NULL;
03255         input->result
03256             = (char *) xmlStrdup ((const xmlChar *)
03257                                   gtk_entry_get_text (window->entry_result));
03258         input->variables
03259             = (char *) xmlStrdup ((const xmlChar *)
03260                                   gtk_entry_get_text (window->entry_variables));
03261
03262         // Setting the algorithm
03263         switch (window_get_algorithm ())
03264         {
03265             case ALGORITHM_MONTE_CARLO:
03266                 input->algorithm = ALGORITHM_MONTE_CARLO;
03267                 input->nsimulations
03268                     = gtk_spin_button_get_value_as_int (window->spin_simulations);
03269                 input->niterations
03270                     = gtk_spin_button_get_value_as_int (window->spin_iterations);
03271                 input->tolerance = gtk_spin_button_get_value (window->
03272 spin_tolerance);
03273                 input->nbest = gtk_spin_button_get_value_as_int (window->
03274 spin_bests);
03275                 window_save_gradient ();
03276                 break;
03277             case ALGORITHM_SWEEP:
03278                 input->algorithm = ALGORITHM_SWEEP;
03279                 input->niterations
03280                     = gtk_spin_button_get_value_as_int (window->spin_iterations);
03281                 input->tolerance = gtk_spin_button_get_value (window->
03282 spin_tolerance);
03283                 input->nbest = gtk_spin_button_get_value_as_int (window->
03284 spin_bests);
03285                 window_save_gradient ();

```

```

03283         break;
03284     default:
03285         input->algorithm = ALGORITHM_GENETIC;
03286         input->nsimulations
03287             = gtk_spin_button_get_value_as_int (window->spin_population);
03288         input->niterations
03289             = gtk_spin_button_get_value_as_int (window->spin_generations);
03290         input->mutation_ratio
03291             = gtk_spin_button_get_value (window->spin_mutation);
03292         input->reproduction_ratio
03293             = gtk_spin_button_get_value (window->spin_reproduction);
03294         input->adaptation_ratio
03295             = gtk_spin_button_get_value (window->spin_adaptation);
03296         break;
03297     }
03298     input->norm = window_get_norm ();
03299     input->p = gtk_spin_button_get_value (window->spin_p);
03300
03301     // Saving the XML file
03302     buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
03303     input_save (buffer);
03304
03305     // Closing and freeing memory
03306     g_free (buffer);
03307     gtk_widget_destroy (GTK_WIDGET (dlg));
03308 #if DEBUG
03309     fprintf (stderr, "window_save: end\n");
03310 #endif
03311     return 1;
03312 }
03313
03314 // Closing and freeing memory
03315 gtk_widget_destroy (GTK_WIDGET (dlg));
03316 #if DEBUG
03317 fprintf (stderr, "window_save: end\n");
03318 #endif
03319 return 0;
03320 }
03321
03326 void
03327 window_run ()
03328 {
03329     unsigned int i;
03330     char *msg, *msg2, buffer[64], buffer2[64];
03331 #if DEBUG
03332     fprintf (stderr, "window_run: start\n");
03333 #endif
03334     if (!window_save ())
03335     {
03336 #if DEBUG
03337         fprintf (stderr, "window_run: end\n");
03338 #endif
03339         return;
03340     }
03341     running_new ();
03342     while (gtk_events_pending ())
03343         gtk_main_iteration ();
03344     calibrate_open ();
03345     gtk_widget_destroy (GTK_WIDGET (running->dialog));
03346     snprintf (buffer, 64, "error = %.15le\n", calibrate->error_old[0]);
03347     msg2 = g_strdup (buffer);
03348     for (i = 0; i < calibrate->nvariables; ++i, msg2 = msg)
03349     {
03350         snprintf (buffer, 64, "%s = %s\n",
03351                 calibrate->label[i], format[calibrate->precision[i]]);
03352         snprintf (buffer2, 64, buffer, calibrate->value_old[i]);
03353         msg = g_strconcat (msg2, buffer2, NULL);
03354         g_free (msg2);
03355     }
03356     snprintf (buffer, 64, "%s = %.6lg s", gettext ("Calculation time"),
03357             calibrate->calculation_time);
03358     msg = g_strconcat (msg2, buffer, NULL);
03359     g_free (msg2);
03360     show_message (gettext ("Best result"), msg, INFO_TYPE);
03361     g_free (msg);
03362     calibrate_free ();
03363 #if DEBUG
03364     fprintf (stderr, "window_run: end\n");
03365 #endif
03366 }
03367
03372 void
03373 window_help ()
03374 {
03375     char *buffer, *buffer2;
03376 #if DEBUG
03377     fprintf (stderr, "window_help: start\n");

```

```

03378 #endif
03379 buffer2 = g_build_filename (window->application_directory, "..", "manuals",
03380                             gettext ("user-manual.pdf"), NULL);
03381 buffer = g_filename_to_uri (buffer2, NULL, NULL);
03382 g_free (buffer2);
03383 gtk_show_uri (NULL, buffer, GDK_CURRENT_TIME, NULL);
03384 #if DEBUG
03385 fprintf (stderr, "window_help: uri=%s\n", buffer);
03386 #endif
03387 g_free (buffer);
03388 #if DEBUG
03389 fprintf (stderr, "window_help: end\n");
03390 #endif
03391 }
03392
03397 void
03398 window_about ()
03399 {
03400     static const gchar *authors[] = {
03401         "Javier Burguete Tolosa <jburguete@eead.csic.es>",
03402         "Borja Latorre Garcés <borja.latorre@csic.es>",
03403         NULL
03404     };
03405     #if DEBUG
03406     fprintf (stderr, "window_about: start\n");
03407     #endif
03408     gtk_show_about_dialog
03409     (window->window,
03410      "program_name", "MPCOTool",
03411      "comments",
03412      gettext ("A software to perform calibrations/optimizations of empirical "
03413              "parameters"),
03414      "authors", authors,
03415      "translator-credits", "Javier Burguete Tolosa <jburguete@eead.csic.es>",
03416      "version", "1.5.1",
03417      "copyright", "Copyright 2012-2016 Javier Burguete Tolosa",
03418      "logo", window->logo,
03419      "website", "https://github.com/jburguete/mpcotool",
03420      "license-type", GTK_LICENSE_BSD, NULL);
03421     #if DEBUG
03422     fprintf (stderr, "window_about: end\n");
03423     #endif
03424 }
03425
03431 void
03432 window_update_gradient ()
03433 {
03434     #if DEBUG
03435     fprintf (stderr, "window_update_gradient: start\n");
03436     #endif
03437     gtk_widget_show (GTK_WIDGET (window->check_gradient));
03438     if (gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (window->check_gradient)))
03439     {
03440         gtk_widget_show (GTK_WIDGET (window->grid_gradient));
03441         gtk_widget_show (GTK_WIDGET (window->label_step));
03442         gtk_widget_show (GTK_WIDGET (window->spin_step));
03443     }
03444     switch (window_get_gradient ())
03445     {
03446     case GRADIENT_METHOD_COORDINATES:
03447         gtk_widget_hide (GTK_WIDGET (window->label_estimates));
03448         gtk_widget_hide (GTK_WIDGET (window->spin_estimates));
03449         break;
03450     default:
03451         gtk_widget_show (GTK_WIDGET (window->label_estimates));
03452         gtk_widget_show (GTK_WIDGET (window->spin_estimates));
03453     }
03454     #if DEBUG
03455     fprintf (stderr, "window_update_gradient: end\n");
03456     #endif
03457 }
03458
03463 void
03464 window_update ()
03465 {
03466     unsigned int i;
03467     #if DEBUG
03468     fprintf (stderr, "window_update: start\n");
03469     #endif
03470     gtk_widget_set_sensitive
03471     (GTK_WIDGET (window->button_evaluator),
03472      gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
03473                                   (window->check_evaluator)));
03474     gtk_widget_hide (GTK_WIDGET (window->label_simulations));
03475     gtk_widget_hide (GTK_WIDGET (window->spin_simulations));
03476     gtk_widget_hide (GTK_WIDGET (window->label_iterations));
03477     gtk_widget_hide (GTK_WIDGET (window->spin_iterations));

```

```

03478 gtk_widget_hide (GTK_WIDGET (window->label_tolerance));
03479 gtk_widget_hide (GTK_WIDGET (window->spin_tolerance));
03480 gtk_widget_hide (GTK_WIDGET (window->label_bests));
03481 gtk_widget_hide (GTK_WIDGET (window->spin_bests));
03482 gtk_widget_hide (GTK_WIDGET (window->label_population));
03483 gtk_widget_hide (GTK_WIDGET (window->spin_population));
03484 gtk_widget_hide (GTK_WIDGET (window->label_generations));
03485 gtk_widget_hide (GTK_WIDGET (window->spin_generations));
03486 gtk_widget_hide (GTK_WIDGET (window->label_mutation));
03487 gtk_widget_hide (GTK_WIDGET (window->spin_mutation));
03488 gtk_widget_hide (GTK_WIDGET (window->label_reproduction));
03489 gtk_widget_hide (GTK_WIDGET (window->spin_reproduction));
03490 gtk_widget_hide (GTK_WIDGET (window->label_adaptation));
03491 gtk_widget_hide (GTK_WIDGET (window->spin_adaptation));
03492 gtk_widget_hide (GTK_WIDGET (window->label_sweeps));
03493 gtk_widget_hide (GTK_WIDGET (window->spin_sweeps));
03494 gtk_widget_hide (GTK_WIDGET (window->label_bits));
03495 gtk_widget_hide (GTK_WIDGET (window->spin_bits));
03496 gtk_widget_hide (GTK_WIDGET (window->check_gradient));
03497 gtk_widget_hide (GTK_WIDGET (window->grid_gradient));
03498 gtk_widget_hide (GTK_WIDGET (window->label_step));
03499 gtk_widget_hide (GTK_WIDGET (window->spin_step));
03500 gtk_widget_hide (GTK_WIDGET (window->label_p));
03501 gtk_widget_hide (GTK_WIDGET (window->spin_p));
03502 i = gtk_spin_button_get_value_as_int (window->spin_iterations);
03503 switch (window_get_algorithm ())
03504 {
03505     case ALGORITHM_MONTE_CARLO:
03506         gtk_widget_show (GTK_WIDGET (window->label_simulations));
03507         gtk_widget_show (GTK_WIDGET (window->spin_simulations));
03508         gtk_widget_show (GTK_WIDGET (window->label_iterations));
03509         gtk_widget_show (GTK_WIDGET (window->spin_iterations));
03510         if (i > 1)
03511         {
03512             gtk_widget_show (GTK_WIDGET (window->label_tolerance));
03513             gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
03514             gtk_widget_show (GTK_WIDGET (window->label_bests));
03515             gtk_widget_show (GTK_WIDGET (window->spin_bests));
03516         }
03517         window_update_gradient ();
03518         break;
03519     case ALGORITHM_SWEEP:
03520         gtk_widget_show (GTK_WIDGET (window->label_iterations));
03521         gtk_widget_show (GTK_WIDGET (window->spin_iterations));
03522         if (i > 1)
03523         {
03524             gtk_widget_show (GTK_WIDGET (window->label_tolerance));
03525             gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
03526             gtk_widget_show (GTK_WIDGET (window->label_bests));
03527             gtk_widget_show (GTK_WIDGET (window->spin_bests));
03528         }
03529         gtk_widget_show (GTK_WIDGET (window->label_sweeps));
03530         gtk_widget_show (GTK_WIDGET (window->spin_sweeps));
03531         gtk_widget_show (GTK_WIDGET (window->check_gradient));
03532         window_update_gradient ();
03533         break;
03534     default:
03535         gtk_widget_show (GTK_WIDGET (window->label_population));
03536         gtk_widget_show (GTK_WIDGET (window->spin_population));
03537         gtk_widget_show (GTK_WIDGET (window->label_generations));
03538         gtk_widget_show (GTK_WIDGET (window->spin_generations));
03539         gtk_widget_show (GTK_WIDGET (window->label_mutation));
03540         gtk_widget_show (GTK_WIDGET (window->spin_mutation));
03541         gtk_widget_show (GTK_WIDGET (window->label_reproduction));
03542         gtk_widget_show (GTK_WIDGET (window->spin_reproduction));
03543         gtk_widget_show (GTK_WIDGET (window->label_adaptation));
03544         gtk_widget_show (GTK_WIDGET (window->spin_adaptation));
03545         gtk_widget_show (GTK_WIDGET (window->label_bits));
03546         gtk_widget_show (GTK_WIDGET (window->spin_bits));
03547     }
03548     gtk_widget_set_sensitive
03549     (GTK_WIDGET (window->button_remove_experiment), input->
nnextperiments > 1);
03550     gtk_widget_set_sensitive
03551     (GTK_WIDGET (window->button_remove_variable), input->
nvariables > 1);
03552     for (i = 0; i < input->ninputs; ++i)
03553     {
03554         gtk_widget_show (GTK_WIDGET (window->check_template[i]));
03555         gtk_widget_show (GTK_WIDGET (window->button_template[i]));
03556         gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 0);
03557         gtk_widget_set_sensitive (GTK_WIDGET (window->button_template[i]), 1);
03558         g_signal_handler_block
03559         (window->check_template[i], window->id_template[i]);
03560         g_signal_handler_block (window->button_template[i], window->
id_input[i]);
03561         gtk_toggle_button_set_active

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03562         (GTK_TOGGLE_BUTTON (window->check_template[i]), 1);
03563     g_signal_handler_unblock
03564     (window->button_template[i], window->id_input[i]);
03565     g_signal_handler_unblock
03566     (window->check_template[i], window->id_template[i]);
03567 }
03568 if (i > 0)
03569 {
03570     gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i - 1]), 1);
03571     gtk_widget_set_sensitive
03572     (GTK_WIDGET (window->button_template[i - 1]),
03573      gtk_toggle_button_get_active
03574      GTK_TOGGLE_BUTTON (window->check_template[i - 1]));
03575 }
03576 if (i < MAX_NINPUTS)
03577 {
03578     gtk_widget_show (GTK_WIDGET (window->check_template[i]));
03579     gtk_widget_show (GTK_WIDGET (window->button_template[i]));
03580     gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 1);
03581     gtk_widget_set_sensitive
03582     (GTK_WIDGET (window->button_template[i]),
03583      gtk_toggle_button_get_active
03584      GTK_TOGGLE_BUTTON (window->check_template[i]));
03585     g_signal_handler_block
03586     (window->check_template[i], window->id_template[i]);
03587     g_signal_handler_block (window->button_template[i], window->
id_input[i]);
03588     gtk_toggle_button_set_active
03589     (GTK_TOGGLE_BUTTON (window->check_template[i]), 0);
03590     g_signal_handler_unblock
03591     (window->button_template[i], window->id_input[i]);
03592     g_signal_handler_unblock
03593     (window->check_template[i], window->id_template[i]);
03594 }
03595 while (++i < MAX_NINPUTS)
03596 {
03597     gtk_widget_hide (GTK_WIDGET (window->check_template[i]));
03598     gtk_widget_hide (GTK_WIDGET (window->button_template[i]));
03599 }
03600 gtk_widget_set_sensitive
03601 (GTK_WIDGET (window->spin_minabs),
03602  gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (window->check_minabs)));
03603 gtk_widget_set_sensitive
03604 (GTK_WIDGET (window->spin_maxabs),
03605  gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (window->check_maxabs)));
03606 if (window_get_norm () == ERROR_NORM_P)
03607 {
03608     gtk_widget_show (GTK_WIDGET (window->label_p));
03609     gtk_widget_show (GTK_WIDGET (window->spin_p));
03610 }
03611 #if DEBUG
03612 fprintf (stderr, "window_update: end\n");
03613 #endif
03614 }
03615
03620 void
03621 window_set_algorithm ()
03622 {
03623     int i;
03624     #if DEBUG
03625     fprintf (stderr, "window_set_algorithm: start\n");
03626     #endif
03627     i = window_get_algorithm ();
03628     switch (i)
03629     {
03630     case ALGORITHM_SWEEP:
03631         input->nsweeps = (unsigned int *) g_realloc
03632         (input->nsweeps, input->nvariables * sizeof (unsigned int));
03633         i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03634         if (i < 0)
03635             i = 0;
03636         gtk_spin_button_set_value (window->spin_sweeps,
03637                                   (gdouble) input->nsweeps[i]);
03638         break;
03639     case ALGORITHM_GENETIC:
03640         input->nbits = (unsigned int *) g_realloc
03641         (input->nbits, input->nvariables * sizeof (unsigned int));
03642         i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03643         if (i < 0)
03644             i = 0;
03645         gtk_spin_button_set_value (window->spin_bits, (gdouble) input->
nbits[i]);
03646     }
03647     window_update ();
03648     #if DEBUG
03649     fprintf (stderr, "window_set_algorithm: end\n");
03650     #endif

```

```

03651 }
03652
03657 void
03658 window_set_experiment ()
03659 {
03660     unsigned int i, j;
03661     char *buffer1, *buffer2;
03662     #if DEBUG
03663     fprintf (stderr, "window_set_experiment: start\n");
03664     #endif
03665     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
03666     gtk_spin_button_set_value (window->spin_weight, input->weight[i]);
03667     buffer1 = gtk_combo_box_text_get_active_text (window->combo_experiment);
03668     buffer2 = g_build_filename (input->directory, buffer1, NULL);
03669     g_free (buffer1);
03670     g_signal_handler_block
03671         (window->button_experiment, window->id_experiment_name);
03672     gtk_file_chooser_set_filename
03673         (GTK_FILE_CHOOSER (window->button_experiment), buffer2);
03674     g_signal_handler_unblock
03675         (window->button_experiment, window->id_experiment_name);
03676     g_free (buffer2);
03677     for (j = 0; j < input->ninputs; ++j)
03678     {
03679         g_signal_handler_block (window->button_template[j], window->
03680             id_input[j]);
03681         buffer2
03682             = g_build_filename (input->directory, input->template[j][i], NULL);
03683         gtk_file_chooser_set_filename
03684             (GTK_FILE_CHOOSER (window->button_template[j]), buffer2);
03685         g_free (buffer2);
03686         g_signal_handler_unblock
03687             (window->button_template[j], window->id_input[j]);
03688     }
03689     #if DEBUG
03690     fprintf (stderr, "window_set_experiment: end\n");
03691     #endif
03692 }
03693 void
03694 window_remove_experiment ()
03695 {
03700     unsigned int i, j;
03701     #if DEBUG
03702     fprintf (stderr, "window_remove_experiment: start\n");
03703     #endif
03704     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
03705     g_signal_handler_block (window->combo_experiment, window->
03706         id_experiment);
03707     gtk_combo_box_text_remove (window->combo_experiment, i);
03708     g_signal_handler_unblock (window->combo_experiment, window->
03709         id_experiment);
03710     xmlFree (input->experiment[i]);
03711     --input->nexperiments;
03712     for (j = i; j < input->nexperiments; ++j)
03713     {
03714         input->experiment[j] = input->experiment[j + 1];
03715         input->weight[j] = input->weight[j + 1];
03716     }
03717     j = input->nexperiments - 1;
03718     if (i > j)
03719     {
03720         i = j;
03721         for (j = 0; j < input->ninputs; ++j)
03722             g_signal_handler_block (window->button_template[j], window->
03723                 id_input[j]);
03724         g_signal_handler_block
03725             (window->button_experiment, window->id_experiment_name);
03726         gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
03727         g_signal_handler_unblock
03728             (window->button_experiment, window->id_experiment_name);
03729         for (j = 0; j < input->ninputs; ++j)
03730             g_signal_handler_unblock (window->button_template[j], window->
03731                 id_input[j]);
03732         window_update ();
03733     }
03734     #if DEBUG
03735     fprintf (stderr, "window_remove_experiment: end\n");
03736     #endif
03737 }
03738 void
03739 window_add_experiment ()
03740 {
03741     unsigned int i, j;
03742     #if DEBUG
03743     fprintf (stderr, "window_add_experiment: start\n");
03744     #endif
03745     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));

```



```

03745 g_signal_handler_block (window->combo_experiment, window->
id_experiment);
03746 gtk_combo_box_text_insert_text
03747 (window->combo_experiment, i, input->experiment[i]);
03748 g_signal_handler_unblock (window->combo_experiment, window->
id_experiment);
03749 input->experiment = (char **) g_realloc
03750 (input->experiment, (input->nexperiments + 1) * sizeof (char *));
03751 input->weight = (double *) g_realloc
03752 (input->weight, (input->nexperiments + 1) * sizeof (double));
03753 for (j = input->nexperiments - 1; j > i; --j)
03754 {
03755     input->experiment[j + 1] = input->experiment[j];
03756     input->weight[j + 1] = input->weight[j];
03757 }
03758 input->experiment[j + 1]
03759 = (char *) xmlStrdup ((xmlChar *) input->experiment[j]);
03760 input->weight[j + 1] = input->weight[j];
03761 ++input->nexperiments;
03762 for (j = 0; j < input->ninputs; ++j)
03763 g_signal_handler_block (window->button_template[j], window->
id_input[j]);
03764 g_signal_handler_block
03765 (window->button_experiment, window->id_experiment_name);
03766 gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i + 1);
03767 g_signal_handler_unblock
03768 (window->button_experiment, window->id_experiment_name);
03769 for (j = 0; j < input->ninputs; ++j)
03770 g_signal_handler_unblock (window->button_template[j], window->
id_input[j]);
03771 window_update ();
03772 #if DEBUG
03773 fprintf (stderr, "window_add_experiment: end\n");
03774 #endif
03775 }
03776
03781 void
03782 window_name_experiment ()
03783 {
03784     unsigned int i;
03785     char *buffer;
03786     GFile *file1, *file2;
03787 #if DEBUG
03788     fprintf (stderr, "window_name_experiment: start\n");
03789 #endif
03790 i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
03791 file1
03792 = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_experiment));
03793 file2 = g_file_new_for_path (input->directory);
03794 buffer = g_file_get_relative_path (file2, file1);
03795 g_signal_handler_block (window->combo_experiment, window->
id_experiment);
03796 gtk_combo_box_text_remove (window->combo_experiment, i);
03797 gtk_combo_box_text_insert_text (window->combo_experiment, i, buffer);
03798 gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
03799 g_signal_handler_unblock (window->combo_experiment, window->
id_experiment);
03800 g_free (buffer);
03801 g_object_unref (file2);
03802 g_object_unref (file1);
03803 #if DEBUG
03804     fprintf (stderr, "window_name_experiment: end\n");
03805 #endif
03806 }
03807
03812 void
03813 window_weight_experiment ()
03814 {
03815     unsigned int i;
03816 #if DEBUG
03817     fprintf (stderr, "window_weight_experiment: start\n");
03818 #endif
03819 i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
03820 input->weight[i] = gtk_spin_button_get_value (window->spin_weight);
03821 #if DEBUG
03822     fprintf (stderr, "window_weight_experiment: end\n");
03823 #endif
03824 }
03825
03831 void
03832 window_inputs_experiment ()
03833 {
03834     unsigned int j;
03835 #if DEBUG
03836     fprintf (stderr, "window_inputs_experiment: start\n");
03837 #endif
03838 j = input->ninputs - 1;

```

```

03839     if (j
03840         && !gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
03841             (window->check_template[j]))))
03842         --input->ninputs;
03843     if (input->ninputs < MAX_NINPUTS
03844         && gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
03845             (window->check_template[j]))))
03846     {
03847         ++input->ninputs;
03848         for (j = 0; j < input->ninputs; ++j)
03849         {
03850             input->template[j] = (char **)
03851                 g_realloc (input->template[j], input->nvariables * sizeof (char *));
03852         }
03853     }
03854     window_update ();
03855     #if DEBUG
03856     fprintf (stderr, "window_inputs_experiment: end\n");
03857     #endif
03858 }
03859
03860 void
03861 window_template_experiment (void *data)
03862 {
03863     unsigned int i, j;
03864     char *buffer;
03865     GFile *file1, *file2;
03866     #if DEBUG
03867     fprintf (stderr, "window_template_experiment: start\n");
03868     #endif
03869     i = (size_t) data;
03870     j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
03871     file1
03872         = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
03873     file2 = g_file_new_for_path (input->directory);
03874     buffer = g_file_get_relative_path (file2, file1);
03875     input->template[i][j] = (char *) xmlStrdup ((xmlChar *) buffer);
03876     g_free (buffer);
03877     g_object_unref (file2);
03878     g_object_unref (file1);
03879     #if DEBUG
03880     fprintf (stderr, "window_template_experiment: end\n");
03881     #endif
03882 }
03883
03884 void
03885 window_set_variable ()
03886 {
03887     unsigned int i;
03888     #if DEBUG
03889     fprintf (stderr, "window_set_variable: start\n");
03890     #endif
03891     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03892     g_signal_handler_block (window->entry_variable, window->
03893         id_variable_label);
03894     gtk_entry_set_text (window->entry_variable, input->label[i]);
03895     g_signal_handler_unblock (window->entry_variable, window->
03896         id_variable_label);
03897     gtk_spin_button_set_value (window->spin_min, input->rangemin[i]);
03898     gtk_spin_button_set_value (window->spin_max, input->rangemax[i]);
03899     if (input->rangeminabs[i] != -G_MAXDOUBLE)
03900     {
03901         gtk_spin_button_set_value (window->spin_minabs, input->
03902             rangeminabs[i]);
03903         gtk_toggle_button_set_active
03904             (GTK_TOGGLE_BUTTON (window->check_minabs), 1);
03905     }
03906     else
03907     {
03908         gtk_spin_button_set_value (window->spin_minabs, -G_MAXDOUBLE);
03909         gtk_toggle_button_set_active
03910             (GTK_TOGGLE_BUTTON (window->check_minabs), 0);
03911     }
03912     if (input->rangemaxabs[i] != G_MAXDOUBLE)
03913     {
03914         gtk_spin_button_set_value (window->spin_maxabs, input->
03915             rangemaxabs[i]);
03916         gtk_toggle_button_set_active
03917             (GTK_TOGGLE_BUTTON (window->check_maxabs), 1);
03918     }
03919     else
03920     {
03921         gtk_spin_button_set_value (window->spin_maxabs, G_MAXDOUBLE);
03922         gtk_toggle_button_set_active
03923             (GTK_TOGGLE_BUTTON (window->check_maxabs), 0);
03924     }
03925     gtk_spin_button_set_value (window->spin_precision, input->

```

```

    precision[i]);
03933   gtk_spin_button_set_value (window->spin_steps, (gdouble) input->
nsteps);
03934   if (input->nsteps)
03935       gtk_spin_button_set_value (window->spin_step, input->step[i]);
03936   #if DEBUG
03937       fprintf (stderr, "window_set_variable: precision[%u]=%u\n", i,
03938               input->precision[i]);
03939   #endif
03940   switch (window_get_algorithm ())
03941   {
03942       case ALGORITHM_SWEEP:
03943           gtk_spin_button_set_value (window->spin_sweeps,
03944                                     (gdouble) input->nsweeps[i]);
03945   #if DEBUG
03946       fprintf (stderr, "window_set_variable: nsweeps[%u]=%u\n", i,
03947               input->nsweeps[i]);
03948   #endif
03949       break;
03950       case ALGORITHM_GENETIC:
03951           gtk_spin_button_set_value (window->spin_bits, (gdouble) input->
nbits[i]);
03952   #if DEBUG
03953       fprintf (stderr, "window_set_variable: nbits[%u]=%u\n", i,
03954               input->nbits[i]);
03955   #endif
03956       break;
03957   }
03958   window_update ();
03959   #if DEBUG
03960       fprintf (stderr, "window_set_variable: end\n");
03961   #endif
03962 }
03963
03964 void
03965 window_remove_variable ()
03966 {
03967     unsigned int i, j;
03968     #if DEBUG
03969         fprintf (stderr, "window_remove_variable: start\n");
03970     #endif
03971     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03972     g_signal_handler_block (window->combo_variable, window->
id_variable);
03973     gtk_combo_box_text_remove (window->combo_variable, i);
03974     g_signal_handler_unblock (window->combo_variable, window->
id_variable);
03975     xmlFree (input->label[i]);
03976     --input->nvariables;
03977     for (j = i; j < input->nvariables; ++j)
03978     {
03979         input->label[j] = input->label[j + 1];
03980         input->rangemin[j] = input->rangemin[j + 1];
03981         input->rangemax[j] = input->rangemax[j + 1];
03982         input->rangeminabs[j] = input->rangeminabs[j + 1];
03983         input->rangemaxabs[j] = input->rangemaxabs[j + 1];
03984         input->precision[j] = input->precision[j + 1];
03985         input->step[j] = input->step[j + 1];
03986         switch (window_get_algorithm ())
03987         {
03988             case ALGORITHM_SWEEP:
03989                 input->nsweeps[j] = input->nsweeps[j + 1];
03990             break;
03991             case ALGORITHM_GENETIC:
03992                 input->nbits[j] = input->nbits[j + 1];
03993             break;
03994         }
03995     }
03996     j = input->nvariables - 1;
03997     if (i > j)
03998         i = j;
03999     g_signal_handler_block (window->entry_variable, window->
id_variable_label);
04000     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
04001     g_signal_handler_unblock (window->entry_variable, window->
id_variable_label);
04002     window_update ();
04003     #if DEBUG
04004         fprintf (stderr, "window_remove_variable: end\n");
04005     #endif
04006 }
04007
04008 void
04009 window_add_variable ()
04010 {
04011     unsigned int i, j;
04012     #if DEBUG
04013         fprintf (stderr, "window_add_variable: start\n");
04014     #endif

```

```

04021 #endif
04022 i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
04023 g_signal_handler_block (window->combo_variable, window->
id_variable);
04024 gtk_combo_box_text_insert_text (window->combo_variable, i, input->
label[i]);
04025 g_signal_handler_unblock (window->combo_variable, window->
id_variable);
04026 input->label = (char **) g_realloc
(input->label, (input->nvariables + 1) * sizeof (char *));
04027 input->rangemin = (double *) g_realloc
(input->rangemin, (input->nvariables + 1) * sizeof (double));
04028 input->rangemax = (double *) g_realloc
(input->rangemax, (input->nvariables + 1) * sizeof (double));
04029 input->rangeminabs = (double *) g_realloc
(input->rangeminabs, (input->nvariables + 1) * sizeof (double));
04030 input->rangemaxabs = (double *) g_realloc
(input->rangemaxabs, (input->nvariables + 1) * sizeof (double));
04031 input->precision = (unsigned int *) g_realloc
(input->precision, (input->nvariables + 1) * sizeof (unsigned int));
04032 input->step = (double *) g_realloc
(input->step, (input->nvariables + 1) * sizeof (double));
04033 for (j = input->nvariables - 1; j > i; --j)
04034 {
04035     input->label[j + 1] = input->label[j];
04036     input->rangemin[j + 1] = input->rangemin[j];
04037     input->rangemax[j + 1] = input->rangemax[j];
04038     input->rangeminabs[j + 1] = input->rangeminabs[j];
04039     input->rangemaxabs[j + 1] = input->rangemaxabs[j];
04040     input->precision[j + 1] = input->precision[j];
04041     input->step[j + 1] = input->step[j];
04042 }
04043 input->label[j + 1] = (char *) xmlStrdup ((xmlChar *) input->label[j]);
04044 input->rangemin[j + 1] = input->rangemin[j];
04045 input->rangemax[j + 1] = input->rangemax[j];
04046 input->rangeminabs[j + 1] = input->rangeminabs[j];
04047 input->rangemaxabs[j + 1] = input->rangemaxabs[j];
04048 input->precision[j + 1] = input->precision[j];
04049 input->step[j + 1] = input->step[j];
04050 switch (window_get_algorithm ())
04051 {
04052     case ALGORITHM_SWEEP:
04053         input->nsweeps = (unsigned int *) g_realloc
(input->nsweeps, (input->nvariables + 1) * sizeof (unsigned int));
04054         for (j = input->nvariables - 1; j > i; --j)
04055             input->nsweeps[j + 1] = input->nsweeps[j];
04056         input->nsweeps[j + 1] = input->nsweeps[j];
04057         break;
04058     case ALGORITHM_GENETIC:
04059         input->nbits = (unsigned int *) g_realloc
(input->nbits, (input->nvariables + 1) * sizeof (unsigned int));
04060         for (j = input->nvariables - 1; j > i; --j)
04061             input->nbits[j + 1] = input->nbits[j];
04062         input->nbits[j + 1] = input->nbits[j];
04063     }
04064 ++input->nvariables;
04065 g_signal_handler_block (window->entry_variable, window->
id_variable_label);
04066 gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i + 1);
04067 g_signal_handler_unblock (window->entry_variable, window->
id_variable_label);
04068 window_update ();
04069 #if DEBUG
04070 fprintf (stderr, "window_add_variable: end\n");
04071 #endif
04072 }
04073 void
04074 window_label_variable ()
04075 {
04076     unsigned int i;
04077     const char *buffer;
04078     #if DEBUG
04079     fprintf (stderr, "window_label_variable: start\n");
04080     #endif
04081     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
04082     buffer = gtk_entry_get_text (window->entry_variable);
04083     g_signal_handler_block (window->combo_variable, window->
id_variable);
04084     gtk_combo_box_text_remove (window->combo_variable, i);
04085     gtk_combo_box_text_insert_text (window->combo_variable, i, buffer);
04086     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
04087     g_signal_handler_unblock (window->combo_variable, window->
id_variable);
04088     #if DEBUG
04089     fprintf (stderr, "window_label_variable: end\n");
04090     #endif

```

```

04105 }
04106
04111 void
04112 window_precision_variable ()
04113 {
04114     unsigned int i;
04115     #if DEBUG
04116     fprintf (stderr, "window_precision_variable: start\n");
04117     #endif
04118     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
04119     input->precision[i]
04120     = (unsigned int) gtk_spin_button_get_value_as_int (window->spin_precision);
04121     gtk_spin_button_set_digits (window->spin_min, input->precision[i]);
04122     gtk_spin_button_set_digits (window->spin_max, input->precision[i]);
04123     gtk_spin_button_set_digits (window->spin_minabs, input->precision[i]);
04124     gtk_spin_button_set_digits (window->spin_maxabs, input->precision[i]);
04125     #if DEBUG
04126     fprintf (stderr, "window_precision_variable: end\n");
04127     #endif
04128 }
04129
04134 void
04135 window_rangemin_variable ()
04136 {
04137     unsigned int i;
04138     #if DEBUG
04139     fprintf (stderr, "window_rangemin_variable: start\n");
04140     #endif
04141     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
04142     input->rangemin[i] = gtk_spin_button_get_value (window->spin_min);
04143     #if DEBUG
04144     fprintf (stderr, "window_rangemin_variable: end\n");
04145     #endif
04146 }
04147
04152 void
04153 window_rangemax_variable ()
04154 {
04155     unsigned int i;
04156     #if DEBUG
04157     fprintf (stderr, "window_rangemax_variable: start\n");
04158     #endif
04159     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
04160     input->rangemax[i] = gtk_spin_button_get_value (window->spin_max);
04161     #if DEBUG
04162     fprintf (stderr, "window_rangemax_variable: end\n");
04163     #endif
04164 }
04165
04170 void
04171 window_rangeminabs_variable ()
04172 {
04173     unsigned int i;
04174     #if DEBUG
04175     fprintf (stderr, "window_rangeminabs_variable: start\n");
04176     #endif
04177     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
04178     input->rangeminabs[i] = gtk_spin_button_get_value (window->
04179 spin_minabs);
04180     #if DEBUG
04181     fprintf (stderr, "window_rangeminabs_variable: end\n");
04182     #endif
04183 }
04188 void
04189 window_rangemaxabs_variable ()
04190 {
04191     unsigned int i;
04192     #if DEBUG
04193     fprintf (stderr, "window_rangemaxabs_variable: start\n");
04194     #endif
04195     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
04196     input->rangemaxabs[i] = gtk_spin_button_get_value (window->
04197 spin_maxabs);
04198     #if DEBUG
04199     fprintf (stderr, "window_rangemaxabs_variable: end\n");
04200     #endif
04201 }
04206 void
04207 window_step_variable ()
04208 {
04209     unsigned int i;
04210     #if DEBUG
04211     fprintf (stderr, "window_step_variable: start\n");
04212     #endif
04213     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));

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```

04214   input->step[i] = gtk_spin_button_get_value (window->spin_step);
04215   #if DEBUG
04216   fprintf (stderr, "window_step_variable: end\n");
04217   #endif
04218   }
04219
04224   void
04225   window_update_variable ()
04226   {
04227     int i;
04228     #if DEBUG
04229     fprintf (stderr, "window_update_variable: start\n");
04230     #endif
04231     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
04232     if (i < 0)
04233       i = 0;
04234     switch (window_get_algorithm ())
04235     {
04236       case ALGORITHM_SWEEP:
04237         input->nsweeps[i]
04238         = gtk_spin_button_get_value_as_int (window->spin_sweeps);
04239       #if DEBUG
04240         fprintf (stderr, "window_update_variable: nsweeps[%d]=%u\n", i,
04241                 input->nsweeps[i]);
04242       #endif
04243       break;
04244       case ALGORITHM_GENETIC:
04245         input->nbits[i] = gtk_spin_button_get_value_as_int (window->spin_bits);
04246       #if DEBUG
04247         fprintf (stderr, "window_update_variable: nbits[%d]=%u\n", i,
04248                 input->nbits[i]);
04249       #endif
04250     }
04251     #if DEBUG
04252     fprintf (stderr, "window_update_variable: end\n");
04253     #endif
04254   }
04255
04263   int
04264   window_read (char *filename)
04265   {
04266     unsigned int i;
04267     char *buffer;
04268     #if DEBUG
04269     fprintf (stderr, "window_read: start\n");
04270     #endif
04271
04272     // Reading new input file
04273     input_free ();
04274     if (!input_open (filename))
04275       return 0;
04276
04277     // Setting GTK+ widgets data
04278     gtk_entry_set_text (window->entry_result, input->result);
04279     gtk_entry_set_text (window->entry_variables, input->variables);
04280     buffer = g_build_filename (input->directory, input->simulator, NULL);
04281     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
04282                                   (window->button_simulator), buffer);
04283     g_free (buffer);
04284     gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
04285                                  (size_t) input->evaluator);
04286     if (input->evaluator)
04287     {
04288       buffer = g_build_filename (input->directory, input->evaluator, NULL);
04289       gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
04290                                     (window->button_evaluator), buffer);
04291       g_free (buffer);
04292     }
04293     gtk_toggle_button_set_active
04294     (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
04295 algorithm]), TRUE);
04296     switch (input->algorithm)
04297     {
04298       case ALGORITHM_MONTE_CARLO:
04299         gtk_spin_button_set_value (window->spin_simulations,
04300                                   (gdouble) input->nsimulations);
04301       case ALGORITHM_SWEEP:
04302         gtk_spin_button_set_value (window->spin_iterations,
04303                                   (gdouble) input->niterations);
04304         gtk_spin_button_set_value (window->spin_bests, (gdouble) input->
nbest);
04305         gtk_spin_button_set_value (window->spin_tolerance, input->
tolerance);
04306         gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_gradient),
input->nsteps);
04307         if (input->nsteps)
04308         {

```

```

04309         gtk_toggle_button_set_active
04310             (GTK_TOGGLE_BUTTON (window->button_gradient
04311                 [input->gradient_method]), TRUE);
04312         gtk_spin_button_set_value (window->spin_steps,
04313             (gdouble) input->nsteps);
04314         gtk_spin_button_set_value (window->spin_relaxation,
04315             (gdouble) input->relaxation);
04316         switch (input->gradient_method)
04317         {
04318             case GRADIENT_METHOD_RANDOM:
04319                 gtk_spin_button_set_value (window->spin_estimates,
04320                     (gdouble) input->nestimates);
04321             }
04322         }
04323         break;
04324     default:
04325         gtk_spin_button_set_value (window->spin_population,
04326             (gdouble) input->nsimulations);
04327         gtk_spin_button_set_value (window->spin_generations,
04328             (gdouble) input->niterations);
04329         gtk_spin_button_set_value (window->spin_mutation, input->
04330             mutation_ratio);
04331         gtk_spin_button_set_value (window->spin_reproduction,
04332             input->reproduction_ratio);
04333         gtk_spin_button_set_value (window->spin_adaptation,
04334             input->adaptation_ratio);
04335     }
04336     gtk_toggle_button_set_active
04337         (GTK_TOGGLE_BUTTON (window->button_norm[input->norm]), TRUE);
04338     gtk_spin_button_set_value (window->spin_p, input->p);
04339     g_signal_handler_block (window->combo_experiment, window->
04340         id_experiment);
04341     g_signal_handler_block (window->button_experiment,
04342         window->id_experiment_name);
04343     gtk_combo_box_text_remove_all (window->combo_experiment);
04344     for (i = 0; i < input->nexperiments; ++i)
04345         gtk_combo_box_text_append_text (window->combo_experiment,
04346             input->experiment[i]);
04347     g_signal_handler_unblock
04348         (window->button_experiment, window->id_experiment_name);
04349     g_signal_handler_unblock (window->combo_experiment, window->
04350         id_experiment);
04351     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
04352     g_signal_handler_block (window->combo_variable, window->
04353         id_variable);
04354     g_signal_handler_block (window->entry_variable, window->
04355         id_variable_label);
04356     gtk_combo_box_text_remove_all (window->combo_variable);
04357     for (i = 0; i < input->nvariables; ++i)
04358         gtk_combo_box_text_append_text (window->combo_variable, input->
04359             label[i]);
04360     g_signal_handler_unblock (window->entry_variable, window->
04361         id_variable_label);
04362     g_signal_handler_unblock (window->combo_variable, window->
04363         id_variable);
04364     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
04365     window_set_variable ();
04366     window_update ();
04367     #if DEBUG
04368     fprintf (stderr, "window_read: end\n");
04369     #endif
04370     return 1;
04371 }
04372 void
04373 window_open ()
04374 {
04375     GtkFileChooserDialog *dlg;
04376     GtkFileFilter *filter;
04377     char *buffer, *directory, *name;
04378     #if DEBUG
04379     fprintf (stderr, "window_open: start\n");
04380     #endif
04381     // Saving a backup of the current input file
04382     directory = g_strdup (input->directory);
04383     name = g_strdup (input->name);
04384     // Opening dialog
04385     dlg = (GtkFileChooserDialog *)
04386         gtk_file_chooser_dialog_new (gettext ("Open input file"),
04387             window->window,
04388             GTK_FILE_CHOOSER_ACTION_OPEN,
04389             gettext ("Cancel"), GTK_RESPONSE_CANCEL,
04390             gettext ("OK"), GTK_RESPONSE_OK, NULL);

```

```

04392
04393 // Adding XML filter
04394 filter = (GtkFileFilter *) gtk_file_filter_new ();
04395 gtk_file_filter_set_name (filter, "XML");
04396 gtk_file_filter_add_pattern (filter, "*.xml");
04397 gtk_file_filter_add_pattern (filter, "*.XML");
04398 gtk_file_chooser_add_filter (GTK_FILE_CHOOSER (dlg), filter);
04399
04400 // If OK saving
04401 while (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
04402 {
04403
04404     // Traying to open the input file
04405     buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
04406     if (!window_read (buffer))
04407     {
04408 #if DEBUG
04409         fprintf (stderr, "window_open: error reading input file\n");
04410 #endif
04411         g_free (buffer);
04412
04413         // Reading backup file on error
04414         buffer = g_build_filename (directory, name, NULL);
04415         if (!input_open (buffer))
04416         {
04417             // Closing on backup file reading error
04418 #if DEBUG
04419             fprintf (stderr, "window_read: error reading backup file\n");
04420 #endif
04421             g_free (buffer);
04422             break;
04423         }
04424         g_free (buffer);
04425     }
04426     else
04427     {
04428         g_free (buffer);
04429         break;
04430     }
04431 }
04432 }
04433
04434 // Freeing and closing
04435 g_free (name);
04436 g_free (directory);
04437 gtk_widget_destroy (GTK_WIDGET (dlg));
04438 #if DEBUG
04439     fprintf (stderr, "window_open: end\n");
04440 #endif
04441 }
04442
04443 void
04444 window_new ()
04445 {
04446     unsigned int i;
04447     char *buffer, *buffer2, buffer3[64];
04448     char *label_algorithm[NALGORITHMS] = {
04449         "_Monte-Carlo", gettext ("_Sweep"), gettext ("_Genetic")
04450     };
04451     char *tip_algorithm[NALGORITHMS] = {
04452         gettext ("Monte-Carlo brute force algorithm"),
04453         gettext ("Sweep brute force algorithm"),
04454         gettext ("Genetic algorithm")
04455     };
04456     char *label_gradient[NGRADIENTS] = {
04457         gettext ("_Coordinates descent"), gettext ("_Random")
04458     };
04459     char *tip_gradient[NGRADIENTS] = {
04460         gettext ("Coordinates descent gradient estimate method"),
04461         gettext ("Random gradient estimate method")
04462     };
04463     char *label_norm[NNORMS] = { "L2", "L", "Lp", "L1" };
04464     char *tip_norm[NNORMS] = {
04465         gettext ("Euclidean error norm (L2)"),
04466         gettext ("Maximum error norm (L)"),
04467         gettext ("P error norm (Lp)"),
04468         gettext ("Taxicab error norm (L1)")
04469     };
04470 #if DEBUG
04471     fprintf (stderr, "window_new: start\n");
04472 #endif
04473
04474 // Creating the window
04475 window->window = (GtkWindow *) gtk_window_new (GTK_WINDOW_TOPLEVEL);
04476
04477 // Finish when closing the window

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04483 g_signal_connect (window->window, "delete-event", gtk_main_quit, NULL);
04484
04485 // Setting the window title
04486 gtk_window_set_title (window->window, "MPCOTool");
04487
04488 // Creating the open button
04489 window->button_open = (GtkToolButton *) gtk_tool_button_new
04490     (gtk_image_new_from_icon_name ("document-open",
04491         GTK_ICON_SIZE_LARGE_TOOLBAR),
04492     gettext ("Open"));
04493 g_signal_connect (window->button_open, "clicked", window_open, NULL);
04494
04495 // Creating the save button
04496 window->button_save = (GtkToolButton *) gtk_tool_button_new
04497     (gtk_image_new_from_icon_name ("document-save",
04498         GTK_ICON_SIZE_LARGE_TOOLBAR),
04499     gettext ("Save"));
04500 g_signal_connect (window->button_save, "clicked", (void (*)(
window_save,
04501     NULL));
04502
04503 // Creating the run button
04504 window->button_run = (GtkToolButton *) gtk_tool_button_new
04505     (gtk_image_new_from_icon_name ("system-run",
04506         GTK_ICON_SIZE_LARGE_TOOLBAR),
04507     gettext ("Run"));
04508 g_signal_connect (window->button_run, "clicked", window_run, NULL);
04509
04510 // Creating the options button
04511 window->button_options = (GtkToolButton *) gtk_tool_button_new
04512     (gtk_image_new_from_icon_name ("preferences-system",
04513         GTK_ICON_SIZE_LARGE_TOOLBAR),
04514     gettext ("Options"));
04515 g_signal_connect (window->button_options, "clicked", options_new, NULL);
04516
04517 // Creating the help button
04518 window->button_help = (GtkToolButton *) gtk_tool_button_new
04519     (gtk_image_new_from_icon_name ("help-browser",
04520         GTK_ICON_SIZE_LARGE_TOOLBAR),
04521     gettext ("Help"));
04522 g_signal_connect (window->button_help, "clicked", window_help, NULL);
04523
04524 // Creating the about button
04525 window->button_about = (GtkToolButton *) gtk_tool_button_new
04526     (gtk_image_new_from_icon_name ("help-about",
04527         GTK_ICON_SIZE_LARGE_TOOLBAR),
04528     gettext ("About"));
04529 g_signal_connect (window->button_about, "clicked", window_about, NULL);
04530
04531 // Creating the exit button
04532 window->button_exit = (GtkToolButton *) gtk_tool_button_new
04533     (gtk_image_new_from_icon_name ("application-exit",
04534         GTK_ICON_SIZE_LARGE_TOOLBAR),
04535     gettext ("Exit"));
04536 g_signal_connect (window->button_exit, "clicked", gtk_main_quit, NULL);
04537
04538 // Creating the buttons bar
04539 window->bar_buttons = (GtkToolbar *) gtk_toolbar_new ();
04540 gtk_toolbar_insert
04541     (window->bar_buttons, GTK_TOOL_ITEM (window->button_open), 0);
04542 gtk_toolbar_insert
04543     (window->bar_buttons, GTK_TOOL_ITEM (window->button_save), 1);
04544 gtk_toolbar_insert
04545     (window->bar_buttons, GTK_TOOL_ITEM (window->button_run), 2);
04546 gtk_toolbar_insert
04547     (window->bar_buttons, GTK_TOOL_ITEM (window->button_options), 3);
04548 gtk_toolbar_insert
04549     (window->bar_buttons, GTK_TOOL_ITEM (window->button_help), 4);
04550 gtk_toolbar_insert
04551     (window->bar_buttons, GTK_TOOL_ITEM (window->button_about), 5);
04552 gtk_toolbar_insert
04553     (window->bar_buttons, GTK_TOOL_ITEM (window->button_exit), 6);
04554 gtk_toolbar_set_style (window->bar_buttons, GTK_TOOLBAR_BOTH);
04555
04556 // Creating the simulator program label and entry
04557 window->label_simulator
04558     = (GtkLabel *) gtk_label_new (gettext ("Simulator program"));
04559 window->button_simulator = (GtkFileChooserButton *)
04560     gtk_file_chooser_button_new (gettext ("Simulator program"),
04561         GTK_FILE_CHOOSER_ACTION_OPEN);
04562 gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_simulator),
04563     gettext ("Simulator program executable file"));
04564
04565 // Creating the evaluator program label and entry
04566 window->check_evaluator = (GtkCheckButton *)
04567     gtk_check_button_new_with_mnemonic (gettext ("Evaluator program"));
04568 g_signal_connect (window->check_evaluator, "toggled",

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        window_update, NULL);
04569     window->button_evaluator = (GtkFileChooserButton *)
04570         gtk_file_chooser_button_new (gettext ("Evaluator program"),
04571             GTK_FILE_CHOOSER_ACTION_OPEN);
04572     gtk_widget_set_tooltip_text
04573         (GTK_WIDGET (window->button_evaluator),
04574         gettext ("Optional evaluator program executable file"));
04575
04576     // Creating the results files labels and entries
04577     window->label_result = (GtkLabel *) gtk_label_new (gettext ("Result file"));
04578     window->entry_result = (GtkEntry *) gtk_entry_new ();
04579     gtk_widget_set_tooltip_text
04580         (GTK_WIDGET (window->entry_result), gettext ("Best results file"));
04581     window->label_variables
04582         = (GtkLabel *) gtk_label_new (gettext ("Variables file"));
04583     window->entry_variables = (GtkEntry *) gtk_entry_new ();
04584     gtk_widget_set_tooltip_text
04585         (GTK_WIDGET (window->entry_variables),
04586         gettext ("All simulated results file"));
04587
04588     // Creating the files grid and attaching widgets
04589     window->grid_files = (GtkGrid *) gtk_grid_new ();
04590     gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
label_simulator),
04591         0, 0, 1, 1);
04592     gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
button_simulator),
04593         1, 0, 1, 1);
04594     gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
check_evaluator),
04595         0, 1, 1, 1);
04596     gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
button_evaluator),
04597         1, 1, 1, 1);
04598     gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
label_result),
04599         0, 2, 1, 1);
04600     gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
entry_result),
04601         1, 2, 1, 1);
04602     gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
label_variables),
04603         0, 3, 1, 1);
04604     gtk_grid_attach (window->grid_files, GTK_WIDGET (window->
entry_variables),
04605         1, 3, 1, 1);
04606
04607     // Creating the algorithm properties
04608     window->label_simulations = (GtkLabel *) gtk_label_new
04609         (gettext ("Simulations number"));
04610     window->spin_simulations
04611         = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
04612     gtk_widget_set_tooltip_text
04613         (GTK_WIDGET (window->spin_simulations),
04614         gettext ("Number of simulations to perform for each iteration"));
04615     window->label_iterations = (GtkLabel *)
04616         gtk_label_new (gettext ("Iterations number"));
04617     window->spin_iterations
04618         = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
04619     gtk_widget_set_tooltip_text
04620         (GTK_WIDGET (window->spin_iterations), gettext ("Number of iterations"));
04621     g_signal_connect
04622         (window->spin_iterations, "value-changed", window_update, NULL);
04623     window->label_tolerance = (GtkLabel *) gtk_label_new (gettext ("Tolerance"));
04624     window->spin_tolerance
04625         = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
04626     gtk_widget_set_tooltip_text
04627         (GTK_WIDGET (window->spin_tolerance),
04628         gettext ("Tolerance to set the variable interval on the next iteration"));
04629     window->label_bests = (GtkLabel *) gtk_label_new (gettext ("Bests number"));
04630     window->spin_bests
04631         = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
04632     gtk_widget_set_tooltip_text
04633         (GTK_WIDGET (window->spin_bests),
04634         gettext ("Number of best simulations used to set the variable interval "
04635             "on the next iteration"));
04636     window->label_population
04637         = (GtkLabel *) gtk_label_new (gettext ("Population number"));
04638     window->spin_population
04639         = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
04640     gtk_widget_set_tooltip_text
04641         (GTK_WIDGET (window->spin_population),
04642         gettext ("Number of population for the genetic algorithm"));
04643     window->label_generations
04644         = (GtkLabel *) gtk_label_new (gettext ("Generations number"));
04645     window->spin_generations
04646         = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);

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04647 gtk_widget_set_tooltip_text
04648     (GTK_WIDGET (window->spin_generations),
04649      gettext ("Number of generations for the genetic algorithm"));
04650 window->label_mutation
04651     = (GtkLabel *) gtk_label_new (gettext ("Mutation ratio"));
04652 window->spin_mutation
04653     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
04654 gtk_widget_set_tooltip_text
04655     (GTK_WIDGET (window->spin_mutation),
04656      gettext ("Ratio of mutation for the genetic algorithm"));
04657 window->label_reproduction
04658     = (GtkLabel *) gtk_label_new (gettext ("Reproduction ratio"));
04659 window->spin_reproduction
04660     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
04661 gtk_widget_set_tooltip_text
04662     (GTK_WIDGET (window->spin_reproduction),
04663      gettext ("Ratio of reproduction for the genetic algorithm"));
04664 window->label_adaptation
04665     = (GtkLabel *) gtk_label_new (gettext ("Adaptation ratio"));
04666 window->spin_adaptation
04667     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
04668 gtk_widget_set_tooltip_text
04669     (GTK_WIDGET (window->spin_adaptation),
04670      gettext ("Ratio of adaptation for the genetic algorithm"));
04671
04672 // Creating the gradient based method properties
04673 window->check_gradient = (GtkCheckButton *)
04674     gtk_check_button_new_with_mnemonic (gettext ("Gradient based method"));
04675 g_signal_connect (window->check_gradient, "clicked",
04676     window_update, NULL);
04677 window->grid_gradient = (GtkGrid *) gtk_grid_new ();
04678 window->button_gradient[0] = (GtkRadioButton *)
04679     gtk_radio_button_new_with_mnemonic (NULL, label_gradient[0]);
04679 gtk_grid_attach (window->grid_gradient,
04680     GTK_WIDGET (window->button_gradient[0]), 0, 0, 1, 1);
04681 g_signal_connect (window->button_gradient[0], "clicked",
04682     window_update, NULL);
04683 for (i = 0; ++i < NGRADIENTS;)
04684 {
04685     window->button_gradient[i] = (GtkRadioButton *)
04686         gtk_radio_button_new_with_mnemonic
04687         (gtk_radio_button_get_group (window->button_gradient[0]),
04688          label_gradient[i]);
04688     gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_gradient[i]),
04689         tip_gradient[i]);
04689     gtk_grid_attach (window->grid_gradient,
04690         GTK_WIDGET (window->button_gradient[i]), 0, i, 1, 1);
04691     g_signal_connect (window->button_gradient[i], "clicked",
04692         window_update, NULL);
04693 }
04694 window->label_steps = (GtkLabel *) gtk_label_new (gettext ("Steps number"));
04695 window->spin_steps = (GtkSpinButton *)
04696     gtk_spin_button_new_with_range (1., 1.e12, 1.);
04697 window->label_estimates
04698     = (GtkLabel *) gtk_label_new (gettext ("Gradient estimates number"));
04699 window->spin_estimates = (GtkSpinButton *)
04700     gtk_spin_button_new_with_range (1., 1.e3, 1.);
04701 window->label_relaxation
04702     = (GtkLabel *) gtk_label_new (gettext ("Relaxation parameter"));
04703 window->spin_relaxation = (GtkSpinButton *)
04704     gtk_spin_button_new_with_range (0., 2., 0.001);
04705 gtk_grid_attach (window->grid_gradient, GTK_WIDGET (window->
04706     label_steps),
04707     0, NGRADIENTS, 1, 1);
04708 gtk_grid_attach (window->grid_gradient, GTK_WIDGET (window->
04709     spin_steps),
04710     1, NGRADIENTS, 1, 1);
04711 gtk_grid_attach (window->grid_gradient, GTK_WIDGET (window->
04712     label_estimates),
04713     0, NGRADIENTS + 1, 1, 1);
04714 gtk_grid_attach (window->grid_gradient, GTK_WIDGET (window->
04715     spin_estimates),
04716     1, NGRADIENTS + 1, 1, 1);
04717 gtk_grid_attach (window->grid_gradient, GTK_WIDGET (window->
04718     label_relaxation),
04719     0, NGRADIENTS + 2, 1, 1);
04720 gtk_grid_attach (window->grid_gradient, GTK_WIDGET (window->
04721     spin_relaxation),
04722     1, NGRADIENTS + 2, 1, 1);
04723
04724 // Creating the array of algorithms
04725 window->grid_algorithm = (GtkGrid *) gtk_grid_new ();
04726 window->button_algorithm[0] = (GtkRadioButton *)
04727     gtk_radio_button_new_with_mnemonic (NULL, label_algorithm[0]);
04728 gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[0]),
04729     tip_algorithm[0]);
04730 gtk_grid_attach (window->grid_algorithm,

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04726         GTK_WIDGET (window->button_algorithm[0]), 0, 0, 1, 1);
04727 g_signal_connect (window->button_algorithm[0], "clicked",
04728                 window_set_algorithm, NULL);
04729 for (i = 0; ++i < NALGORITHMS;)
04730 {
04731     window->button_algorithm[i] = (GtkRadioButton *)
04732     gtk_radio_button_new_with_mnemonic
04733     (gtk_radio_button_get_group (window->button_algorithm[0]),
04734      label_algorithm[i]);
04735     gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_algorithm[i]),
04736                                 tip_algorithm[i]);
04737     gtk_grid_attach (window->grid_algorithm,
04738                     GTK_WIDGET (window->button_algorithm[i]), 0, i, 1, 1);
04739     g_signal_connect (window->button_algorithm[i], "clicked",
04740                     window_set_algorithm, NULL);
04741 }
04742 gtk_grid_attach (window->grid_algorithm,
04743                 GTK_WIDGET (window->label_simulations), 0,
04744                 NALGORITHMS, 1, 1);
04745 gtk_grid_attach (window->grid_algorithm,
04746                 GTK_WIDGET (window->spin_simulations), 1, NALGORITHMS, 1, 1);
04747 gtk_grid_attach (window->grid_algorithm,
04748                 GTK_WIDGET (window->label_iterations), 0,
04749                 NALGORITHMS + 1, 1, 1);
04750 gtk_grid_attach (window->grid_algorithm,
04751                 GTK_WIDGET (window->spin_iterations), 1,
04752                 NALGORITHMS + 1, 1, 1);
04753 gtk_grid_attach (window->grid_algorithm,
04754                 GTK_WIDGET (window->label_tolerance), 0,
04755                 NALGORITHMS + 2, 1, 1);
04756 gtk_grid_attach (window->grid_algorithm,
04757                 GTK_WIDGET (window->spin_tolerance), 1,
04758                 NALGORITHMS + 2, 1, 1);
04759 gtk_grid_attach (window->grid_algorithm,
04760                 GTK_WIDGET (window->label_bests), 0, NALGORITHMS + 3, 1, 1);
04761 gtk_grid_attach (window->grid_algorithm,
04762                 GTK_WIDGET (window->spin_bests), 1, NALGORITHMS + 3, 1, 1);
04763 gtk_grid_attach (window->grid_algorithm,
04764                 GTK_WIDGET (window->label_population), 0,
04765                 NALGORITHMS + 4, 1, 1);
04766 gtk_grid_attach (window->grid_algorithm,
04767                 GTK_WIDGET (window->spin_population), 1,
04768                 NALGORITHMS + 4, 1, 1);
04769 gtk_grid_attach (window->grid_algorithm,
04770                 GTK_WIDGET (window->label_generations), 0,
04771                 NALGORITHMS + 5, 1, 1);
04772 gtk_grid_attach (window->grid_algorithm,
04773                 GTK_WIDGET (window->spin_generations), 1,
04774                 NALGORITHMS + 5, 1, 1);
04775 gtk_grid_attach (window->grid_algorithm,
04776                 GTK_WIDGET (window->label_mutation), 0,
04777                 NALGORITHMS + 6, 1, 1);
04778 gtk_grid_attach (window->grid_algorithm,
04779                 GTK_WIDGET (window->spin_mutation), 1,
04780                 NALGORITHMS + 6, 1, 1);
04781 gtk_grid_attach (window->grid_algorithm,
04782                 GTK_WIDGET (window->label_reproduction), 0,
04783                 NALGORITHMS + 7, 1, 1);
04784 gtk_grid_attach (window->grid_algorithm,
04785                 GTK_WIDGET (window->spin_reproduction), 1,
04786                 NALGORITHMS + 7, 1, 1);
04787 gtk_grid_attach (window->grid_algorithm,
04788                 GTK_WIDGET (window->label_adaptation), 0,
04789                 NALGORITHMS + 8, 1, 1);
04790 gtk_grid_attach (window->grid_algorithm,
04791                 GTK_WIDGET (window->spin_adaptation), 1,
04792                 NALGORITHMS + 8, 1, 1);
04793 gtk_grid_attach (window->grid_algorithm,
04794                 GTK_WIDGET (window->check_gradient), 0,
04795                 NALGORITHMS + 9, 2, 1);
04796 gtk_grid_attach (window->grid_algorithm,
04797                 GTK_WIDGET (window->grid_gradient), 0,
04798                 NALGORITHMS + 10, 2, 1);
04799 window->frame_algorithm = (GtkFrame *) gtk_frame_new (gettext ("Algorithm"));
04800 gtk_container_add (GTK_CONTAINER (window->frame_algorithm),
04801                 GTK_WIDGET (window->grid_algorithm));
04802
04803 // Creating the variable widgets
04804 window->combo_variable = (GtkComboBoxText *) gtk_combo_box_text_new ();
04805 gtk_widget_set_tooltip_text
04806     (GTK_WIDGET (window->combo_variable), gettext ("Variables selector"));
04807 window->id_variable = g_signal_connect
04808     (window->combo_variable, "changed", window_set_variable, NULL);
04809 window->button_add_variable
04810     = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
04811     GTK_ICON_SIZE_BUTTON);
04812 g_signal_connect

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04813     (window->button_add_variable, "clicked",
window_add_variable, NULL);
04814     gtk_widget_set_tooltip_text
04815     (GTK_WIDGET (window->button_add_variable), gettext ("Add variable"));
04816     window->button_remove_variable
04817     = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
04818     GTK_ICON_SIZE_BUTTON);
04819     g_signal_connect
04820     (window->button_remove_variable, "clicked",
window_remove_variable, NULL);
04821     gtk_widget_set_tooltip_text
04822     (GTK_WIDGET (window->button_remove_variable), gettext ("Remove variable"));
04823     window->label_variable = (GtkLabel *) gtk_label_new (gettext ("Name"));
04824     window->entry_variable = (GtkEntry *) gtk_entry_new ();
04825     gtk_widget_set_tooltip_text
04826     (GTK_WIDGET (window->entry_variable), gettext ("Variable name"));
04827     window->id_variable_label = g_signal_connect
04828     (window->entry_variable, "changed", window_label_variable, NULL);
04829     window->label_min = (GtkLabel *) gtk_label_new (gettext ("Minimum"));
04830     window->spin_min = (GtkSpinButton *) gtk_spin_button_new_with_range
04831     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
04832     gtk_widget_set_tooltip_text
04833     (GTK_WIDGET (window->spin_min),
04834     gettext ("Minimum initial value of the variable"));
04835     window->scrolled_min
04836     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
04837     gtk_container_add (GTK_CONTAINER (window->scrolled_min),
04838     GTK_WIDGET (window->spin_min));
04839     g_signal_connect (window->spin_min, "value-changed",
04840     window_rangemin_variable, NULL);
04841     window->label_max = (GtkLabel *) gtk_label_new (gettext ("Maximum"));
04842     window->spin_max = (GtkSpinButton *) gtk_spin_button_new_with_range
04843     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
04844     gtk_widget_set_tooltip_text
04845     (GTK_WIDGET (window->spin_max),
04846     gettext ("Maximum initial value of the variable"));
04847     window->scrolled_max
04848     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
04849     gtk_container_add (GTK_CONTAINER (window->scrolled_max),
04850     GTK_WIDGET (window->spin_max));
04851     g_signal_connect (window->spin_max, "value-changed",
04852     window_rangemax_variable, NULL);
04853     window->check_minabs = (GtkCheckButton *)
04854     gtk_check_button_new_with_mnemonic (gettext ("Absolute minimum"));
04855     g_signal_connect (window->check_minabs, "toggled", window_update, NULL);
04856     window->spin_minabs = (GtkSpinButton *) gtk_spin_button_new_with_range
04857     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
04858     gtk_widget_set_tooltip_text
04859     (GTK_WIDGET (window->spin_minabs),
04860     gettext ("Minimum allowed value of the variable"));
04861     window->scrolled_minabs
04862     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
04863     gtk_container_add (GTK_CONTAINER (window->scrolled_minabs),
04864     GTK_WIDGET (window->spin_minabs));
04865     g_signal_connect (window->spin_minabs, "value-changed",
04866     window_rangeminabs_variable, NULL);
04867     window->check_maxabs = (GtkCheckButton *)
04868     gtk_check_button_new_with_mnemonic (gettext ("Absolute maximum"));
04869     g_signal_connect (window->check_maxabs, "toggled", window_update, NULL);
04870     window->spin_maxabs = (GtkSpinButton *) gtk_spin_button_new_with_range
04871     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
04872     gtk_widget_set_tooltip_text
04873     (GTK_WIDGET (window->spin_maxabs),
04874     gettext ("Maximum allowed value of the variable"));
04875     window->scrolled_maxabs
04876     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
04877     gtk_container_add (GTK_CONTAINER (window->scrolled_maxabs),
04878     GTK_WIDGET (window->spin_maxabs));
04879     g_signal_connect (window->spin_maxabs, "value-changed",
04880     window_rangemaxabs_variable, NULL);
04881     window->label_precision
04882     = (GtkLabel *) gtk_label_new (gettext ("Precision digits"));
04883     window->spin_precision = (GtkSpinButton *)
04884     gtk_spin_button_new_with_range (0., (gdouble) DEFAULT_PRECISION, 1.);
04885     gtk_widget_set_tooltip_text
04886     (GTK_WIDGET (window->spin_precision),
04887     gettext ("Number of precision floating point digits\n"
04888     "0 is for integer numbers"));
04889     g_signal_connect (window->spin_precision, "value-changed",
04890     window_precision_variable, NULL);
04891     window->label_sweeps = (GtkLabel *) gtk_label_new (gettext ("Sweeps number"));
04892     window->spin_sweeps
04893     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
04894     gtk_widget_set_tooltip_text
04895     (GTK_WIDGET (window->spin_sweeps),
04896     gettext ("Number of steps sweeping the variable"));
04897     g_signal_connect

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04898     (window->spin_sweeps, "value-changed", window_update_variable, NULL);
04899 window->label_bits = (GtkLabel *) gtk_label_new (gettext ("Bits number"));
04900 window->spin_bits
04901     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
04902 gtk_widget_set_tooltip_text
04903     (GTK_WIDGET (window->spin_bits),
04904      gettext ("Number of bits to encode the variable"));
04905 g_signal_connect
04906     (window->spin_bits, "value-changed", window_update_variable, NULL);
04907 window->label_step = (GtkLabel *) gtk_label_new (gettext ("Step size"));
04908 window->spin_step = (GtkSpinButton *) gtk_spin_button_new_with_range
04909     (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
04910 gtk_widget_set_tooltip_text
04911     (GTK_WIDGET (window->spin_step),
04912      gettext ("Initial step size for the gradient based method"));
04913 window->scrolled_step
04914     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
04915 gtk_container_add (GTK_CONTAINER (window->scrolled_step),
04916                    GTK_WIDGET (window->spin_step));
04917 g_signal_connect
04918     (window->spin_step, "value-changed", window_step_variable, NULL);
04919 window->grid_variable = (GtkGrid *) gtk_grid_new ();
04920 gtk_grid_attach (window->grid_variable,
04921                 GTK_WIDGET (window->combo_variable), 0, 0, 2, 1);
04922 gtk_grid_attach (window->grid_variable,
04923                 GTK_WIDGET (window->button_add_variable), 2, 0, 1, 1);
04924 gtk_grid_attach (window->grid_variable,
04925                 GTK_WIDGET (window->button_remove_variable), 3, 0, 1, 1);
04926 gtk_grid_attach (window->grid_variable,
04927                 GTK_WIDGET (window->label_variable), 0, 1, 1, 1);
04928 gtk_grid_attach (window->grid_variable,
04929                 GTK_WIDGET (window->entry_variable), 1, 1, 3, 1);
04930 gtk_grid_attach (window->grid_variable,
04931                 GTK_WIDGET (window->label_min), 0, 2, 1, 1);
04932 gtk_grid_attach (window->grid_variable,
04933                 GTK_WIDGET (window->scrolled_min), 1, 2, 3, 1);
04934 gtk_grid_attach (window->grid_variable,
04935                 GTK_WIDGET (window->label_max), 0, 3, 1, 1);
04936 gtk_grid_attach (window->grid_variable,
04937                 GTK_WIDGET (window->scrolled_max), 1, 3, 3, 1);
04938 gtk_grid_attach (window->grid_variable,
04939                 GTK_WIDGET (window->check_minabs), 0, 4, 1, 1);
04940 gtk_grid_attach (window->grid_variable,
04941                 GTK_WIDGET (window->scrolled_minabs), 1, 4, 3, 1);
04942 gtk_grid_attach (window->grid_variable,
04943                 GTK_WIDGET (window->check_maxabs), 0, 5, 1, 1);
04944 gtk_grid_attach (window->grid_variable,
04945                 GTK_WIDGET (window->scrolled_maxabs), 1, 5, 3, 1);
04946 gtk_grid_attach (window->grid_variable,
04947                 GTK_WIDGET (window->label_precision), 0, 6, 1, 1);
04948 gtk_grid_attach (window->grid_variable,
04949                 GTK_WIDGET (window->spin_precision), 1, 6, 3, 1);
04950 gtk_grid_attach (window->grid_variable,
04951                 GTK_WIDGET (window->label_sweeps), 0, 7, 1, 1);
04952 gtk_grid_attach (window->grid_variable,
04953                 GTK_WIDGET (window->spin_sweeps), 1, 7, 3, 1);
04954 gtk_grid_attach (window->grid_variable,
04955                 GTK_WIDGET (window->label_bits), 0, 8, 1, 1);
04956 gtk_grid_attach (window->grid_variable,
04957                 GTK_WIDGET (window->spin_bits), 1, 8, 3, 1);
04958 gtk_grid_attach (window->grid_variable,
04959                 GTK_WIDGET (window->label_step), 0, 9, 1, 1);
04960 gtk_grid_attach (window->grid_variable,
04961                 GTK_WIDGET (window->scrolled_step), 1, 9, 3, 1);
04962 window->frame_variable = (GtkFrame *) gtk_frame_new (gettext ("Variable"));
04963 gtk_container_add (GTK_CONTAINER (window->frame_variable),
04964                    GTK_WIDGET (window->grid_variable));
04965
04966 // Creating the experiment widgets
04967 window->combo_experiment = (GtkComboBoxText *) gtk_combo_box_text_new ();
04968 gtk_widget_set_tooltip_text (GTK_WIDGET (window->combo_experiment),
04969                              gettext ("Experiment selector"));
04970 window->id_experiment = g_signal_connect
04971     (window->combo_experiment, "changed", window_set_experiment, NULL)
;
04972 window->button_add_experiment
04973     = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
04974                                                    GTK_ICON_SIZE_BUTTON);
04975 g_signal_connect
04976     (window->button_add_experiment, "clicked",
window_add_experiment, NULL);
04977 gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_experiment),
04978                              gettext ("Add experiment"));
04979 window->button_remove_experiment
04980     = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
04981                                                    GTK_ICON_SIZE_BUTTON);
04982 g_signal_connect (window->button_remove_experiment, "clicked",

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04983         window_remove_experiment, NULL);
04984     gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_remove_experiment),
04985         gettext ("Remove experiment"));
04986     window->label_experiment
04987     = (GtkLabel *) gtk_label_new (gettext ("Experimental data file"));
04988     window->button_experiment = (GtkFileChooserButton *)
04989     gtk_file_chooser_button_new (gettext ("Experimental data file"),
04990         GTK_FILE_CHOOSER_ACTION_OPEN);
04991     gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_experiment),
04992         gettext ("Experimental data file"));
04993     window->id_experiment_name
04994     = g_signal_connect (window->button_experiment, "selection-changed",
04995         window_name_experiment, NULL);
04996     window->label_weight = (GtkLabel *) gtk_label_new (gettext ("Weight"));
04997     window->spin_weight
04998     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
04999     gtk_widget_set_tooltip_text
05000     (GTK_WIDGET (window->spin_weight),
05001         gettext ("Weight factor to build the objective function"));
05002     g_signal_connect
05003     (window->spin_weight, "value-changed", window_weight_experiment,
05004     NULL);
05005     window->grid_experiment = (GtkGrid *) gtk_grid_new ();
05006     gtk_grid_attach (window->grid_experiment,
05007         GTK_WIDGET (window->combo_experiment), 0, 0, 2, 1);
05008     gtk_grid_attach (window->grid_experiment,
05009         GTK_WIDGET (window->button_add_experiment), 2, 0, 1, 1);
05010     gtk_grid_attach (window->grid_experiment,
05011         GTK_WIDGET (window->button_remove_experiment), 3, 0, 1, 1);
05012     gtk_grid_attach (window->grid_experiment,
05013         GTK_WIDGET (window->label_experiment), 0, 1, 1, 1);
05014     gtk_grid_attach (window->grid_experiment,
05015         GTK_WIDGET (window->button_experiment), 1, 1, 3, 1);
05016     gtk_grid_attach (window->grid_experiment,
05017         GTK_WIDGET (window->label_weight), 0, 2, 1, 1);
05018     gtk_grid_attach (window->grid_experiment,
05019         GTK_WIDGET (window->spin_weight), 1, 2, 3, 1);
05020     for (i = 0; i < MAX_NINPUTS; ++i)
05021     {
05022         snprintf (buffer3, 64, "%s %u", gettext ("Input template"), i + 1);
05023         window->check_template[i] = (GtkCheckButton *)
05024         gtk_check_button_new_with_label (buffer3);
05025         window->id_template[i]
05026         = g_signal_connect (window->check_template[i], "toggled",
05027             window_inputs_experiment, NULL);
05028         gtk_grid_attach (window->grid_experiment,
05029             GTK_WIDGET (window->check_template[i]), 0, 3 + i, 1, 1);
05030         window->button_template[i] = (GtkFileChooserButton *)
05031         gtk_file_chooser_button_new (gettext ("Input template"),
05032             GTK_FILE_CHOOSER_ACTION_OPEN);
05033         gtk_widget_set_tooltip_text
05034         (GTK_WIDGET (window->button_template[i]),
05035             gettext ("Experimental input template file"));
05036         window->id_input[i]
05037         = g_signal_connect_swapped (window->button_template[i],
05038             "selection-changed",
05039             (void (*)(void *)) window_template_experiment,
05040             (void *) (size_t) i);
05041         gtk_grid_attach (window->grid_experiment,
05042             GTK_WIDGET (window->button_template[i]), 1, 3 + i, 3, 1);
05043     }
05044     window->frame_experiment
05045     = (GtkFrame *) gtk_frame_new (gettext ("Experiment"));
05046     gtk_container_add (GTK_CONTAINER (window->frame_experiment),
05047         GTK_WIDGET (window->grid_experiment));
05048     // Creating the error norm widgets
05049     window->frame_norm = (GtkFrame *) gtk_frame_new (gettext ("Error norm"));
05050     window->grid_norm = (GtkGrid *) gtk_grid_new ();
05051     gtk_container_add (GTK_CONTAINER (window->frame_norm),
05052         GTK_WIDGET (window->grid_norm));
05053     window->button_norm[0] = (GtkRadioButton *)
05054     gtk_radio_button_new_with_mnemonic (NULL, label_norm[0]);
05055     gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[0]),
05056         tip_norm[0]);
05057     gtk_grid_attach (window->grid_norm,
05058         GTK_WIDGET (window->button_norm[0]), 0, 0, 1, 1);
05059     g_signal_connect (window->button_norm[0], "clicked", window_update, NULL);
05060     for (i = 0; ++i < NNORMS;)
05061     {
05062         window->button_norm[i] = (GtkRadioButton *)
05063         gtk_radio_button_new_with_mnemonic
05064         (gtk_radio_button_get_group (window->button_norm[0]),
05065             label_norm[i]);
05066         gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_norm[i]),
05067             tip_norm[i]);
05068         gtk_grid_attach (window->grid_norm,

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05069         GTK_WIDGET (window->button_norm[i]), 0, i, 1, 1);
05070     g_signal_connect (window->button_norm[i], "clicked",
window_update, NULL);
05071 }
05072     window->label_p = (GtkLabel *) gtk_label_new (gettext ("P parameter"));
05073     gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->label_p),
05074         1, 0, 1, 2);
05075     window->spin_p = (GtkSpinButton *)
05076     gtk_spin_button_new_with_range (-G_MAXDOUBLE, G_MAXDOUBLE, 0.01);
05077     gtk_widget_set_tooltip_text
05078     (GTK_WIDGET (window->spin_p), gettext ("P parameter for the P error norm"));
05079     window->scrolled_p
05080     = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
05081     gtk_container_add (GTK_CONTAINER (window->scrolled_p),
05082         GTK_WIDGET (window->spin_p));
05083     gtk_widget_set_hexpand (GTK_WIDGET (window->scrolled_p), TRUE);
05084     gtk_widget_set_halign (GTK_WIDGET (window->scrolled_p), GTK_ALIGN_FILL);
05085     gtk_grid_attach (window->grid_norm, GTK_WIDGET (window->scrolled_p),
05086         2, 0, 1, 2);
05087
05088     // Creating the grid and attaching the widgets to the grid
05089     window->grid = (GtkGrid *) gtk_grid_new ();
05090     gtk_grid_attach (window->grid, GTK_WIDGET (window->bar_buttons), 0, 0, 3, 1);
05091     gtk_grid_attach (window->grid, GTK_WIDGET (window->grid_files), 0, 1, 1, 1);
05092     gtk_grid_attach (window->grid,
05093         GTK_WIDGET (window->frame_algorithm), 0, 2, 1, 1);
05094     gtk_grid_attach (window->grid,
05095         GTK_WIDGET (window->frame_variable), 1, 2, 1, 1);
05096     gtk_grid_attach (window->grid,
05097         GTK_WIDGET (window->frame_experiment), 2, 2, 1, 1);
05098     gtk_grid_attach (window->grid,
05099         GTK_WIDGET (window->frame_norm), 1, 1, 2, 1);
05100     gtk_container_add (GTK_CONTAINER (window->window), GTK_WIDGET (window->
grid));
05101
05102     // Setting the window logo
05103     window->logo = gdk_pixbuf_new_from_xpm_data (logo);
05104     gtk_window_set_icon (window->window, window->logo);
05105
05106     // Showing the window
05107     gtk_widget_show_all (GTK_WIDGET (window->window));
05108
05109     // In GTK+ 3.16 and 3.18 the default scrolled size is wrong
05110     #if GTK_MINOR_VERSION >= 16
05111     gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_min), -1, 40);
05112     gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_max), -1, 40);
05113     gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_minabs), -1, 40);
05114     gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_maxabs), -1, 40);
05115     gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_step), -1, 40);
05116     gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_p), -1, 40);
05117     #endif
05118
05119     // Reading initial example
05120     input_new ();
05121     buffer2 = g_get_current_dir ();
05122     buffer = g_build_filename (buffer2, "..", "tests", "test1", INPUT_FILE, NULL);
05123     g_free (buffer2);
05124     window_read (buffer);
05125     g_free (buffer);
05126
05127     #if DEBUG
05128     fprintf (stderr, "window_new: start\n");
05129     #endif
05130 }
05131
05132 #endif
05133
05134 int
05140 cores_number ()
05141 {
05142     #ifdef G_OS_WIN32
05143     SYSTEM_INFO sysinfo;
05144     GetSystemInfo (&sysinfo);
05145     return sysinfo.dwNumberOfProcessors;
05146     #else
05147     return (int) sysconf (_SC_NPROCESSORS_ONLN);
05148     #endif
05149 }
05150
05160 int
05161 main (int argc, char **argv)
05162 {
05163     #if HAVE_GTK
05164     char *buffer;
05165     #endif
05166
05167     // Starting pseudo-random numbers generator

```



```

05168     calibrate->rng = gsl_rng_alloc (gsl_rng_taus2);
05169     calibrate->seed = DEFAULT_RANDOM_SEED;
05170
05171     // Allowing spaces in the XML data file
05172     xmlKeepBlanksDefault (0);
05173
05174     // Starting MPI
05175     #if HAVE_MPI
05176         MPI_Init (&argn, &argc);
05177         MPI_Comm_size (MPI_COMM_WORLD, &ntasks);
05178         MPI_Comm_rank (MPI_COMM_WORLD, &calibrate->mpi_rank);
05179         printf ("rank=%d tasks=%d\n", calibrate->mpi_rank, ntasks);
05180     #else
05181         ntasks = 1;
05182     #endif
05183
05184     #if HAVE_GTK
05185
05186         // Getting threads number
05187         nthreads_gradient = nthreads = cores_number ();
05188
05189         // Setting local language and international floating point numbers notation
05190         setlocale (LC_ALL, "");
05191         setlocale (LC_NUMERIC, "C");
05192         window->application_directory = g_get_current_dir ();
05193         buffer = g_build_filename (window->application_directory,
05194                                   LOCALE_DIR, NULL);
05194         bindtextdomain (PROGRAM_INTERFACE, buffer);
05195         bind_textdomain_codeset (PROGRAM_INTERFACE, "UTF-8");
05196         textdomain (PROGRAM_INTERFACE);
05197
05198         // Initing GTK+
05199         gtk_disable_setlocale ();
05200         gtk_init (&argn, &argc);
05201
05202         // Opening the main window
05203         window_new ();
05204         gtk_main ();
05205
05206         // Freeing memory
05207         input_free ();
05208         g_free (buffer);
05209         gtk_widget_destroy (GTK_WIDGET (window->window));
05210         g_free (window->application_directory);
05211
05212     #else
05213
05214         // Checking syntax
05215         if (!(argn == 2 || (argn == 4 && !strcmp (argc[1], "-nthreads"))))
05216         {
05217             printf ("The syntax is:\nmpcotoolbin [-nthreads x] data_file\n");
05218             return 1;
05219         }
05220
05221         // Getting threads number
05222         if (argn == 2)
05223             nthreads_gradient = nthreads = cores_number ();
05224         else
05225         {
05226             nthreads_gradient = nthreads = atoi (argc[2]);
05227             if (!nthreads)
05228             {
05229                 printf ("Bad threads number\n");
05230                 return 2;
05231             }
05232         }
05233         printf ("nthreads=%u\n", nthreads);
05234
05235         // Making calibration
05236         if (input_open (argc[argn - 1]))
05237             calibrate_open ();
05238
05239         // Freeing memory
05240         calibrate_free ();
05241
05242     #endif
05243
05244     // Closing MPI
05245     #if HAVE_MPI
05246         MPI_Finalize ();
05247     #endif
05248
05249     // Freeing memory
05250     gsl_rng_free (calibrate->rng);
05251
05252     // Closing
05253     return 0;

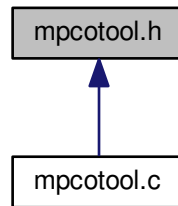
```

```
05254 }
```

## 5.7 mpcotool.h File Reference

Header file of the mpcotool.

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



### Data Structures

- struct [Input](#)  
*Struct to define the calibration input file.*
- struct [Calibrate](#)  
*Struct to define the calibration data.*
- struct [ParallelData](#)  
*Struct to pass to the GThreads parallelized function.*

### Enumerations

- enum [Algorithm](#) { [ALGORITHM\\_MONTE\\_CARLO](#) = 0, [ALGORITHM\\_SWEEP](#) = 1, [ALGORITHM\\_GENETIC](#) = 2 }  
*Enum to define the algorithms.*
- enum [GradientMethod](#) { [GRADIENT\\_METHOD\\_COORDINATES](#) = 0, [GRADIENT\\_METHOD\\_RANDOM](#) = 1 }  
*Enum to define the methods to estimate the gradient.*
- 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 [show\\_message](#) (char \*title, char \*msg, int type)  
*Function to show a dialog with a message.*
- void [show\\_error](#) (char \*msg)  
*Function to show a dialog with an error message.*
- int [xml\\_node\\_get\\_int](#) (xmlNode \*node, const xmlChar \*prop, int \*error\_code)  
*Function to get an integer number of a XML node property.*

- unsigned int [xml\\_node\\_get\\_uint](#) (xmlNode \*node, const xmlChar \*prop, int \*error\_code)  
*Function to get an unsigned integer number of a XML node property.*
- unsigned int [xml\\_node\\_get\\_uint\\_with\\_default](#) (xmlNode \*node, const xmlChar \*prop, unsigned int default\_value, int \*error\_code)  
*Function to get an unsigned integer number of a XML node property with a default value.*
- double [xml\\_node\\_get\\_float](#) (xmlNode \*node, const xmlChar \*prop, int \*error\_code)  
*Function to get a floating point number of a XML node property.*
- double [xml\\_node\\_get\\_float\\_with\\_default](#) (xmlNode \*node, const xmlChar \*prop, double default\_value, int \*error\_code)  
*Function to get a floating point number of a XML node property with a default value.*
- void [xml\\_node\\_set\\_int](#) (xmlNode \*node, const xmlChar \*prop, int value)  
*Function to set an integer number in a XML node property.*
- void [xml\\_node\\_set\\_uint](#) (xmlNode \*node, const xmlChar \*prop, unsigned int value)  
*Function to set an unsigned integer number in a XML node property.*
- void [xml\\_node\\_set\\_float](#) (xmlNode \*node, const xmlChar \*prop, double value)  
*Function to set a floating point number in a XML node property.*
- void [input\\_new](#) ()  
*Function to create a new [Input](#) struct.*
- void [input\\_free](#) ()  
*Function to free the memory of the input file data.*
- int [input\\_open](#) (char \*filename)  
*Function to open the input file.*
- void [calibrate\\_input](#) (unsigned int simulation, char \*input, GMappedFile \*template)  
*Function to write the simulation input file.*
- double [calibrate\\_parse](#) (unsigned int simulation, unsigned int experiment)  
*Function to parse input files, simulating and calculating the \ objective function.*
- void [calibrate\\_print](#) ()  
*Function to print the results.*
- void [calibrate\\_save\\_variables](#) (unsigned int simulation, double error)  
*Function to save in a file the variables and the error.*
- void [calibrate\\_best](#) (unsigned int simulation, double value)  
*Function to save the best simulations.*
- void [calibrate\\_sequential](#) ()  
*Function to calibrate sequentially.*
- void \* [calibrate\\_thread](#) ([ParallelData](#) \*data)  
*Function to calibrate on a thread.*
- void [calibrate\\_merge](#) (unsigned int nsaveds, unsigned int \*simulation\_best, double \*error\_best)  
*Function to merge the 2 calibration results.*
- void [calibrate\\_synchronise](#) ()  
*Function to synchronise the calibration results of MPI tasks.*
- void [calibrate\\_sweep](#) ()  
*Function to calibrate with the sweep algorithm.*
- void [calibrate\\_MonteCarlo](#) ()  
*Function to calibrate with the Monte-Carlo algorithm.*
- void [calibrate\\_best\\_gradient](#) (unsigned int simulation, double value)  
*Function to save the best simulation in a gradient based method.*
- void [calibrate\\_gradient\\_sequential](#) ()
- void \* [calibrate\\_gradient\\_thread](#) ([ParallelData](#) \*data)  
*Function to estimate the gradient on a thread.*
- double [calibrate\\_variable\\_step\\_gradient](#) (unsigned int variable)
- void [calibrate\\_step\\_gradient](#) (unsigned int simulation)

- Function to do a step of the gradient based method.*

  - void [calibrate\\_gradient](#) ()
- Function to calibrate with a gradient based method.*

  - double [calibrate\\_genetic\\_objective](#) (Entity \*entity)
- Function to calculate the objective function of an entity.*

  - void [calibrate\\_genetic](#) ()
- Function to calibrate with the genetic algorithm.*

  - void [calibrate\\_save\\_old](#) ()
- Function to save the best results on iterative methods.*

  - void [calibrate\\_merge\\_old](#) ()
- Function to merge the best results with the previous step best results on iterative methods.*

  - void [calibrate\\_refine](#) ()
- Function to refine the search ranges of the variables in iterative algorithms.*

  - void [calibrate\\_step](#) ()
- Function to do a step of the iterative algorithm.*

  - void [calibrate\\_iterate](#) ()
- Function to iterate the algorithm.*

  - void [calibrate\\_open](#) ()
- Function to open and perform a calibration.*

### 5.7.1 Detailed Description

Header file of the mpcotool.

#### Authors

Javier Burguete.

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Definition in file [mpcotool.h](#).

### 5.7.2 Enumeration Type Documentation

#### 5.7.2.1 enum Algorithm

Enum to define the algorithms.

#### Enumerator

**ALGORITHM\_MONTE\_CARLO** Monte-Carlo algorithm.

**ALGORITHM\_SWEEP** Sweep algorithm.

**ALGORITHM\_GENETIC** Genetic algorithm.

Definition at line 43 of file [mpcotool.h](#).

```
00044 {
00045     ALGORITHM_MONTE_CARLO = 0,
00046     ALGORITHM_SWEEP = 1,
00047     ALGORITHM_GENETIC = 2
00048 };
```

## 5.7.2.2 enum ErrorNorm

Enum to define the error norm.

Enumerator

**ERROR\_NORM\_EUCLIDIAN** Euclidian norm:  $\sqrt{\sum_i (w_i x_i)^2}$ .  
**ERROR\_NORM\_MAXIMUM** Maximum norm:  $\max_i |w_i x_i|$ .  
**ERROR\_NORM\_P** P-norm  $\sqrt[p]{\sum_i |w_i x_i|^p}$ .  
**ERROR\_NORM\_TAXICAB** Taxicab norm  $\sum_i |w_i x_i|$ .

Definition at line 64 of file [mpcotool.h](#).

```
00065 {
00066     ERROR_NORM_EUCLIDIAN = 0,
00068     ERROR_NORM_MAXIMUM = 1,
00070     ERROR_NORM_P = 2,
00072     ERROR_NORM_TAXICAB = 3
00074 };
```

## 5.7.2.3 enum GradientMethod

Enum to define the methods to estimate the gradient.

Enumerator

**GRADIENT\_METHOD\_COORDINATES** Coordinates descent method.  
**GRADIENT\_METHOD\_RANDOM** Random method.

Definition at line 54 of file [mpcotool.h](#).

```
00055 {
00056     GRADIENT_METHOD_COORDINATES = 0,
00057     GRADIENT_METHOD_RANDOM = 1,
00058 };
```

## 5.7.3 Function Documentation

5.7.3.1 void calibrate\_best ( unsigned int *simulation*, double *value* )

Function to save the best simulations.

Parameters

<i>simulation</i>	Simulation number.
<i>value</i>	Objective function value.

Definition at line 1610 of file [mpcotool.c](#).

```
01611 {
01612     unsigned int i, j;
01613     double e;
01614     #if DEBUG
01615         fprintf (stderr, "calibrate_best: start\n");
01616         fprintf (stderr, "calibrate_best: nsaveds=%u nbest=%u\n",
01617                 calibrate->nsaveds, calibrate->nbest);
01618     #endif
01619     if (calibrate->nsaveds < calibrate->nbest
01620         || value < calibrate->error_best[calibrate->nsaveds - 1])
01621     {
01622         if (calibrate->nsaveds < calibrate->nbest)
01623             ++calibrate->nsaveds;
01624         calibrate->error_best[calibrate->nsaveds - 1] = value;
01625         calibrate->simulation_best[calibrate->
```

```

    nsaveds - 1] = simulation;
01626     for (i = calibrate->nsaveds; --i;)
01627     {
01628         if (calibrate->error_best[i] < calibrate->
error_best[i - 1])
01629         {
01630             j = calibrate->simulation_best[i];
01631             e = calibrate->error_best[i];
01632             calibrate->simulation_best[i] = calibrate->
simulation_best[i - 1];
01633             calibrate->error_best[i] = calibrate->
error_best[i - 1];
01634             calibrate->simulation_best[i - 1] = j;
01635             calibrate->error_best[i - 1] = e;
01636         }
01637         else
01638             break;
01639     }
01640 }
01641 #if DEBUG
01642 fprintf (stderr, "calibrate_best: end\n");
01643 #endif
01644 }

```

### 5.7.3.2 void calibrate\_best\_gradient ( unsigned int *simulation*, double *value* )

Function to save the best simulation in a gradient based method.

#### Parameters

<i>simulation</i>	Simulation number.
<i>value</i>	Objective function value.

Definition at line 1919 of file [mpcotool.c](#).

```

01920 {
01921     #if DEBUG
01922     fprintf (stderr, "calibrate_best_gradient: start\n");
01923     fprintf (stderr,
01924             "calibrate_best_gradient: simulation=%u value=%.14le best=%.14le\n",
01925             simulation, value, calibrate->error_best[0]);
01926     #endif
01927     if (value < calibrate->error_best[0])
01928     {
01929         calibrate->error_best[0] = value;
01930         calibrate->simulation_best[0] = simulation;
01931     }
01932     #if DEBUG
01933     fprintf (stderr,
01934             "calibrate_best_gradient: BEST simulation=%u value=%.14le\n",
01935             simulation, value);
01936     #endif
01937     #if DEBUG
01938     fprintf (stderr, "calibrate_best_gradient: end\n");
01939     #endif
01940 }

```

### 5.7.3.3 double calibrate\_genetic\_objective ( Entity \* *entity* )

Function to calculate the objective function of an entity.

#### Parameters

<i>entity</i>	entity data.
---------------	--------------

#### Returns

objective function value.

Definition at line 2218 of file [mpcotool.c](#).

```

02219 {
02220     unsigned int j;
02221     double objective;
02222     char buffer[64];
02223     #if DEBUG
02224     fprintf (stderr, "calibrate_genetic_objective: start\n");
02225     #endif
02226     for (j = 0; j < calibrate->nvariables; ++j)
02227     {
02228         calibrate->value[entity->id * calibrate->nvariables + j]
02229         = genetic_get_variable (entity, calibrate->genetic_variable + j);
02230     }
02231     objective = calibrate_norm (entity->id);
02232     g_mutex_lock (mutex);
02233     for (j = 0; j < calibrate->nvariables; ++j)
02234     {
02235         snprintf (buffer, 64, "%s ", format[calibrate->precision[j]]);
02236         fprintf (calibrate->file_variables, buffer,
02237             genetic_get_variable (entity, calibrate->
02238                 genetic_variable + j));
02239     }
02240     fprintf (calibrate->file_variables, "%.14le\n", objective);
02241     g_mutex_unlock (mutex);
02242     #if DEBUG
02243     fprintf (stderr, "calibrate_genetic_objective: end\n");
02244     #endif
02245     return objective;
02246 }

```

#### 5.7.3.4 void\* calibrate\_gradient\_thread ( ParallelData \* data )

Function to estimate the gradient on a thread.

##### Parameters

<i>data</i>	Function data.
-------------	----------------

##### Returns

NULL

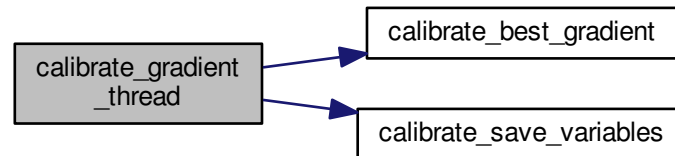
Definition at line 1982 of file mpcotool.c.

```

01983 {
01984     unsigned int i, thread;
01985     double e;
01986     #if DEBUG
01987     fprintf (stderr, "calibrate_gradient_thread: start\n");
01988     #endif
01989     thread = data->thread;
01990     #if DEBUG
01991     fprintf (stderr, "calibrate_gradient_thread: thread=%u start=%u end=%u\n",
01992         thread,
01993         calibrate->thread_gradient[thread],
01994         calibrate->thread_gradient[thread + 1]);
01995     #endif
01996     for (i = calibrate->thread_gradient[thread];
01997         i < calibrate->thread_gradient[thread + 1]; ++i)
01998     {
01999         e = calibrate_norm (i);
02000         g_mutex_lock (mutex);
02001         calibrate_best_gradient (i, e);
02002         calibrate_save_variables (i, e);
02003         g_mutex_unlock (mutex);
02004     }
02005     #if DEBUG
02006     fprintf (stderr, "calibrate_gradient_thread: i=%u e=%lg\n", i, e);
02007     #endif
02008     #if DEBUG
02009     fprintf (stderr, "calibrate_gradient_thread: end\n");
02010     #endif
02011     g_thread_exit (NULL);
02012     return NULL;
02013 }

```

Here is the call graph for this function:



#### 5.7.3.5 void calibrate\_input ( unsigned int *simulation*, char \* *input*, GMappedFile \* *template* )

Function to write the simulation input file.

##### Parameters

<i>simulation</i>	Simulation number.
<i>input</i>	Input file name.
<i>template</i>	Template of the input file name.

Definition at line 1252 of file [mpcotool.c](#).

```

01253 {
01254     unsigned int i;
01255     char buffer[32], value[32], *buffer2, *buffer3, *content;
01256     FILE *file;
01257     gsize length;
01258     GRegex *regex;
01259
01260     #if DEBUG
01261     fprintf (stderr, "calibrate_input: start\n");
01262     #endif
01263
01264     // Checking the file
01265     if (!template)
01266         goto calibrate_input_end;
01267
01268     // Opening template
01269     content = g_mapped_file_get_contents (template);
01270     length = g_mapped_file_get_length (template);
01271     #if DEBUG
01272     fprintf (stderr, "calibrate_input: length=%lu\ncontent:\n%s", length,
01273             content);
01274     #endif
01275     file = g_fopen (input, "w");
01276
01277     // Parsing template
01278     for (i = 0; i < calibrate->nvariables; ++i)
01279     {
01280     #if DEBUG
01281         fprintf (stderr, "calibrate_input: variable=%u\n", i);
01282     #endif
01283         snprintf (buffer, 32, "@variable%u@", i + 1);
01284         regex = g_regex_new (buffer, 0, 0, NULL);
01285         if (i == 0)
01286         {
01287             buffer2 = g_regex_replace_literal (regex, content, length, 0,
01288                                             calibrate->label[i], 0, NULL);
01289     #if DEBUG
01290             fprintf (stderr, "calibrate_input: buffer2\n%s", buffer2);
01291     #endif
01292         }
01293         else
01294         {
01295             length = strlen (buffer3);
01296             buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
01297                                             calibrate->label[i], 0, NULL);

```



```

01298         g_free (buffer3);
01299     }
01300     g_regex_unref (regex);
01301     length = strlen (buffer2);
01302     snprintf (buffer, 32, "@value%u@", i + 1);
01303     regex = g_regex_new (buffer, 0, 0, NULL);
01304     snprintf (value, 32, format[calibrate->precision[i]],
01305              calibrate->value[simulation * calibrate->
nvariables + i]);
01306
01307     #if DEBUG
01308         fprintf (stderr, "calibrate_input: value=%s\n", value);
01309     #endif
01310     buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
01311                                     0, NULL);
01312     g_free (buffer2);
01313     g_regex_unref (regex);
01314 }
01315
01316 // Saving input file
01317 fwrite (buffer3, strlen (buffer3), sizeof (char), file);
01318 g_free (buffer3);
01319 fclose (file);
01320
01321 calibrate_input_end:
01322 #if DEBUG
01323     fprintf (stderr, "calibrate_input: end\n");
01324 #endif
01325     return;
01326 }

```

### 5.7.3.6 void calibrate\_merge ( unsigned int nsaveds, unsigned int \* simulation\_best, double \* error\_best )

Function to merge the 2 calibration results.

#### Parameters

<i>nsaveds</i>	Number of saved results.
<i>simulation_best</i>	Array of best simulation numbers.
<i>error_best</i>	Array of best objective function values.

Definition at line 1724 of file [mpcotool.c](#).

```

01726 {
01727     unsigned int i, j, k, s[calibrate->nbest];
01728     double e[calibrate->nbest];
01729     #if DEBUG
01730         fprintf (stderr, "calibrate_merge: start\n");
01731     #endif
01732     i = j = k = 0;
01733     do
01734     {
01735         if (i == calibrate->nsaveds)
01736         {
01737             s[k] = simulation_best[j];
01738             e[k] = error_best[j];
01739             ++j;
01740             ++k;
01741             if (j == nsaveds)
01742                 break;
01743         }
01744         else if (j == nsaveds)
01745         {
01746             s[k] = calibrate->simulation_best[i];
01747             e[k] = calibrate->error_best[i];
01748             ++i;
01749             ++k;
01750             if (i == calibrate->nsaveds)
01751                 break;
01752         }
01753         else if (calibrate->error_best[i] > error_best[j])
01754         {
01755             s[k] = simulation_best[j];
01756             e[k] = error_best[j];
01757             ++j;
01758             ++k;
01759         }
01760         else
01761         {
01762             s[k] = calibrate->simulation_best[i];

```

```

01763         e[k] = calibrate->error_best[i];
01764         ++i;
01765         ++k;
01766     }
01767 }
01768 while (k < calibrate->nbest);
01769 calibrate->nsaveds = k;
01770 memcpy (calibrate->simulation_best, s, k * sizeof (unsigned int));
01771 memcpy (calibrate->error_best, e, k * sizeof (double));
01772 #if DEBUG
01773 fprintf (stderr, "calibrate_merge: end\n");
01774 #endif
01775 }

```

### 5.7.3.7 double calibrate\_parse ( unsigned int *simulation*, unsigned int *experiment* )

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

#### Parameters

<i>simulation</i>	Simulation number.
<i>experiment</i>	Experiment number.

#### Returns

Objective function value.

Definition at line 1339 of file [mpcotool.c](#).

```

01340 {
01341     unsigned int i;
01342     double e;
01343     char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
01344         *buffer3, *buffer4;
01345     FILE *file_result;
01346
01347 #if DEBUG
01348     fprintf (stderr, "calibrate_parse: start\n");
01349     fprintf (stderr, "calibrate_parse: simulation=%u experiment=%u\n", simulation,
01350             experiment);
01351 #endif
01352
01353     // Opening input files
01354     for (i = 0; i < calibrate->ninputs; ++i)
01355     {
01356         snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
01357 #if DEBUG
01358         fprintf (stderr, "calibrate_parse: i=%u input=%s\n", i, &input[i][0]);
01359 #endif
01360         calibrate_input (simulation, &input[i][0],
01361                         calibrate->file[i][experiment]);
01362     }
01363     for (; i < MAX_NINPUTS; ++i)
01364         strcpy (&input[i][0], "");
01365 #if DEBUG
01366     fprintf (stderr, "calibrate_parse: parsing end\n");
01367 #endif
01368
01369     // Performing the simulation
01370     snprintf (output, 32, "output-%u-%u", simulation, experiment);
01371     buffer2 = g_path_get_dirname (calibrate->simulator);
01372     buffer3 = g_path_get_basename (calibrate->simulator);
01373     buffer4 = g_build_filename (buffer2, buffer3, NULL);
01374     snprintf (buffer, 512, "%s\n" %s %s %s %s %s %s %s %s %s",
01375             buffer4, input[0], input[1], input[2], input[3], input[4], input[5],
01376             input[6], input[7], output);
01377     g_free (buffer4);
01378     g_free (buffer3);
01379     g_free (buffer2);
01380 #if DEBUG
01381     fprintf (stderr, "calibrate_parse: %s\n", buffer);
01382 #endif
01383     system (buffer);
01384
01385     // Checking the objective value function
01386     if (calibrate->evaluator)
01387     {
01388         snprintf (result, 32, "result-%u-%u", simulation, experiment);

```

```

01389     buffer2 = g_path_get_dirname (calibrate->evaluator);
01390     buffer3 = g_path_get_basename (calibrate->evaluator);
01391     buffer4 = g_build_filename (buffer2, buffer3, NULL);
01392     snprintf (buffer, 512, "\"%s\" %s %s %s",
01393              buffer4, output, calibrate->experiment[experiment], result);
01394     g_free (buffer4);
01395     g_free (buffer3);
01396     g_free (buffer2);
01397     #if DEBUG
01398     fprintf (stderr, "calibrate_parse: %s\n", buffer);
01399     #endif
01400     system (buffer);
01401     file_result = g_fopen (result, "r");
01402     e = atof (fgets (buffer, 512, file_result));
01403     fclose (file_result);
01404 }
01405 else
01406 {
01407     strcpy (result, "");
01408     file_result = g_fopen (output, "r");
01409     e = atof (fgets (buffer, 512, file_result));
01410     fclose (file_result);
01411 }
01412
01413 // Removing files
01414 #if !DEBUG
01415 for (i = 0; i < calibrate->ninputs; ++i)
01416 {
01417     if (calibrate->file[i][0])
01418     {
01419         snprintf (buffer, 512, RM " %s", &input[i][0]);
01420         system (buffer);
01421     }
01422 }
01423     snprintf (buffer, 512, RM " %s %s", output, result);
01424     system (buffer);
01425 #endif
01426
01427 #if DEBUG
01428 fprintf (stderr, "calibrate_parse: end\n");
01429 #endif
01430
01431 // Returning the objective function
01432 return e * calibrate->weight[experiment];
01433 }

```

Here is the call graph for this function:



#### 5.7.3.8 void calibrate\_save\_variables ( unsigned int *simulation*, double *error* )

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

##### Parameters

<i>simulation</i>	Simulation number.
<i>error</i>	Error value.

Definition at line 1582 of file [mpcotool.c](#).

```

01583 {
01584     unsigned int i;
01585     char buffer[64];
01586     #if DEBUG

```

```

01587     fprintf (stderr, "calibrate_save_variables: start\n");
01588 #endif
01589     for (i = 0; i < calibrate->nvariables; ++i)
01590     {
01591         snprintf (buffer, 64, "%s ", format[calibrate->precision[i]]);
01592         fprintf (calibrate->file_variables, buffer,
01593                 calibrate->value[simulation * calibrate->
01594                             nvariables + i]);
01595     }
01596     fprintf (calibrate->file_variables, "%.14le\n", error);
01597 #if DEBUG
01598     fprintf (stderr, "calibrate_save_variables: end\n");
01599 #endif
01600 }

```

### 5.7.3.9 void calibrate\_step\_gradient ( unsigned int *simulation* )

Function to do a step of the gradient based method.

#### Parameters

<i>simulation</i>	Simulation number.
-------------------	--------------------

Definition at line 2082 of file `mpcotool.c`.

```

02083 {
02084     GThread *thread[nthreads_gradient];
02085     ParallelData data[nthreads_gradient];
02086     unsigned int i, j, k, b;
02087 #if DEBUG
02088     fprintf (stderr, "calibrate_step_gradient: start\n");
02089 #endif
02090     for (i = 0; i < calibrate->nestimates; ++i)
02091     {
02092         k = (simulation + i) * calibrate->nvariables;
02093         b = calibrate->simulation_best[0] * calibrate->
02094             nvariables;
02095 #if DEBUG
02096         fprintf (stderr, "calibrate_step_gradient: simulation=%u best=%u\n",
02097                 simulation + i, calibrate->simulation_best[0]);
02098 #endif
02099         for (j = 0; j < calibrate->nvariables; ++j, ++k, ++b)
02100         {
02101             #if DEBUG
02102                 fprintf (stderr,
02103                         "calibrate_step_gradient: estimate=%u best=%u=%.14le\n",
02104                         i, j, calibrate->value[b]);
02105             #endif
02106             calibrate->value[k]
02107                 = calibrate->value[b] + calibrate_estimate_gradient (j
02108                 , i);
02109             calibrate->value[k] = fmin (fmax (calibrate->
02110                 value[k],
02111                 calibrate->rangeminabs[j]),
02112                 calibrate->rangemaxabs[j]);
02113             #if DEBUG
02114                 fprintf (stderr,
02115                         "calibrate_step_gradient: estimate=%u variable=%u=%.14le\n",
02116                         i, j, calibrate->value[k]);
02117             #endif
02118         }
02119     }
02120     if (nthreads_gradient == 1)
02121         calibrate_gradient_sequential (simulation);
02122     else
02123     {
02124         for (i = 0; i <= nthreads_gradient; ++i)
02125         {
02126             calibrate->thread_gradient[i]
02127                 = simulation + calibrate->nstart_gradient
02128                 + i * (calibrate->nend_gradient - calibrate->
02129                     nstart_gradient)
02130                 / nthreads_gradient;
02131             #if DEBUG
02132                 fprintf (stderr,
02133                         "calibrate_step_gradient: i=%u thread_gradient=%u\n",
02134                         i, calibrate->thread_gradient[i]);
02135             #endif
02136         }
02137     }
02138 }

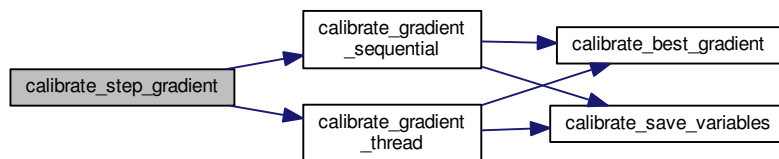
```

```

02135         data[i].thread = i;
02136         thread[i] = g_thread_new
02137             (NULL, (void (*)(void*)) calibrate_gradient_thread, &data[i]);
02138     }
02139     for (i = 0; i < nthreads_gradient; ++i)
02140         g_thread_join (thread[i]);
02141 }
02142 #if DEBUG
02143 fprintf (stderr, "calibrate_step_gradient: end\n");
02144 #endif
02145 }

```

Here is the call graph for this function:



#### 5.7.3.10 void\* calibrate\_thread ( ParallelData \* data )

Function to calibrate on a thread.

##### Parameters

<i>data</i>	Function data.
-------------	----------------

##### Returns

NULL

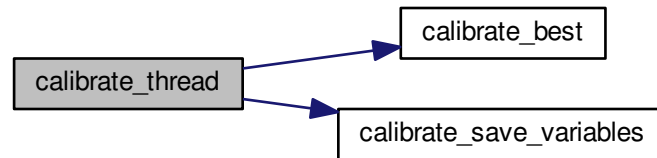
Definition at line 1682 of file [mpcotool.c](#).

```

01683 {
01684     unsigned int i, thread;
01685     double e;
01686     #if DEBUG
01687         fprintf (stderr, "calibrate_thread: start\n");
01688     #endif
01689     thread = data->thread;
01690     #if DEBUG
01691         fprintf (stderr, "calibrate_thread: thread=%u start=%u end=%u\n", thread,
01692             calibrate->thread[thread], calibrate->thread[thread + 1]);
01693     #endif
01694     for (i = calibrate->thread[thread]; i < calibrate->thread[thread + 1]; ++i)
01695     {
01696         e = calibrate_norm (i);
01697         g_mutex_lock (mutex);
01698         calibrate_best (i, e);
01699         calibrate_save_variables (i, e);
01700         g_mutex_unlock (mutex);
01701     #if DEBUG
01702         fprintf (stderr, "calibrate_thread: i=%u e=%lg\n", i, e);
01703     #endif
01704     }
01705     #if DEBUG
01706         fprintf (stderr, "calibrate_thread: end\n");
01707     #endif
01708     g_thread_exit (NULL);
01709     return NULL;
01710 }

```

Here is the call graph for this function:



### 5.7.3.11 int input\_open ( char \* filename )

Function to open the input file.

#### Parameters

<i>filename</i>	Input data file name.
-----------------	-----------------------

#### Returns

1 on success, 0 on error.

Definition at line 574 of file [mpcotool.c](#).

```

00575 {
00576     char buffer2[64];
00577     char *buffert[MAX_NINPUTS] =
00578         { NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL };
00579     xmlDoc *doc;
00580     xmlNode *node, *child;
00581     xmlChar *buffer;
00582     char *msg;
00583     int error_code;
00584     unsigned int i;
00585
00586     #if DEBUG
00587     fprintf (stderr, "input_open: start\n");
00588     #endif
00589
00590     // Resetting input data
00591     buffer = NULL;
00592     input_new ();
00593
00594     // Parsing the input file
00595     #if DEBUG
00596     fprintf (stderr, "input_open: parsing the input file %s\n", filename);
00597     #endif
00598     doc = xmlParseFile (filename);
00599     if (!doc)
00600     {
00601         msg = gettext ("Unable to parse the input file");
00602         goto exit_on_error;
00603     }
00604
00605     // Getting the root node
00606     #if DEBUG
00607     fprintf (stderr, "input_open: getting the root node\n");
00608     #endif
00609     node = xmlDocGetRootElement (doc);
00610     if (xmlStrcmp (node->name, XML_CALIBRATE))
00611     {
00612         msg = gettext ("Bad root XML node");
00613         goto exit_on_error;
00614     }
00615

```

```

00616 // Getting results file names
00617 input->result = (char *) xmlGetProp (node, XML_RESULT);
00618 if (!input->result)
00619     input->result = (char *) xmlStrdup (result_name);
00620 input->variables = (char *) xmlGetProp (node, XML_VARIABLES);
00621 if (!input->variables)
00622     input->variables = (char *) xmlStrdup (variables_name);
00623
00624 // Opening simulator program name
00625 input->simulator = (char *) xmlGetProp (node, XML_SIMULATOR);
00626 if (!input->simulator)
00627 {
00628     msg = gettext ("Bad simulator program");
00629     goto exit_on_error;
00630 }
00631
00632 // Opening evaluator program name
00633 input->evaluator = (char *) xmlGetProp (node, XML_EVALUATOR);
00634
00635 // Obtaining pseudo-random numbers generator seed
00636 input->seed
00637     = xml_node_get_uint_with_default (node,
XML_SEED, DEFAULT_RANDOM_SEED,
00638                                     &error_code);
00639 if (error_code)
00640 {
00641     msg = gettext ("Bad pseudo-random numbers generator seed");
00642     goto exit_on_error;
00643 }
00644
00645 // Opening algorithm
00646 buffer = xmlGetProp (node, XML_ALGORITHM);
00647 if (!xmlStrcmp (buffer, XML_MONTE_CARLO))
00648 {
00649     input->algorithm = ALGORITHM_MONTE_CARLO;
00650
00651 // Obtaining simulations number
00652 input->nsimulations
00653     = xml_node_get_int (node, XML_NSIMULATIONS, &error_code);
00654 if (error_code)
00655 {
00656     msg = gettext ("Bad simulations number");
00657     goto exit_on_error;
00658 }
00659 }
00660 else if (!xmlStrcmp (buffer, XML_SWEEP))
00661     input->algorithm = ALGORITHM_SWEEP;
00662 else if (!xmlStrcmp (buffer, XML_GENETIC))
00663 {
00664     input->algorithm = ALGORITHM_GENETIC;
00665
00666 // Obtaining population
00667 if (xmlHasProp (node, XML_NPOPULATION))
00668 {
00669     input->nsimulations
00670         = xml_node_get_uint (node, XML_NPOPULATION, &error_code);
00671     if (error_code || input->nsimulations < 3)
00672     {
00673         msg = gettext ("Invalid population number");
00674         goto exit_on_error;
00675     }
00676 }
00677 else
00678 {
00679     msg = gettext ("No population number");
00680     goto exit_on_error;
00681 }
00682
00683 // Obtaining generations
00684 if (xmlHasProp (node, XML_NGENERATIONS))
00685 {
00686     input->niterations
00687         = xml_node_get_uint (node, XML_NGENERATIONS, &error_code);
00688     if (error_code || !input->niterations)
00689     {
00690         msg = gettext ("Invalid generations number");
00691         goto exit_on_error;
00692     }
00693 }
00694 else
00695 {
00696     msg = gettext ("No generations number");
00697     goto exit_on_error;
00698 }
00699
00700 // Obtaining mutation probability
00701 if (xmlHasProp (node, XML_MUTATION))

```

```

00702     {
00703         input->mutation_ratio
00704         = xml_node_get_float (node, XML_MUTATION, &error_code);
00705         if (error_code || input->mutation_ratio < 0.
00706             || input->mutation_ratio >= 1.)
00707         {
00708             msg = gettext ("Invalid mutation probability");
00709             goto exit_on_error;
00710         }
00711     }
00712     else
00713     {
00714         msg = gettext ("No mutation probability");
00715         goto exit_on_error;
00716     }
00717
00718     // Obtaining reproduction probability
00719     if (xmlHasProp (node, XML_REPRODUCTION))
00720     {
00721         input->reproduction_ratio
00722         = xml_node_get_float (node, XML_REPRODUCTION, &error_code);
00723         if (error_code || input->reproduction_ratio < 0.
00724             || input->reproduction_ratio >= 1.0)
00725         {
00726             msg = gettext ("Invalid reproduction probability");
00727             goto exit_on_error;
00728         }
00729     }
00730     else
00731     {
00732         msg = gettext ("No reproduction probability");
00733         goto exit_on_error;
00734     }
00735
00736     // Obtaining adaptation probability
00737     if (xmlHasProp (node, XML_ADAPTATION))
00738     {
00739         input->adaptation_ratio
00740         = xml_node_get_float (node, XML_ADAPTATION, &error_code);
00741         if (error_code || input->adaptation_ratio < 0.
00742             || input->adaptation_ratio >= 1.)
00743         {
00744             msg = gettext ("Invalid adaptation probability");
00745             goto exit_on_error;
00746         }
00747     }
00748     else
00749     {
00750         msg = gettext ("No adaptation probability");
00751         goto exit_on_error;
00752     }
00753
00754     // Checking survivals
00755     i = input->mutation_ratio * input->nsimulations;
00756     i += input->reproduction_ratio * input->
00757 nsimulations;
00758     i += input->adaptation_ratio * input->
00759 nsimulations;
00760     if (i > input->nsimulations - 2)
00761     {
00762         msg = gettext
00763             ("No enough survival entities to reproduce the population");
00764         goto exit_on_error;
00765     }
00766     else
00767     {
00768         msg = gettext ("Unknown algorithm");
00769         goto exit_on_error;
00770     }
00771     xmlFree (buffer);
00772     buffer = NULL;
00773
00774     if (input->algorithm == ALGORITHM_MONTE_CARLO
00775         || input->algorithm == ALGORITHM_SWEEP)
00776     {
00777         // Obtaining iterations number
00778         input->niterations
00779         = xml_node_get_uint (node, XML_NITERATIONS, &error_code);
00780         if (error_code == 1)
00781             input->niterations = 1;
00782         else if (error_code)
00783         {
00784             msg = gettext ("Bad iterations number");
00785             goto exit_on_error;
00786         }
00787     }

```



```

00787
00788     // Obtaining best number
00789     input->nbest
00790     = xml_node_get_uint_with_default (node,
XML_NBEST, 1, &error_code);
00791     if (error_code || !input->nbest)
00792     {
00793         msg = gettext ("Invalid best number");
00794         goto exit_on_error;
00795     }
00796
00797     // Obtaining tolerance
00798     input->tolerance
00799     = xml_node_get_float_with_default (node,
XML_TOLERANCE, 0.,
&error_code);
00800     if (error_code || input->tolerance < 0.)
00801     {
00802         msg = gettext ("Invalid tolerance");
00803         goto exit_on_error;
00804     }
00805
00806     // Getting gradient method parameters
00807     if (xmlHasProp (node, XML_NSTEPS))
00808     {
00809         input->nsteps = xml_node_get_uint (node,
XML_NSTEPS, &error_code);
00810         if (error_code || !input->nsteps)
00811         {
00812             msg = gettext ("Invalid steps number");
00813             goto exit_on_error;
00814         }
00815         buffer = xmlGetProp (node, XML_GRADIENT_METHOD);
00816         if (!xmlStrcmp (buffer, XML_COORDINATES))
00817             input->gradient_method =
GRADIENT_METHOD_COORDINATES;
00818         else if (!xmlStrcmp (buffer, XML_RANDOM))
00819             input->gradient_method =
GRADIENT_METHOD_RANDOM;
00820         else
00821         {
00822             input->nestimates
00823             = xml_node_get_uint (node, XML_NESTIMATES, &error_code);
00824             if (error_code || !input->nestimates)
00825             {
00826                 msg = gettext ("Invalid estimates number");
00827                 goto exit_on_error;
00828             }
00829         }
00830         else
00831         {
00832             msg = gettext ("Unknown method to estimate the gradient");
00833             goto exit_on_error;
00834         }
00835         xmlFree (buffer);
00836         buffer = NULL;
00837         input->relaxation
00838         = xml_node_get_float_with_default (node,
XML_RELAXATION,
DEFAULT_RELAXATION, &error_code);
00839         if (error_code || input->relaxation < 0. || input->
relaxation > 2.)
00840         {
00841             msg = gettext ("Invalid relaxation parameter");
00842             goto exit_on_error;
00843         }
00844     }
00845     else
00846         input->nsteps = 0;
00847 }
00848
00849 // Reading the experimental data
00850 for (child = node->children; child; child = child->next)
00851 {
00852     if (xmlStrcmp (child->name, XML_EXPERIMENT))
00853         break;
00854 #if DEBUG
00855     fprintf (stderr, "input_open: nexperiments=%u\n", input->nexperiments);
00856 #endif
00857     if (xmlHasProp (child, XML_NAME))
00858         buffer = xmlGetProp (child, XML_NAME);
00859     else
00860     {
00861         snprintf (buffer2, 64, "%s %u: %s",
00862             gettext ("Experiment"),
00863             input->nexperiments + 1, gettext ("no data file name"));
00864         msg = buffer2;
00865         goto exit_on_error;
00866     }

```

```

00867     }
00868     #if DEBUG
00869     fprintf (stderr, "input_open: experiment=%s\n", buffer);
00870     #endif
00871     input->weight = g_realloc (input->weight,
00872                               (1 + input->nexperiments) * sizeof (double));
00873     input->weight[input->nexperiments]
00874     = xml_node_get_float_with_default (child,
XML_WEIGHT, 1., &error_code);
00875     if (error_code)
00876     {
00877         snprintf (buffer2, 64, "%s %s: %s",
00878                 gettext ("Experiment"), buffer, gettext ("bad weight"));
00879         msg = buffer2;
00880         goto exit_on_error;
00881     }
00882     #if DEBUG
00883     fprintf (stderr, "input_open: weight=%lg\n",
00884             input->weight[input->nexperiments]);
00885     #endif
00886     if (!input->nexperiments)
00887         input->ninputs = 0;
00888     #if DEBUG
00889     fprintf (stderr, "input_open: template[0]\n");
00890     #endif
00891     if (xmlHasProp (child, XML_TEMPLATE1))
00892     {
00893         input->template[0]
00894         = (char **) g_realloc (input->template[0],
00895                               (1 + input->nexperiments) * sizeof (char *));
00896         buffert[0] = (char *) xmlGetProp (child, template[0]);
00897         #if DEBUG
00898         fprintf (stderr, "input_open: experiment=%u templatel=%s\n",
00899                 input->nexperiments, buffert[0]);
00900         #endif
00901         if (!input->nexperiments)
00902             ++input->ninputs;
00903         #if DEBUG
00904         fprintf (stderr, "input_open: ninputs=%u\n", input->ninputs);
00905         #endif
00906     }
00907     else
00908     {
00909         snprintf (buffer2, 64, "%s %s: %s",
00910                 gettext ("Experiment"), buffer, gettext ("no template"));
00911         msg = buffer2;
00912         goto exit_on_error;
00913     }
00914     for (i = 1; i < MAX_NINPUTS; ++i)
00915     {
00916         #if DEBUG
00917         fprintf (stderr, "input_open: template%u\n", i + 1);
00918         #endif
00919         if (xmlHasProp (child, template[i]))
00920         {
00921             if (input->nexperiments && input->ninputs <= i)
00922             {
00923                 snprintf (buffer2, 64, "%s %s: %s",
00924                         gettext ("Experiment"),
00925                         buffer, gettext ("bad templates number"));
00926                 msg = buffer2;
00927                 while (i-- > 0)
00928                     xmlFree (buffert[i]);
00929                 goto exit_on_error;
00930             }
00931             input->template[i] = (char **)
00932             g_realloc (input->template[i],
00933                       (1 + input->nexperiments) * sizeof (char *));
00934             buffert[i] = (char *) xmlGetProp (child, template[i]);
00935             #if DEBUG
00936             fprintf (stderr, "input_open: experiment=%u template%u=%s\n",
00937                     input->nexperiments, i + 1,
00938                     input->template[i][input->nexperiments]);
00939             #endif
00940             if (!input->nexperiments)
00941                 ++input->ninputs;
00942             #if DEBUG
00943             fprintf (stderr, "input_open: ninputs=%u\n", input->ninputs);
00944             #endif
00945         }
00946         else if (input->nexperiments && input->ninputs > i)
00947         {
00948             snprintf (buffer2, 64, "%s %s: %s%u",
00949                     gettext ("Experiment"),
00950                     buffer, gettext ("no template"), i + 1);
00951             msg = buffer2;
00952             while (i-- > 0)

```

```

00953         xmlFree (buffert[i]);
00954         goto exit_on_error;
00955     }
00956     else
00957         break;
00958 }
00959 input->experiment
00960 = g_realloc (input->experiment,
00961             (1 + input->nexperiments) * sizeof (char *));
00962 input->experiment[input->nexperiments] = (char *) buffer;
00963 for (i = 0; i < input->ninputs; ++i)
00964     input->template[i][input->nexperiments] = buffert[i];
00965 ++input->nexperiments;
00966 #if DEBUG
00967     fprintf (stderr, "input_open: nexperiments=%u\n", input->nexperiments);
00968 #endif
00969 }
00970 if (!input->nexperiments)
00971 {
00972     msg = gettext ("No calibration experiments");
00973     goto exit_on_error;
00974 }
00975 buffer = NULL;
00976
00977 // Reading the variables data
00978 for (; child; child = child->next)
00979 {
00980     if (xmlStrcmp (child->name, XML_VARIABLE))
00981     {
00982         snprintf (buffer2, 64, "%s %u: %s",
00983                 gettext ("Variable"),
00984                 input->nvariables + 1, gettext ("bad XML node"));
00985         msg = buffer2;
00986         goto exit_on_error;
00987     }
00988     if (xmlHasProp (child, XML_NAME))
00989         buffer = xmlGetProp (child, XML_NAME);
00990     else
00991     {
00992         snprintf (buffer2, 64, "%s %u: %s",
00993                 gettext ("Variable"),
00994                 input->nvariables + 1, gettext ("no name"));
00995         msg = buffer2;
00996         goto exit_on_error;
00997     }
00998     if (xmlHasProp (child, XML_MINIMUM))
00999     {
01000         input->rangemin = g_realloc
01001             (input->rangemin, (1 + input->nvariables) * sizeof (double));
01002         input->rangeminabs = g_realloc
01003             (input->rangeminabs, (1 + input->nvariables) * sizeof (double));
01004         input->rangemin[input->nvariables]
01005             = xml_node_get_float (child, XML_MINIMUM, &error_code);
01006         if (error_code)
01007         {
01008             snprintf (buffer2, 64, "%s %s: %s",
01009                     gettext ("Variable"), buffer, gettext ("bad minimum"));
01010             msg = buffer2;
01011             goto exit_on_error;
01012         }
01013         input->rangeminabs[input->nvariables]
01014             = xml_node_get_float_with_default (child,
XML_ABSOLUTE_MINIMUM,
01015                                             -G_MAXDOUBLE, &error_code);
01016         if (error_code)
01017         {
01018             snprintf (buffer2, 64, "%s %s: %s", gettext ("Variable"), buffer,
01019                     gettext ("bad absolute minimum"));
01020             msg = buffer2;
01021             goto exit_on_error;
01022         }
01023         if (input->rangemin[input->nvariables]
01024             < input->rangeminabs[input->nvariables])
01025         {
01026             snprintf (buffer2, 64, "%s %s: %s",
01027                     gettext ("Variable"),
01028                     buffer, gettext ("minimum range not allowed"));
01029             msg = buffer2;
01030             goto exit_on_error;
01031         }
01032     }
01033     else
01034     {
01035         snprintf (buffer2, 64, "%s %s: %s",
01036                 gettext ("Variable"), buffer, gettext ("no minimum range"));
01037         msg = buffer2;
01038         goto exit_on_error;

```

```

01039     }
01040     if (xmlHasProp (child, XML_MAXIMUM))
01041     {
01042         input->rangemax = g_realloc
01043             (input->rangemax, (1 + input->nvariables) * sizeof (double));
01044         input->rangemaxabs = g_realloc
01045             (input->rangemaxabs, (1 + input->nvariables) * sizeof (double));
01046         input->rangemax[input->nvariables]
01047             = xml_node_get_float (child, XML_MAXIMUM, &error_code);
01048         if (error_code)
01049         {
01050             snprintf (buffer2, 64, "%s %s: %s",
01051                 gettext ("Variable"), buffer, gettext ("bad maximum"));
01052             msg = buffer2;
01053             goto exit_on_error;
01054         }
01055         input->rangemaxabs[input->nvariables]
01056             = xml_node_get_float_with_default (child,
XML_ABSOLUTE_MAXIMUM,
01057                 G_MAXDOUBLE, &error_code);
01058         if (error_code)
01059         {
01060             snprintf (buffer2, 64, "%s %s: %s", gettext ("Variable"), buffer,
01061                 gettext ("bad absolute maximum"));
01062             msg = buffer2;
01063             goto exit_on_error;
01064         }
01065         if (input->rangemax[input->nvariables]
01066             > input->rangemaxabs[input->nvariables])
01067         {
01068             snprintf (buffer2, 64, "%s %s: %s",
01069                 gettext ("Variable"),
01070                 buffer, gettext ("maximum range not allowed"));
01071             msg = buffer2;
01072             goto exit_on_error;
01073         }
01074     }
01075     else
01076     {
01077         snprintf (buffer2, 64, "%s %s: %s",
01078             gettext ("Variable"), buffer, gettext ("no maximum range"));
01079         msg = buffer2;
01080         goto exit_on_error;
01081     }
01082     if (input->rangemax[input->nvariables]
01083         < input->rangemin[input->nvariables])
01084     {
01085         snprintf (buffer2, 64, "%s %s: %s",
01086             gettext ("Variable"), buffer, gettext ("bad range"));
01087         msg = buffer2;
01088         goto exit_on_error;
01089     }
01090     input->precision = g_realloc
01091         (input->precision, (1 + input->nvariables) * sizeof (unsigned int));
01092     input->precision[input->nvariables]
01093         = xml_node_get_uint_with_default (child,
XML_PRECISION,
01094             DEFAULT_PRECISION, &error_code);
01095     if (error_code || input->precision[input->nvariables] >=
NPRECISIONS)
01096     {
01097         snprintf (buffer2, 64, "%s %s: %s", gettext ("Variable"), buffer,
01098             gettext ("bad precision"));
01099         msg = buffer2;
01100         goto exit_on_error;
01101     }
01102     if (input->algorithm == ALGORITHM_SWEEP)
01103     {
01104         if (xmlHasProp (child, XML_NSWEEPS))
01105         {
01106             input->nsweeps = (unsigned int *)
01107                 g_realloc (input->nsweeps,
01108                     (1 + input->nvariables) * sizeof (unsigned int));
01109             input->nsweeps[input->nvariables]
01110                 = xml_node_get_uint (child, XML_NSWEEPS, &error_code);
01111             if (error_code || !input->nsweeps[input->
nvariables])
01112             {
01113                 snprintf (buffer2, 64, "%s %s: %s",
01114                     gettext ("Variable"),
01115                     buffer, gettext ("bad sweeps"));
01116                 msg = buffer2;
01117                 goto exit_on_error;
01118             }
01119         }
01120     }
01121     {

```

```

01122         snprintf (buffer2, 64, "%s %s: %s", gettext ("Variable"), buffer,
01123                 gettext ("no sweeps number"));
01124         msg = buffer2;
01125         goto exit_on_error;
01126     }
01127 #if DEBUG
01128     fprintf (stderr, "input_open: nsweeps=%u nsimulations=%u\n",
01129             input->nsweeps[input->nvariables],
01130             input->nsimulations);
01131 #endif
01132     if (input->algorithm == ALGORITHM_GENETIC)
01133     {
01134         // Obtaining bits representing each variable
01135         if (xmlHasProp (child, XML_NBITS))
01136         {
01137             input->nbits = (unsigned int *)
01138                 g_realloc (input->nbits,
01139                     (1 + input->nvariables) * sizeof (unsigned int));
01140             i = xml_node_get_uint (child, XML_NBITS, &error_code);
01141             if (error_code || !i)
01142             {
01143                 snprintf (buffer2, 64, "%s %s: %s",
01144                     gettext ("Variable"),
01145                     buffer, gettext ("invalid bits number"));
01146                 msg = buffer2;
01147                 goto exit_on_error;
01148             }
01149             input->nbits[input->nvariables] = i;
01150         }
01151         else
01152         {
01153             snprintf (buffer2, 64, "%s %s: %s",
01154                 gettext ("Variable"),
01155                 buffer, gettext ("no bits number"));
01156             msg = buffer2;
01157             goto exit_on_error;
01158         }
01159     }
01160     else if (input->nsteps)
01161     {
01162         input->step = (double *)
01163             g_realloc (input->step, (1 + input->nvariables) * sizeof (double));
01164         input->step[input->nvariables]
01165             = xml_node_get_float (child, XML_STEP, &error_code);
01166         if (error_code || input->step[input->nvariables] < 0.)
01167         {
01168             snprintf (buffer2, 64, "%s %s: %s",
01169                 gettext ("Variable"),
01170                 buffer, gettext ("bad step size"));
01171             msg = buffer2;
01172             goto exit_on_error;
01173         }
01174     }
01175     input->label = g_realloc
01176         (input->label, (1 + input->nvariables) * sizeof (char *));
01177     input->label[input->nvariables] = (char *) buffer;
01178     ++input->nvariables;
01179 }
01180 if (!input->nvariables)
01181 {
01182     msg = gettext ("No calibration variables");
01183     goto exit_on_error;
01184 }
01185 buffer = NULL;
01186
01187 // Obtaining the error norm
01188 if (xmlHasProp (node, XML_NORM))
01189 {
01190     buffer = xmlGetProp (node, XML_NORM);
01191     if (!xmlStrcmp (buffer, XML_EUCLIDIAN))
01192         input->norm = ERROR_NORM_EUCLIDIAN;
01193     else if (!xmlStrcmp (buffer, XML_MAXIMUM))
01194         input->norm = ERROR_NORM_MAXIMUM;
01195     else if (!xmlStrcmp (buffer, XML_P))
01196     {
01197         input->norm = ERROR_NORM_P;
01198         input->p = xml_node_get_float (node, XML_P, &error_code);
01199         if (!error_code)
01200         {
01201             msg = gettext ("Bad P parameter");
01202             goto exit_on_error;
01203         }
01204     }
01205     else if (!xmlStrcmp (buffer, XML_TAXICAB))
01206         input->norm = ERROR_NORM_TAXICAB;
01207     else

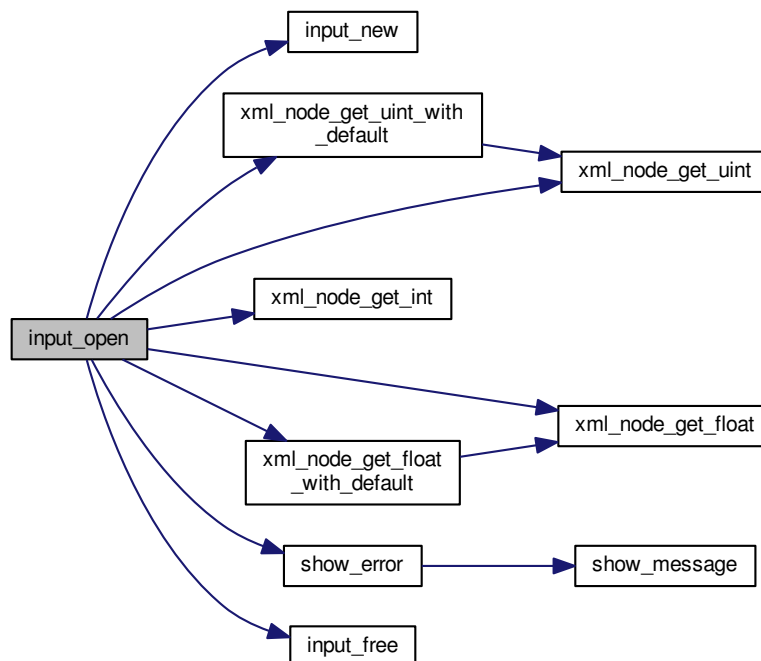
```

```

01208     {
01209         msg = gettext ("Unknown error norm");
01210         goto exit_on_error;
01211     }
01212     xmlFree (buffer);
01213 }
01214 else
01215     input->norm = ERROR_NORM_EUCLIDIAN;
01216
01217 // Getting the working directory
01218 input->directory = g_path_get_dirname (filename);
01219 input->name = g_path_get_basename (filename);
01220
01221 // Closing the XML document
01222 xmlFreeDoc (doc);
01223
01224 #if DEBUG
01225 fprintf (stderr, "input_open: end\n");
01226 #endif
01227 return 1;
01228
01229 exit_on_error:
01230 xmlFree (buffer);
01231 xmlFreeDoc (doc);
01232 show_error (msg);
01233 input_free ();
01234 #if DEBUG
01235 fprintf (stderr, "input_open: end\n");
01236 #endif
01237 return 0;
01238 }

```

Here is the call graph for this function:



### 5.7.3.12 void show\_error ( char \* msg )

Function to show a dialog with an error message.

## Parameters

<i>msg</i>	Error message.
------------	----------------

Definition at line 259 of file [mpcotool.c](#).

```
00260 {
00261     show_message (gettext ("ERROR!"), msg, ERROR_TYPE);
00262 }
```

Here is the call graph for this function:



### 5.7.3.13 void show\_message ( char \* title, char \* msg, int type )

Function to show a dialog with a message.

## Parameters

<i>title</i>	Title.
<i>msg</i>	Message.
<i>type</i>	Message type.

Definition at line 229 of file [mpcotool.c](#).

```
00230 {
00231     #if HAVE_GTK
00232         GtkMessageDialog *dlg;
00233
00234         // Creating the dialog
00235         dlg = (GtkMessageDialog *) gtk_message_dialog_new
00236             (window->window, GTK_DIALOG_MODAL, type, GTK_BUTTONS_OK, "%s", msg);
00237
00238         // Setting the dialog title
00239         gtk_window_set_title (GTK_WINDOW (dlg), title);
00240
00241         // Showing the dialog and waiting response
00242         gtk_dialog_run (GTK_DIALOG (dlg));
00243
00244         // Closing and freeing memory
00245         gtk_widget_destroy (GTK_WIDGET (dlg));
00246
00247     #else
00248         printf ("%s: %s\n", title, msg);
00249     #endif
00250 }
```

### 5.7.3.14 double xml\_node\_get\_float ( xmlNode \* node, const xmlChar \* prop, int \* error\_code )

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

**Parameters**

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>error_code</i>	Error code.

**Returns**

Floating point number value.

Definition at line 369 of file [mpcotool.c](#).

```
00370 {
00371     double x = 0.;
00372     xmlChar *buffer;
00373     buffer = xmlGetProp (node, prop);
00374     if (!buffer)
00375         *error_code = 1;
00376     else
00377     {
00378         if (sscanf ((char *) buffer, "%lf", &x) != 1)
00379             *error_code = 2;
00380         else
00381             *error_code = 0;
00382         xmlFree (buffer);
00383     }
00384     return x;
00385 }
```

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

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

**Parameters**

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>default_value</i>	default value.
<i>error_code</i>	Error code.

**Returns**

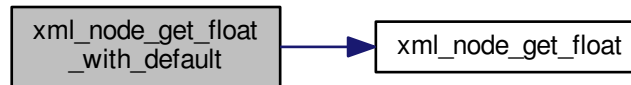
Floating point number value.

Definition at line 403 of file [mpcotool.c](#).

```
00405 {
00406     double x;
00407     if (xmlHasProp (node, prop))
00408         x = xml_node_get_float (node, prop, error_code);
00409     else
00410     {
00411         x = default_value;
00412         *error_code = 0;
00413     }
00414     return x;
00415 }
```



Here is the call graph for this function:



#### 5.7.3.16 int xml\_node\_get\_int ( xmlDoc \* *node*, const xmlChar \* *prop*, int \* *error\_code* )

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

##### Parameters

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>error_code</i>	Error code.

##### Returns

Integer number value.

Definition at line 277 of file [mpcotool.c](#).

```

00278 {
00279     int i = 0;
00280     xmlChar *buffer;
00281     buffer = xmlGetProp (node, prop);
00282     if (!buffer)
00283         *error_code = 1;
00284     else
00285     {
00286         if (sscanf ((char *) buffer, "%d", &i) != 1)
00287             *error_code = 2;
00288         else
00289             *error_code = 0;
00290         xmlFree (buffer);
00291     }
00292     return i;
00293 }
  
```

#### 5.7.3.17 unsigned int xml\_node\_get\_uint ( xmlDoc \* *node*, const xmlChar \* *prop*, int \* *error\_code* )

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

##### Parameters

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>error_code</i>	Error code.

##### Returns

Unsigned integer number value.

Definition at line 308 of file [mpcotool.c](#).

```

00309 {
00310     unsigned int i = 0;
00311     xmlChar *buffer;
00312     buffer = xmlGetProp (node, prop);
00313     if (!buffer)
00314         *error_code = 1;
00315     else
00316     {
00317         if (sscanf ((char *) buffer, "%u", &i) != 1)
00318             *error_code = 2;
00319         else
00320             *error_code = 0;
00321         xmlFree (buffer);
00322     }
00323     return i;
00324 }

```

### 5.7.3.18 unsigned int xml\_node\_get\_uint\_with\_default ( xmlNode \* *node*, const xmlChar \* *prop*, unsigned int *default\_value*, int \* *error\_code* )

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

#### Parameters

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>default_value</i>	default value.
<i>error_code</i>	Error code.

#### Returns

Unsigned integer number value.

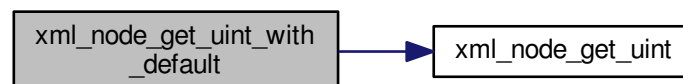
Definition at line 342 of file [mpcotoool.c](#).

```

00344 {
00345     unsigned int i;
00346     if (xmlHasProp (node, prop))
00347         i = xml_node_get_uint (node, prop, error_code);
00348     else
00349     {
00350         i = default_value;
00351         *error_code = 0;
00352     }
00353     return i;
00354 }

```

Here is the call graph for this function:



### 5.7.3.19 void xml\_node\_set\_float ( xmlNode \* *node*, const xmlChar \* *prop*, double *value* )

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

## Parameters

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>value</i>	Floating point number value.

Definition at line 466 of file [mpcotool.c](#).

```
00467 {
00468     xmlChar buffer[64];
00469     snprintf ((char *) buffer, 64, "%.14lg", value);
00470     xmlSetProp (node, prop, buffer);
00471 }
```

### 5.7.3.20 void xml\_node\_set\_int ( xmlDoc \* node, const xmlChar \* prop, int value )

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

## Parameters

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>value</i>	Integer number value.

Definition at line 428 of file [mpcotool.c](#).

```
00429 {
00430     xmlChar buffer[64];
00431     snprintf ((char *) buffer, 64, "%d", value);
00432     xmlSetProp (node, prop, buffer);
00433 }
```

### 5.7.3.21 void xml\_node\_set\_uint ( xmlDoc \* node, const xmlChar \* prop, unsigned int value )

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

## Parameters

<i>node</i>	XML node.
<i>prop</i>	XML property.
<i>value</i>	Unsigned integer number value.

Definition at line 447 of file [mpcotool.c](#).

```
00448 {
00449     xmlChar buffer[64];
00450     snprintf ((char *) buffer, 64, "%u", value);
00451     xmlSetProp (node, prop, buffer);
00452 }
```

## 5.8 mpcotool.h

```
00001 /*
00002 MPCOTool: a software to make calibrations of empirical parameters.
00003
00004 AUTHORS: Javier Burguete and Borja Latorre.
00005
00006 Copyright 2012-2016, AUTHORS.
00007
00008 Redistribution and use in source and binary forms, with or without modification,
00009 are permitted provided that the following conditions are met:
00010
00011     1. Redistributions of source code must retain the above copyright notice,
00012        this list of conditions and the following disclaimer.
00013
```

```

00014     2. Redistributions in binary form must reproduce the above copyright notice,
00015         this list of conditions and the following disclaimer in the
00016         documentation and/or other materials provided with the distribution.
00017
00018 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
00019 WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
00020 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00021 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00022 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00023 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00024 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00025 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00026 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00027 OF SUCH DAMAGE.
00028 */
00029
00036 #ifndef MPCOTOOL__H
00037 #define MPCOTOOL__H 1
00038
00043 enum Algorithm
00044 {
00045     ALGORITHM_MONTE_CARLO = 0,
00046     ALGORITHM_SWEEP = 1,
00047     ALGORITHM_GENETIC = 2
00048 };
00049
00054 enum GradientMethod
00055 {
00056     GRADIENT_METHOD_COORDINATES = 0,
00057     GRADIENT_METHOD_RANDOM = 1,
00058 };
00059
00064 enum ErrorNorm
00065 {
00066     ERROR_NORM_EUCLIDIAN = 0,
00068     ERROR_NORM_MAXIMUM = 1,
00070     ERROR_NORM_P = 2,
00072     ERROR_NORM_TAXICAB = 3
00074 };
00075
00080 typedef struct
00081 {
00082     char **template[MAX_NINPUTS];
00083     char **experiment;
00084     char **label;
00085     char *result;
00086     char *variables;
00087     char *simulator;
00088     char *evaluator;
00090     char *directory;
00091     char *name;
00092     double *rangemin;
00093     double *rangemax;
00094     double *rangeminabs;
00095     double *rangemaxabs;
00096     double *weight;
00097     double *step;
00098     unsigned int *precision;
00099     unsigned int *nsweeps;
00100     unsigned int *nbits;
00102     double tolerance;
00103     double mutation_ratio;
00104     double reproduction_ratio;
00105     double adaptation_ratio;
00106     double relaxation;
00107     double p;
00108     unsigned long int seed;
00110     unsigned int nvariables;
00111     unsigned int nexperiments;
00112     unsigned int ninputs;
00113     unsigned int nsimulations;
00114     unsigned int algorithm;
00115     unsigned int nsteps;
00117     unsigned int gradient_method;
00118     unsigned int nestimates;
00120     unsigned int niterations;
00121     unsigned int nbest;
00122     unsigned int norm;
00123 } Input;
00124
00129 typedef struct
00130 {
00131     GMappedFile **file[MAX_NINPUTS];
00132     char **template[MAX_NINPUTS];
00133     char **experiment;
00134     char **label;
00135     gsl_rng *rng;

```

```

00136 GeneticVariable *genetic_variable;
00138 FILE *file_result;
00139 FILE *file_variables;
00140 char *result;
00141 char *variables;
00142 char *simulator;
00143 char *evaluator;
00145 double *value;
00146 double *rangemin;
00147 double *rangemax;
00148 double *rangeminabs;
00149 double *rangemaxabs;
00150 double *error_best;
00151 double *weight;
00152 double *step;
00153 double *gradient;
00154 double *value_old;
00156 double *error_old;
00158 unsigned int *precision;
00159 unsigned int *nsweeps;
00160 unsigned int *thread;
00162 unsigned int *thread_gradient;
00165 unsigned int *simulation_best;
00166 double tolerance;
00167 double mutation_ratio;
00168 double reproduction_ratio;
00169 double adaptation_ratio;
00170 double relaxation;
00171 double calculation_time;
00172 double p;
00173 unsigned long int seed;
00175 unsigned int nvariables;
00176 unsigned int nexperiments;
00177 unsigned int ninputs;
00178 unsigned int nsimulations;
00179 unsigned int gradient_method;
00180 unsigned int nsteps;
00182 unsigned int nestimates;
00184 unsigned int algorithm;
00185 unsigned int nstart;
00186 unsigned int nend;
00187 unsigned int nstart_gradient;
00189 unsigned int nend_gradient;
00191 unsigned int niterations;
00192 unsigned int nbest;
00193 unsigned int nsaveds;
00194 #if HAVE_MPI
00195     int mpi_rank;
00196 #endif
00197 } Calibrate;
00198
00203 typedef struct
00204 {
00205     unsigned int thread;
00206 } ParallelData;
00207
00208 // Public functions
00209 void show_message (char *title, char *msg, int type);
00210 void show_error (char *msg);
00211 int xml_node_get_int (xmlNode * node, const xmlChar * prop, int *error_code);
00212 unsigned int xml_node_get_uint (xmlNode * node, const xmlChar * prop,
00213                                 int *error_code);
00214 unsigned int xml_node_get_uint_with_default (xmlNode * node,
00215                                             const xmlChar * prop,
00216                                             unsigned int default_value,
00217                                             int *error_code);
00218 double xml_node_get_float (xmlNode * node, const xmlChar * prop,
00219                             int *error_code);
00220 double xml_node_get_float_with_default (xmlNode * node, const xmlChar * prop
00221                                         ,
00222                                         double default_value, int *error_code);
00222 void xml_node_set_int (xmlNode * node, const xmlChar * prop, int value);
00223 void xml_node_set_uint (xmlNode * node, const xmlChar * prop,
00224                         unsigned int value);
00225 void xml_node_set_float (xmlNode * node, const xmlChar * prop, double value);
00226
00227 void input_new ();
00228 void input_free ();
00229 int input_open (char *filename);
00230 void calibrate_input (unsigned int simulation, char *input,
00231                      GMappedFile * template);
00232 double calibrate_parse (unsigned int simulation, unsigned int experiment);
00233 void calibrate_print ();
00234 void calibrate_save_variables (unsigned int simulation, double error);
00235 void calibrate_best (unsigned int simulation, double value);
00236 void calibrate_sequential ();
00237 void *calibrate_thread (ParallelData * data);

```

```
00238 void calibrate_merge (unsigned int nsaveds, unsigned int *simulation_best,  
00239                          double *error_best);  
00240 #if HAVE_MPI  
00241 void calibrate_synchronise ();  
00242 #endif  
00243 void calibrate_sweep ();  
00244 void calibrate_MonteCarlo ();  
00245 void calibrate_best_gradient (unsigned int simulation, double value);  
00246 void calibrate_gradient_sequential ();  
00247 void *calibrate_gradient_thread (ParallelData * data);  
00248 double calibrate_variable_step_gradient (unsigned int variable);  
00249 void calibrate_step_gradient (unsigned int simulation);  
00250 void calibrate_gradient ();  
00251 double calibrate_genetic_objective (Entity * entity);  
00252 void calibrate_genetic ();  
00253 void calibrate_save_old ();  
00254 void calibrate_merge_old ();  
00255 void calibrate_refine ();  
00256 void calibrate_step ();  
00257 void calibrate_iterate ();  
00258 void calibrate_open ();  
00259  
00260 #endif
```

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