

# Calibrator

1.0.2

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# Chapter 1

## CALIBRATOR

A software to perform calibrations or optimizations of empirical parameters.

### VERSIONS

- 1.0.2: Stable and recommended version.
- 1.1.34: 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

- `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:

- `configure.ac`: configure generator.
- `Makefile.in`: Makefile generator.
- `config.h.in`: config header generator.
- `calibrator.c`: main source code.
- `calibrator.h`: main header code.
- `interface.h`: interface header code.
- `build`: script to build all.
- `logo.png`: logo figure.
- `logo2.png`: alternative logo figure.
- `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/calibrator.po`: translation files.
- `manuals/*.png`: manual figures.
- `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

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/calibrator.git
```

3. Link the latest genetic version to genetic:



```
$ cd calibrator/1.0.2
$ 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
```

## USER INSTRUCTIONS

- Command line in sequential mode:

```
$ ./calibratorbin [-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] ./calibratorbin [-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:

```
$ ./calibrator
```

## INPUT FILE FORMAT

```
<?xml version="1.0"/>
<calibrate simulator="simulator_name" evaluator="evaluator_name" algorithm="algorithm_type" nsimulations="nsimulations"
  <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_1"/>
  ...
  <variable name="variable_M" minimum="min_value" maximum="max_value" precision="precision_digits" sweeps="sweeps_M"/>
</calibrate>
```

- **"precision"**: defined for each variable. Number of precision digits to evaluate the variable. 0 apply for integer numbers.
- **"weight"**: defined for each experiment. Multiplies the objective value obtained for each experiment in the final objective function value.
- **"seed"**: Seed of the pseudo-random numbers generator.

Implemented algorithms are:

- **"sweep"**: Sweep brutal force algorithm. Requires for each variable:

sweeps: number of sweeps to generate for each variable in every experiment.

The total number of simulations to run is:

(number of experiments) x (variable 1 number of sweeps) x ... x (variable n number of sweeps) x  
(number of iterations)

- **"Monte-Carlo"**: Monte-Carlo brutal force algorithm. Requires on calibrate:

nsimulations: number of simulations to run in every experiment.

The total number of simulations to run is:

(number of experiments) x (number of simulations) x (number of iterations)

- Both brutal 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).

- **"genetic"**: Genetic algorithm. 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 brutal 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, c-string format and sweeps number to perform are:

```
alpha1, [179.70, 180.20], %.2lf, 5
```

```
alpha2, [179.30, 179.60], %.2lf, 5
```

```
random, [0.00, 0.20], %.2lf, 5
```

```
boot-time, [0.0, 3.0], %.1lf, 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" format="%.2lf" nsweeps="5"/>
  <variable name="alpha2" minimum="179.30" maximum="179.60" format="%.2lf" nsweeps="5"/>
  <variable name="random" minimum="0.00" maximum="0.20" format="%.2lf" nsweeps="5"/>
  <variable name="boot-time" minimum="0.0" maximum="3.0" format="%.1lf" nsweeps="5"/>
</calibrate>
```

- A template file as *template1.js*:

```

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

```

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

```

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

```

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



## Chapter 2

# Data Structure Index

### 2.1 Data Structures

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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## Chapter 4

# Data Structure Documentation

### 4.1 Calibrate Struct Reference

Struct to define the calibration data.

```
#include <calibrator.h>
```

#### Data Fields

- char \* [simulator](#)  
*Name of the simulator program.*
- char \* [evaluator](#)  
*Name of the program to evaluate the objective function.*
- char \*\* [experiment](#)  
*Array of experimental data file names.*
- char \*\* [template](#) [MAX\_NINPUTS]  
*Matrix of template names of input files.*
- char \*\* [label](#)  
*Array of variable names.*
- 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 \* [precision](#)  
*Array of variable precisions.*
- unsigned int \* [nsweeps](#)  
*Array of sweeps of the sweep algorithm.*
- unsigned int [nstart](#)  
*Beginning simulation number of the task.*
- unsigned int [nend](#)  
*Ending simulation number of the task.*
- unsigned int \* [thread](#)

- Array of simulation numbers to calculate on the thread.*

  - unsigned int [niterations](#)

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

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

*Number of saved simulations.*
  - unsigned int \* [simulation\\_best](#)

*Array of best simulation numbers.*
  - unsigned long int [seed](#)

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

*Algorithm tolerance.*
  - double [mutation\\_ratio](#)

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

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

*Adaptation probability.*
  - FILE \* [file\\_result](#)

*Result file.*
  - FILE \* [file\\_variables](#)

*Variables file.*
  - gsl\_rng \* [rng](#)

*GSL random number generator.*
  - GMappedFile \*\* [file](#) [[MAX\\_NINPUTS](#)]

*Matrix of input template files.*
  - GeneticVariable \* [genetic\\_variable](#)

*Array of variables for the genetic algorithm.*
  - int [mpi\\_rank](#)

*Number of MPI task.*

### 4.1.1 Detailed Description

Struct to define the calibration data.

Definition at line 92 of file [calibrator.h](#).

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

- [calibrator.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 <calibrator.h>
```

### Data Fields

- char \* [simulator](#)  
*Name of the simulator program.*
- char \* [evaluator](#)  
*Name of the program to evaluate the objective function.*
- char \*\* [experiment](#)  
*Array of experimental data file names.*
- char \*\* [template](#) [MAX\_NINPUTS]  
*Matrix of template names of input files.*
- char \*\* [label](#)  
*Array of variable names.*

- 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 [tolerance](#)  
*Algorithm tolerance.*
- double [mutation\\_ratio](#)  
*Mutation probability.*
- double [reproduction\\_ratio](#)  
*Reproduction probability.*
- double [adaptation\\_ratio](#)  
*Adaptation probability.*
- 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 \* [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.*
- unsigned int [niterations](#)  
*Number of algorithm iterations.*
- unsigned int [nbest](#)  
*Number of best simulations.*

#### 4.3.1 Detailed Description

Struct to define the calibration input file.

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

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

- [calibrator.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\_processors`  
*Processors number GtkLabel.*
- `GtkSpinButton * spin\_processors`  
*Processors number GtkSpinButton.*
- `GtkLabel * label\_seed`  
*Pseudo-random numbers generator seed GtkLabel.*
- `GtkSpinButton * spin\_seed`  
*Pseudo-random numbers generator seed GtkSpinButton.*

#### 4.4.1 Detailed Description

Struct to define the options dialog.

Definition at line 74 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 <calibrator.h>
```

### Data Fields

- `unsigned int thread`  
*Thread number.*

#### 4.5.1 Detailed Description

Struct to pass to the GThreads parallelized function.

Definition at line 147 of file [calibrator.h](#).

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

- [calibrator.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 90 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.*
- `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:

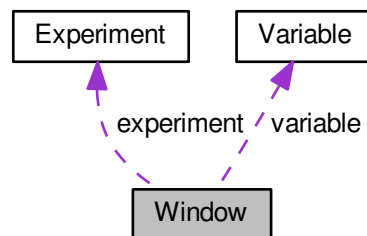
- [interface.h](#)

## 4.8 Window Struct Reference

Struct to define the main window.

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

Collaboration diagram for Window:



### Data Fields

- GtkWidget \* [window](#)  
*Main GtkWidget.*
- GtkWidget \* [grid](#)  
*Main GtkWidget.*
- GtkWidget \* [bar\\_buttons](#)  
*GtkWidget to store the main buttons.*
- GtkWidget \* [button\\_open](#)  
*Open GtkWidget.*
- GtkWidget \* [button\\_save](#)  
*Save GtkWidget.*
- GtkWidget \* [button\\_run](#)  
*Run GtkWidget.*
- GtkWidget \* [button\\_options](#)  
*Options GtkWidget.*
- GtkWidget \* [button\\_help](#)  
*Help GtkWidget.*
- GtkWidget \* [button\\_about](#)  
*Help GtkWidget.*
- GtkWidget \* [button\\_exit](#)

- *Exit GtkToolButton.*
- GtkLabel \* [label\\_simulator](#)  
*Simulator program GtkLabel.*
- GtkFileChooserButton \* [button\\_simulator](#)  
*Simulator program GtkFileChooserButton.*
- GtkCheckButton \* [check\\_evaluator](#)  
*Evaluator program GtkCheckButton.*
- GtkFileChooserButton \* [button\\_evaluator](#)  
*Evaluator program GtkFileChooserButton.*
- 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.*

- 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.*
- GtkFrame \* [frame\\_experiment](#)

- [Experiment](#) *GtkFrame.*
- GtkWidget \* [grid\\_experiment](#)  
*Experiment GtkWidget.*
- GtkComboBoxText \* [combo\\_experiment](#)  
*Experiment GtkWidgetEntry.*
- GtkWidget \* [button\\_add\\_experiment](#)  
*GtkButton to add a experiment.*
- GtkWidget \* [button\\_remove\\_experiment](#)  
*GtkButton to remove a experiment.*
- GtkWidget \* [label\\_experiment](#)  
*Experiment GtkWidget.*
- GtkFileChooserButton \* [button\\_experiment](#)  
*GtkFileChooserButton to set the experimental data file.*
- GtkWidget \* [label\\_weight](#)  
*Weight GtkWidget.*
- 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 100 of file [interface.h](#).

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

- [interface.h](#)

## Chapter 5

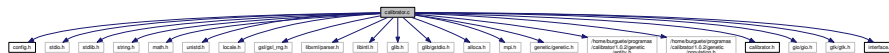
# File Documentation

### 5.1 calibrator.c File Reference

Source file of the calibrator.

```
#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 "calibrator.h"
#include <gio/gio.h>
#include <gtk/gtk.h>
#include "interface.h"
```

Include dependency graph for calibrator.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.*
- 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.*
- 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_thread` (unsigned int simulation, double value)  
*Function to save the best simulations of a thread.*
- void `calibrate_best_sequential` (unsigned int simulation, double value)  
*Function to save the best simulations.*
- void \* `calibrate_thread` (`ParallelData` \*data)  
*Function to calibrate on a thread.*
- void `calibrate_sequential` ()  
*Function to calibrate sequentially.*
- 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.*
- 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\\_iterate](#) ()  
*Function to iterate the algorithm.*
- void [calibrate\\_free](#) ()  
*Function to free the memory used by [Calibrate](#) struct.*
- void [calibrate\\_new](#) ()  
*Function to open and perform a calibration.*
- 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.*
- 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.*
- int [window\\_get\\_algorithm](#) ()  
*Function to get the algorithm number.*
- 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.*
- int `main` (int argn, char \*\*argc)
- *Main function.*

## Variables

- int `ntasks`
- *Number of tasks.*
- unsigned int `nthreads`
- *Number of threads.*
- GMutex `mutex` [1]
- *Mutex struct.*
- void(\* `calibrate_step` )()
- *Pointer to the function to perform a calibration algorithm step.*
- Input `input` [1]
- *Input struct to define the input file to calibrator.*
- Calibrate `calibrate` [1]
- *Calibration data.*
- 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.*

### 5.1.1 Detailed Description

Source file of the calibrator.

#### Authors

Javier Burguete and Borja Latorre.

#### Copyright

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

### 5.1.2 Function Documentation

#### 5.1.2.1 void [calibrate\\_best\\_sequential](#) ( 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 [1330](#) of file [calibrator.c](#).

```

01331 {
01332     unsigned int i, j;
01333     double e;
01334     #if DEBUG
01335     fprintf (stderr, "calibrate_best_sequential: start\n");
01336     #endif
01337     if (calibrate->nsaveds < calibrate->nbest
01338         || value < calibrate->error_best[calibrate->nsaveds - 1])
01339     {
01340         if (calibrate->nsaveds < calibrate->nbest)
01341             ++calibrate->nsaveds;
01342         calibrate->error_best[calibrate->nsaveds - 1] = value;
01343         calibrate->simulation_best[calibrate->
01344             nsaveds - 1] = simulation;
01345         for (i = calibrate->nsaveds; --i;)
01346         {
01347             if (calibrate->error_best[i] < calibrate->
01348                 error_best[i - 1])
01349             {
01350                 j = calibrate->simulation_best[i];
01351                 e = calibrate->error_best[i];
01352                 calibrate->simulation_best[i] = calibrate->
01353                 simulation_best[i - 1];
01354                 calibrate->error_best[i] = calibrate->
01355                 error_best[i - 1];
01356                 calibrate->simulation_best[i - 1] = j;
01357                 calibrate->error_best[i - 1] = e;

```

```

01354         }
01355         else
01356             break;
01357     }
01358 }
01359 #if DEBUG
01360 fprintf (stderr, "calibrate_best_sequential: end\n");
01361 #endif
01362 }

```

### 5.1.2.2 void calibrate\_best\_thread ( unsigned int *simulation*, double *value* )

Function to save the best simulations of a thread.

#### Parameters

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

Definition at line 1285 of file [calibrator.c](#).

```

01286 {
01287     unsigned int i, j;
01288     double e;
01289     #if DEBUG
01290     fprintf (stderr, "calibrate_best_thread: start\n");
01291     #endif
01292     if (calibrate->nsaveds < calibrate->nbest
01293         || value < calibrate->error_best[calibrate->nsaveds - 1])
01294     {
01295         g_mutex_lock (mutex);
01296         if (calibrate->nsaveds < calibrate->nbest)
01297             ++calibrate->nsaveds;
01298         calibrate->error_best[calibrate->nsaveds - 1] = value;
01299         calibrate->simulation_best[calibrate->
01300             nsaveds - 1] = simulation;
01301         for (i = calibrate->nsaveds; --i;)
01302         {
01303             if (calibrate->error_best[i] < calibrate->
01304                 error_best[i - 1])
01305             {
01306                 j = calibrate->simulation_best[i];
01307                 e = calibrate->error_best[i];
01308                 calibrate->simulation_best[i] = calibrate->
01309                     simulation_best[i - 1];
01310                 calibrate->error_best[i] = calibrate->
01311                     error_best[i - 1];
01312                 calibrate->simulation_best[i - 1] = j;
01313                 calibrate->error_best[i - 1] = e;
01314             }
01315             else
01316                 break;
01317         }
01318         g_mutex_unlock (mutex);
01319     }
01320     #if DEBUG
01321     fprintf (stderr, "calibrate_best_thread: end\n");
01322     #endif
01323 }

```

### 5.1.2.3 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.

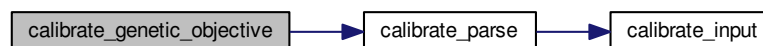
Definition at line 1639 of file [calibrator.c](#).

```

01640 {
01641     unsigned int j;
01642     double objective;
01643     char buffer[64];
01644     #if DEBUG
01645     fprintf (stderr, "calibrate_genetic_objective: start\n");
01646     #endif
01647     for (j = 0; j < calibrate->nvariables; ++j)
01648     {
01649         calibrate->value[entity->id * calibrate->nvariables + j]
01650         = genetic_get_variable (entity, calibrate->genetic_variable + j);
01651     }
01652     for (j = 0, objective = 0.; j < calibrate->nexperiments; ++j)
01653         objective += calibrate_parse (entity->id, j);
01654     g_mutex_lock (mutex);
01655     for (j = 0; j < calibrate->nvariables; ++j)
01656     {
01657         snprintf (buffer, 64, "%s ", format[calibrate->precision[j]]);
01658         fprintf (calibrate->file_variables, buffer,
01659                 genetic_get_variable (entity, calibrate->
01660                 genetic_variable + j));
01661     }
01662     fprintf (calibrate->file_variables, "%.14le\n", objective);
01663     g_mutex_unlock (mutex);
01664     #if DEBUG
01665     fprintf (stderr, "calibrate_genetic_objective: end\n");
01666     #endif
01667     return objective;
01668 }

```

Here is the call graph for this function:



#### 5.1.2.4 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 1034 of file [calibrator.c](#).

```

01035 {
01036     unsigned int i;
01037     char buffer[32], value[32], *buffer2, *buffer3, *content;
01038     FILE *file;
01039     gsize length;
01040     GRegex *regex;
01041
01042     #if DEBUG
01043     fprintf (stderr, "calibrate_input: start\n");
01044     #endif
01045
01046     // Checking the file
01047     if (!template)
01048         goto calibrate_input_end;
01049
01050     // Opening template
01051     content = g_mapped_file_get_contents (template);
01052     length = g_mapped_file_get_length (template);
01053     #if DEBUG
01054     fprintf (stderr, "calibrate_input: length=%lu\ncontent:\n%s", length,
01055             content);
01056     #endif
01057 }

```

```

01056 #endif
01057     file = g_fopen (input, "w");
01058
01059     // Parsing template
01060     for (i = 0; i < calibrate->nvariables; ++i)
01061     {
01062         #if DEBUG
01063             fprintf (stderr, "calibrate_input: variable=%u\n", i);
01064         #endif
01065         snprintf (buffer, 32, "@variable%u@", i + 1);
01066         regex = g_regex_new (buffer, 0, 0, NULL);
01067         if (i == 0)
01068         {
01069             buffer2 = g_regex_replace_literal (regex, content, length, 0,
01070                                               calibrate->label[i], 0, NULL);
01071         #if DEBUG
01072             fprintf (stderr, "calibrate_input: buffer2\n%s", buffer2);
01073         #endif
01074         }
01075         else
01076         {
01077             length = strlen (buffer3);
01078             buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
01079                                               calibrate->label[i], 0, NULL);
01080             g_free (buffer3);
01081         }
01082         g_regex_unref (regex);
01083         length = strlen (buffer2);
01084         snprintf (buffer, 32, "@value%u@", i + 1);
01085         regex = g_regex_new (buffer, 0, 0, NULL);
01086         snprintf (value, 32, format[calibrate->precision[i]],
01087                  calibrate->value[simulation * calibrate->
01088                                nvariables + i]);
01089         #if DEBUG
01090             fprintf (stderr, "calibrate_input: value=%s\n", value);
01091         #endif
01092         buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
01093                                           0, NULL);
01094         g_free (buffer2);
01095         g_regex_unref (regex);
01096     }
01097
01098     // Saving input file
01099     fwrite (buffer3, strlen (buffer3), sizeof (char), file);
01100     g_free (buffer3);
01101     fclose (file);
01102
01103 calibrate_input_end:
01104     #if DEBUG
01105         fprintf (stderr, "calibrate_input: end\n");
01106     #endif
01107     return;
01108 }

```

#### 5.1.2.5 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 1446 of file [calibrator.c](#).

```

01448 {
01449     unsigned int i, j, k, s[calibrate->nbest];
01450     double e[calibrate->nbest];
01451     #if DEBUG
01452         fprintf (stderr, "calibrate_merge: start\n");
01453     #endif
01454     i = j = k = 0;
01455     do
01456     {
01457         if (i == calibrate->nsaveds)
01458         {
01459             s[k] = simulation_best[j];
01460             e[k] = error_best[j];

```

```

01461         ++j;
01462         ++k;
01463         if (j == nsaveds)
01464             break;
01465     }
01466     else if (j == nsaveds)
01467     {
01468         s[k] = calibrate->simulation_best[i];
01469         e[k] = calibrate->error_best[i];
01470         ++i;
01471         ++k;
01472         if (i == calibrate->nsaveds)
01473             break;
01474     }
01475     else if (calibrate->error_best[i] > error_best[j])
01476     {
01477         s[k] = simulation_best[j];
01478         e[k] = error_best[j];
01479         ++j;
01480         ++k;
01481     }
01482     else
01483     {
01484         s[k] = calibrate->simulation_best[i];
01485         e[k] = calibrate->error_best[i];
01486         ++i;
01487         ++k;
01488     }
01489 }
01490 while (k < calibrate->nbest);
01491 calibrate->nsaveds = k;
01492 memcpy (calibrate->simulation_best, s, k * sizeof (unsigned int));
01493 memcpy (calibrate->error_best, e, k * sizeof (double));
01494 #if DEBUG
01495 fprintf (stderr, "calibrate_merge: end\n");
01496 #endif
01497 }

```

#### 5.1.2.6 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 1121 of file [calibrator.c](#).

```

01122 {
01123     unsigned int i;
01124     double e;
01125     char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
01126         *buffer3, *buffer4;
01127     FILE *file_result;
01128
01129     #if DEBUG
01130     fprintf (stderr, "calibrate_parse: start\n");
01131     fprintf (stderr, "calibrate_parse: simulation=%u experiment=%u\n", simulation,
01132             experiment);
01133     #endif
01134
01135     // Opening input files
01136     for (i = 0; i < calibrate->ninputs; ++i)
01137     {
01138         snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
01139         #if DEBUG
01140         fprintf (stderr, "calibrate_parse: i=%u input=%s\n", i, &input[i][0]);
01141         #endif
01142         calibrate_input (simulation, &input[i][0],
01143                         calibrate->file[i][experiment]);
01144     }
01145     for (; i < MAX_NINPUTS; ++i)
01146         strcpy (&input[i][0], "");

```

```

01147 #if DEBUG
01148     fprintf (stderr, "calibrate_parse: parsing end\n");
01149 #endif
01150
01151     // Performing the simulation
01152     snprintf (output, 32, "output-%u-%u", simulation, experiment);
01153     buffer2 = g_path_get_dirname (calibrate->simulator);
01154     buffer3 = g_path_get_basename (calibrate->simulator);
01155     buffer4 = g_build_filename (buffer2, buffer3, NULL);
01156     snprintf (buffer, 512, "\"%s\" %s %s %s %s %s %s %s %s %s",
01157             buffer4, input[0], input[1], input[2], input[3], input[4], input[5],
01158             input[6], input[7], output);
01159     g_free (buffer4);
01160     g_free (buffer3);
01161     g_free (buffer2);
01162 #if DEBUG
01163     fprintf (stderr, "calibrate_parse: %s\n", buffer);
01164 #endif
01165     system (buffer);
01166
01167     // Checking the objective value function
01168     if (calibrate->evaluator)
01169     {
01170         snprintf (result, 32, "result-%u-%u", simulation, experiment);
01171         buffer2 = g_path_get_dirname (calibrate->evaluator);
01172         buffer3 = g_path_get_basename (calibrate->evaluator);
01173         buffer4 = g_build_filename (buffer2, buffer3, NULL);
01174         snprintf (buffer, 512, "\"%s\" %s %s %s",
01175             buffer4, output, calibrate->experiment[experiment], result);
01176         g_free (buffer4);
01177         g_free (buffer3);
01178         g_free (buffer2);
01179 #if DEBUG
01180         fprintf (stderr, "calibrate_parse: %s\n", buffer);
01181 #endif
01182         system (buffer);
01183         file_result = g_fopen (result, "r");
01184         e = atof (fgets (buffer, 512, file_result));
01185         fclose (file_result);
01186     }
01187     else
01188     {
01189         strcpy (result, "");
01190         file_result = g_fopen (output, "r");
01191         e = atof (fgets (buffer, 512, file_result));
01192         fclose (file_result);
01193     }
01194
01195     // Removing files
01196 #if !DEBUG
01197     for (i = 0; i < calibrate->ninputs; ++i)
01198     {
01199         if (calibrate->file[i][0])
01200         {
01201             snprintf (buffer, 512, RM " %s", &input[i][0]);
01202             system (buffer);
01203         }
01204     }
01205     snprintf (buffer, 512, RM " %s %s", output, result);
01206     system (buffer);
01207 #endif
01208
01209 #if DEBUG
01210     fprintf (stderr, "calibrate_parse: end\n");
01211 #endif
01212
01213     // Returning the objective function
01214     return e * calibrate->weight[experiment];
01215 }

```

Here is the call graph for this function:



### 5.1.2.7 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 1257 of file `calibrator.c`.

```

01258 {
01259     unsigned int i;
01260     char buffer[64];
01261     #if DEBUG
01262     fprintf (stderr, "calibrate_save_variables: start\n");
01263     #endif
01264     for (i = 0; i < calibrate->nvariables; ++i)
01265     {
01266         snprintf (buffer, 64, "%s ", format[calibrate->precision[i]]);
01267         fprintf (calibrate->file_variables, buffer,
01268                 calibrate->value[simulation * calibrate->
01269                               nvariables + i]);
01270     }
01271     fprintf (calibrate->file_variables, "%.14le\n", error);
01272     #if DEBUG
01273     fprintf (stderr, "calibrate_save_variables: end\n");
01274     #endif
01275 }
```

### 5.1.2.8 void \* `calibrate_thread` ( ParallelData \* *data* )

Function to calibrate on a thread.

Parameters

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

Returns

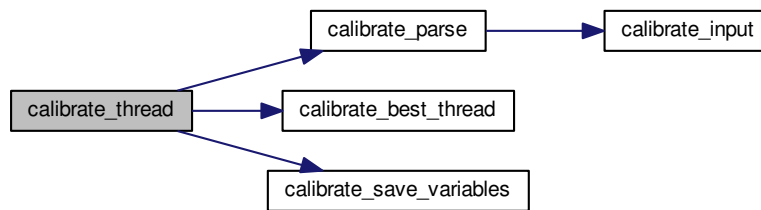
NULL

Definition at line 1372 of file `calibrator.c`.

```

01373 {
01374     unsigned int i, j, thread;
01375     double e;
01376     #if DEBUG
01377     fprintf (stderr, "calibrate_thread: start\n");
01378     #endif
01379     thread = data->thread;
01380     #if DEBUG
01381     fprintf (stderr, "calibrate_thread: thread=%u start=%u end=%u\n", thread,
01382             calibrate->thread[thread], calibrate->thread[thread + 1]);
01383     #endif
01384     for (i = calibrate->thread[thread]; i < calibrate->thread[thread + 1]; ++i)
01385     {
01386         e = 0.;
01387         for (j = 0; j < calibrate->nexperiments; ++j)
01388             e += calibrate_parse (i, j);
01389         calibrate_best_thread (i, e);
01390         g_mutex_lock (mutex);
01391         calibrate_save_variables (i, e);
01392         g_mutex_unlock (mutex);
01393     }
01394     #if DEBUG
01395     fprintf (stderr, "calibrate_thread: i=%u e=%lg\n", i, e);
01396     #endif
01397     #if DEBUG
01398     fprintf (stderr, "calibrate_thread: end\n");
01399     #endif
01400     g_thread_exit (NULL);
01401     return NULL;
01402 }
```

Here is the call graph for this function:



#### 5.1.2.9 int cores\_number ( )

Function to obtain the cores number.

##### Returns

Cores number.

Definition at line 3904 of file [calibrator.c](#).

```

03905 {
03906     #ifdef G_OS_WIN32
03907         SYSTEM_INFO sysinfo;
03908         GetSystemInfo (&sysinfo);
03909         return sysinfo.dwNumberOfProcessors;
03910     #else
03911         return (int) sysconf (_SC_NPROCESSORS_ONLN);
03912     #endif
03913 }
  
```

#### 5.1.2.10 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 472 of file [calibrator.c](#).

```

00473 {
00474     char buffer2[64];
00475     xmlDoc *doc;
00476     xmlNode *node, *child;
00477     xmlChar *buffer;
00478     char *msg;
00479     int error_code;
00480     unsigned int i;
00481
00482     #if DEBUG
00483         fprintf (stderr, "input_open: start\n");
00484     #endif
00485
00486     // Resetting input data
  
```



```

00487     input_new ();
00488
00489     // Parsing the input file
00490     doc = xmlParseFile (filename);
00491     if (!doc)
00492     {
00493         msg = gettext ("Unable to parse the input file");
00494         goto exit_on_error;
00495     }
00496
00497     // Getting the root node
00498     node = xmlDocGetRootElement (doc);
00499     if (xmlStrcmp (node->name, XML_CALIBRATE))
00500     {
00501         msg = gettext ("Bad root XML node");
00502         goto exit_on_error;
00503     }
00504
00505     // Opening simulator program name
00506     input->simulator = (char *) xmlGetProp (node, XML_SIMULATOR);
00507     if (!input->simulator)
00508     {
00509         msg = gettext ("Bad simulator program");
00510         goto exit_on_error;
00511     }
00512
00513     // Opening evaluator program name
00514     input->evaluator = (char *) xmlGetProp (node, XML_EVALUATOR);
00515
00516     // Obtaining pseudo-random numbers generator seed
00517     if (!xmlHasProp (node, XML_SEED))
00518         input->seed = DEFAULT_RANDOM_SEED;
00519     else
00520     {
00521         input->seed = xml_node_get_uint (node, XML_SEED, &error_code);
00522         if (error_code)
00523         {
00524             msg = gettext ("Bad pseudo-random numbers generator seed");
00525             goto exit_on_error;
00526         }
00527     }
00528
00529     // Opening algorithm
00530     buffer = xmlGetProp (node, XML_ALGORITHM);
00531     if (!xmlStrcmp (buffer, XML_MONTE_CARLO))
00532     {
00533         input->algorithm = ALGORITHM_MONTE_CARLO;
00534
00535         // Obtaining simulations number
00536         input->nsimulations
00537             = xml_node_get_int (node, XML_NSIMULATIONS, &error_code);
00538         if (error_code)
00539         {
00540             msg = gettext ("Bad simulations number");
00541             goto exit_on_error;
00542         }
00543     }
00544     else if (!xmlStrcmp (buffer, XML_SWEEP))
00545         input->algorithm = ALGORITHM_SWEEP;
00546     else if (!xmlStrcmp (buffer, XML_GENETIC))
00547     {
00548         input->algorithm = ALGORITHM_GENETIC;
00549
00550         // Obtaining population
00551         if (xmlHasProp (node, XML_NPOPULATION))
00552         {
00553             input->nsimulations
00554                 = xml_node_get_uint (node, XML_NPOPULATION, &error_code);
00555             if (error_code || input->nsimulations < 3)
00556             {
00557                 msg = gettext ("Invalid population number");
00558                 goto exit_on_error;
00559             }
00560         }
00561     }
00562     else
00563     {
00564         msg = gettext ("No population number");
00565         goto exit_on_error;
00566     }
00567
00568     // Obtaining generations
00569     if (xmlHasProp (node, XML_NGENERATIONS))
00570     {
00571         input->niterations
00572             = xml_node_get_uint (node, XML_NGENERATIONS, &error_code);
00573         if (error_code || !input->niterations)
00574         {

```

```

00574         msg = gettext ("Invalid generations number");
00575         goto exit_on_error;
00576     }
00577 }
00578 else
00579 {
00580     msg = gettext ("No generations number");
00581     goto exit_on_error;
00582 }
00583
00584 // Obtaining mutation probability
00585 if (xmlHasProp (node, XML_MUTATION))
00586 {
00587     input->mutation_ratio
00588     = xml_node_get_float (node, XML_MUTATION, &error_code);
00589     if (error_code || input->mutation_ratio < 0.
00590         || input->mutation_ratio >= 1.)
00591     {
00592         msg = gettext ("Invalid mutation probability");
00593         goto exit_on_error;
00594     }
00595 }
00596 else
00597 {
00598     msg = gettext ("No mutation probability");
00599     goto exit_on_error;
00600 }
00601
00602 // Obtaining reproduction probability
00603 if (xmlHasProp (node, XML_REPRODUCTION))
00604 {
00605     input->reproduction_ratio
00606     = xml_node_get_float (node, XML_REPRODUCTION, &error_code);
00607     if (error_code || input->reproduction_ratio < 0.
00608         || input->reproduction_ratio >= 1.0)
00609     {
00610         msg = gettext ("Invalid reproduction probability");
00611         goto exit_on_error;
00612     }
00613 }
00614 else
00615 {
00616     msg = gettext ("No reproduction probability");
00617     goto exit_on_error;
00618 }
00619
00620 // Obtaining adaptation probability
00621 if (xmlHasProp (node, XML_ADAPTATION))
00622 {
00623     input->adaptation_ratio
00624     = xml_node_get_float (node, XML_ADAPTATION, &error_code);
00625     if (error_code || input->adaptation_ratio < 0.
00626         || input->adaptation_ratio >= 1.)
00627     {
00628         msg = gettext ("Invalid adaptation probability");
00629         goto exit_on_error;
00630     }
00631 }
00632 else
00633 {
00634     msg = gettext ("No adaptation probability");
00635     goto exit_on_error;
00636 }
00637
00638 // Checking survivals
00639 i = input->mutation_ratio * input->nsimulations;
00640 i += input->reproduction_ratio * input->
00641 nsimulations;
00642 i += input->adaptation_ratio * input->
00643 nsimulations;
00644 if (i > input->nsimulations - 2)
00645 {
00646     msg = gettext
00647         ("No enough survival entities to reproduce the population");
00648     goto exit_on_error;
00649 }
00650 else
00651 {
00652     msg = gettext ("Unknown algorithm");
00653     goto exit_on_error;
00654 }
00655
00656 if (input->algorithm == ALGORITHM_MONTE_CARLO
00657     || input->algorithm == ALGORITHM_SWEEP)
00658 {

```

```

00659     // Obtaining iterations number
00660     input->niterations
00661     = xml_node_get_int (node, XML_NITERATIONS, &error_code);
00662     if (error_code == 1)
00663         input->niterations = 1;
00664     else if (error_code)
00665     {
00666         msg = gettext ("Bad iterations number");
00667         goto exit_on_error;
00668     }
00669
00670     // Obtaining best number
00671     if (xmlHasProp (node, XML_NBEST))
00672     {
00673         input->nbest = xml_node_get_uint (node,
XML_NBEST, &error_code);
00674         if (error_code || !input->nbest)
00675         {
00676             msg = gettext ("Invalid best number");
00677             goto exit_on_error;
00678         }
00679     }
00680     else
00681         input->nbest = 1;
00682
00683     // Obtaining tolerance
00684     if (xmlHasProp (node, XML_TOLERANCE))
00685     {
00686         input->tolerance
00687         = xml_node_get_float (node, XML_TOLERANCE, &error_code);
00688         if (error_code || input->tolerance < 0.)
00689         {
00690             msg = gettext ("Invalid tolerance");
00691             goto exit_on_error;
00692         }
00693     }
00694     else
00695         input->tolerance = 0.;
00696 }
00697
00698 // Reading the experimental data
00699 for (child = node->children; child; child = child->next)
00700 {
00701     if (xmlStrcmp (child->name, XML_EXPERIMENT))
00702         break;
00703 #if DEBUG
00704     fprintf (stderr, "input_open: nexperiments=%u\n", input->nexperiments);
00705 #endif
00706     if (xmlHasProp (child, XML_NAME))
00707     {
00708         input->experiment
00709         = g_realloc (input->experiment,
00710                     (1 + input->nexperiments) * sizeof (char *));
00711         input->experiment[input->nexperiments]
00712         = (char *) xmlGetProp (child, XML_NAME);
00713     }
00714     else
00715     {
00716         snprintf (buffer2, 64, "%s %u: %s",
00717                  gettext ("Experiment"),
00718                  input->nexperiments + 1, gettext ("no data file name"));
00719         msg = buffer2;
00720         goto exit_on_error;
00721     }
00722 #if DEBUG
00723     fprintf (stderr, "input_open: experiment=%s\n",
00724             input->experiment[input->nexperiments]);
00725 #endif
00726     input->weight = g_realloc (input->weight,
00727                               (1 + input->nexperiments) * sizeof (double));
00728     if (xmlHasProp (child, XML_WEIGHT))
00729     {
00730         input->weight[input->nexperiments]
00731         = xml_node_get_float (child, XML_WEIGHT, &error_code);
00732         if (error_code)
00733         {
00734             snprintf (buffer2, 64, "%s %u: %s",
00735                      gettext ("Experiment"),
00736                      input->nexperiments + 1, gettext ("bad weight"));
00737             msg = buffer2;
00738             goto exit_on_error;
00739         }
00740     }
00741     else
00742         input->weight[input->nexperiments] = 1.;
00743 #if DEBUG
00744     fprintf (stderr, "input_open: weight=%lg\n",

```

```

00745         input->weight[input->nexperiments]);
00746 #endif
00747     if (!input->nexperiments)
00748         input->ninputs = 0;
00749     #if DEBUG
00750         fprintf (stderr, "input_open: template[0]\n");
00751     #endif
00752     if (xmlHasProp (child, XML_TEMPLATE1))
00753     {
00754         input->template[0]
00755             = (char **) g_realloc (input->template[0],
00756                                     (1 + input->nexperiments) * sizeof (char *));
00757         input->template[0][input->nexperiments]
00758             = (char *) xmlGetProp (child, template[0]);
00759     #if DEBUG
00760         fprintf (stderr, "input_open: experiment=%u templatel=%s\n",
00761                 input->nexperiments,
00762                 input->template[0][input->nexperiments]);
00763     #endif
00764         if (!input->nexperiments)
00765             ++input->ninputs;
00766     #if DEBUG
00767         fprintf (stderr, "input_open: ninputs=%u\n", input->ninputs);
00768     #endif
00769     }
00770     else
00771     {
00772         snprintf (buffer2, 64, "%s %u: %s",
00773                 gettext ("Experiment"),
00774                 input->nexperiments + 1, gettext ("no template"));
00775         msg = buffer2;
00776         goto exit_on_error;
00777     }
00778     for (i = 1; i < MAX_NINPUTS; ++i)
00779     {
00780     #if DEBUG
00781         fprintf (stderr, "input_open: template%u\n", i + 1);
00782     #endif
00783         if (xmlHasProp (child, template[i]))
00784         {
00785             if (input->nexperiments && input->ninputs <= i)
00786             {
00787                 snprintf (buffer2, 64, "%s %u: %s",
00788                         gettext ("Experiment"),
00789                         input->nexperiments + 1,
00790                         gettext ("bad templates number"));
00791                 msg = buffer2;
00792                 goto exit_on_error;
00793             }
00794             input->template[i] = (char **)
00795                 g_realloc (input->template[i],
00796                             (1 + input->nexperiments) * sizeof (char *));
00797             input->template[i][input->nexperiments]
00798                 = (char *) xmlGetProp (child, template[i]);
00799     #if DEBUG
00800             fprintf (stderr, "input_open: experiment=%u template%u=%s\n",
00801                     input->nexperiments, i + 1,
00802                     input->template[i][input->nexperiments]);
00803     #endif
00804             if (!input->nexperiments)
00805                 ++input->ninputs;
00806     #if DEBUG
00807             fprintf (stderr, "input_open: ninputs=%u\n", input->ninputs);
00808     #endif
00809         }
00810         else if (input->nexperiments && input->ninputs >= i)
00811         {
00812             snprintf (buffer2, 64, "%s %u: %s",
00813                     gettext ("Experiment"),
00814                     input->nexperiments + 1,
00815                     gettext ("no template"), i + 1);
00816             msg = buffer2;
00817             goto exit_on_error;
00818         }
00819         else
00820             break;
00821     }
00822     ++input->nexperiments;
00823     #if DEBUG
00824         fprintf (stderr, "input_open: nexperiments=%u\n", input->nexperiments);
00825     #endif
00826     }
00827     if (!input->nexperiments)
00828     {
00829         msg = gettext ("No calibration experiments");
00830         goto exit_on_error;
00831     }

```

```

00832
00833 // Reading the variables data
00834 for (; child; child = child->next)
00835 {
00836     if (xmlStrcmp (child->name, XML_VARIABLE))
00837     {
00838         snprintf (buffer2, 64, "%s %u: %s",
00839             gettext ("Variable"),
00840             input->nvariables + 1, gettext ("bad XML node"));
00841         msg = buffer2;
00842         goto exit_on_error;
00843     }
00844     if (xmlHasProp (child, XML_NAME))
00845     {
00846         input->label = g_realloc
00847             (input->label, (1 + input->nvariables) * sizeof (char *));
00848         input->label[input->nvariables]
00849             = (char *) xmlGetProp (child, XML_NAME);
00850     }
00851     else
00852     {
00853         snprintf (buffer2, 64, "%s %u: %s",
00854             gettext ("Variable"),
00855             input->nvariables + 1, gettext ("no name"));
00856         msg = buffer2;
00857         goto exit_on_error;
00858     }
00859     if (xmlHasProp (child, XML_MINIMUM))
00860     {
00861         input->rangemin = g_realloc
00862             (input->rangemin, (1 + input->nvariables) * sizeof (double));
00863         input->rangeminabs = g_realloc
00864             (input->rangeminabs, (1 + input->nvariables) * sizeof (double));
00865         input->rangemin[input->nvariables]
00866             = xml_node_get_float (child, XML_MINIMUM, &error_code);
00867         if (xmlHasProp (child, XML_ABSOLUTE_MINIMUM))
00868         {
00869             input->rangeminabs[input->nvariables]
00870                 = xml_node_get_float (child,
00871                     XML_ABSOLUTE_MINIMUM, &error_code);
00872         }
00873         else
00874             input->rangeminabs[input->nvariables] = -G_MAXDOUBLE;
00875         if (input->rangemin[input->nvariables]
00876             < input->rangeminabs[input->nvariables])
00877         {
00878             snprintf (buffer2, 64, "%s %u: %s",
00879                 gettext ("Variable"),
00880                 input->nvariables + 1,
00881                 gettext ("minimum range not allowed"));
00882             msg = buffer2;
00883             goto exit_on_error;
00884         }
00885     }
00886     else
00887     {
00888         snprintf (buffer2, 64, "%s %u: %s",
00889             gettext ("Variable"),
00890             input->nvariables + 1, gettext ("no minimum range"));
00891         msg = buffer2;
00892         goto exit_on_error;
00893     }
00894     if (xmlHasProp (child, XML_MAXIMUM))
00895     {
00896         input->rangemax = g_realloc
00897             (input->rangemax, (1 + input->nvariables) * sizeof (double));
00898         input->rangemaxabs = g_realloc
00899             (input->rangemaxabs, (1 + input->nvariables) * sizeof (double));
00900         input->rangemax[input->nvariables]
00901             = xml_node_get_float (child, XML_MAXIMUM, &error_code);
00902         if (xmlHasProp (child, XML_ABSOLUTE_MAXIMUM))
00903         {
00904             input->rangemaxabs[input->nvariables]
00905                 = xml_node_get_float (child,
00906                     XML_ABSOLUTE_MAXIMUM, &error_code);
00907         }
00908         else
00909             input->rangemaxabs[input->nvariables] = G_MAXDOUBLE;
00910         if (input->rangemax[input->nvariables]
00911             > input->rangemaxabs[input->nvariables])
00912         {
00913             snprintf (buffer2, 64, "%s %u: %s",
00914                 gettext ("Variable"),
00915                 input->nvariables + 1,
00916                 gettext ("maximum range not allowed"));
00917             msg = buffer2;
00918             goto exit_on_error;
00919         }
00920     }
00921 }

```

```

00917     else
00918     {
00919         snprintf (buffer2, 64, "%s %u: %s",
00920                 gettext ("Variable"),
00921                 input->nvariables + 1, gettext ("no maximum range"));
00922         msg = buffer2;
00923         goto exit_on_error;
00924     }
00925     if (input->rangemax[input->nvariables]
00926         < input->rangemin[input->nvariables])
00927     {
00928         snprintf (buffer2, 64, "%s %u: %s",
00929                 gettext ("Variable"),
00930                 input->nvariables + 1, gettext ("bad range"));
00931         msg = buffer2;
00932         goto exit_on_error;
00933     }
00934     input->precision = g_realloc
00935     (input->precision, (1 + input->nvariables) * sizeof (unsigned int));
00936     if (xmlHasProp (child, XML_PRECISION))
00937         input->precision[input->nvariables]
00938         = xml_node_get_uint (child, XML_PRECISION, &error_code);
00939     else
00940         input->precision[input->nvariables] =
00941         DEFAULT_PRECISION;
00942     if (input->algorithm == ALGORITHM_SWEEP)
00943     {
00944         if (xmlHasProp (child, XML_NSWEEPS))
00945         {
00946             input->nsweeps = (unsigned int *)
00947             g_realloc (input->nsweeps,
00948                 (1 + input->nvariables) * sizeof (unsigned int));
00949             input->nsweeps[input->nvariables]
00950             = xml_node_get_uint (child, XML_NSWEEPS, &error_code);
00951         }
00952         else
00953         {
00954             snprintf (buffer2, 64, "%s %u: %s",
00955                     gettext ("Variable"),
00956                     input->nvariables + 1, gettext ("no sweeps number"));
00957             msg = buffer2;
00958             goto exit_on_error;
00959         }
00960         #if DEBUG
00961         fprintf (stderr, "input_open: nsweeps=%u nsimulations=%u\n",
00962                 input->nsweeps[input->nvariables],
00963                 input->nsimulations);
00964         #endif
00965     }
00966     if (input->algorithm == ALGORITHM_GENETIC)
00967     {
00968         // Obtaining bits representing each variable
00969         if (xmlHasProp (child, XML_NBITS))
00970         {
00971             input->nbits = (unsigned int *)
00972             g_realloc (input->nbits,
00973                 (1 + input->nvariables) * sizeof (unsigned int));
00974             i = xml_node_get_uint (child, XML_NBITS, &error_code);
00975             if (error_code || !i)
00976             {
00977                 snprintf (buffer2, 64, "%s %u: %s",
00978                         gettext ("Variable"),
00979                         input->nvariables + 1,
00980                         gettext ("invalid bits number"));
00981                 msg = buffer2;
00982                 goto exit_on_error;
00983             }
00984             input->nbits[input->nvariables] = i;
00985         }
00986         else
00987         {
00988             snprintf (buffer2, 64, "%s %u: %s",
00989                     gettext ("Variable"),
00990                     input->nvariables + 1, gettext ("no bits number"));
00991             msg = buffer2;
00992             goto exit_on_error;
00993         }
00994     }
00995     ++input->nvariables;
00996 }
00997 if (!input->nvariables)
00998 {
00999     msg = gettext ("No calibration variables");
01000     goto exit_on_error;
01001 }
01002 // Getting the working directory

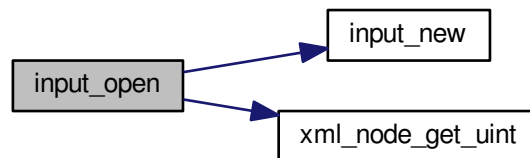
```

```

01002     input->directory = g_path_get_dirname (filename);
01003     input->name = g_path_get_basename (filename);
01004
01005     // Closing the XML document
01006     xmlFreeDoc (doc);
01007
01008     #if DEBUG
01009     fprintf (stderr, "input_open: end\n");
01010     #endif
01011     return 1;
01012
01013 exit_on_error:
01014     show_error (msg);
01015     input_free ();
01016     #if DEBUG
01017     fprintf (stderr, "input_open: end\n");
01018     #endif
01019     return 0;
01020 }

```

Here is the call graph for this function:



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

Function to save the input file.

##### Parameters

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

Definition at line 2142 of file `calibrator.c`.

```

02143 {
02144     unsigned int i, j;
02145     char *buffer;
02146     xmlDoc *doc;
02147     xmlNode *node, *child;
02148     GFile *file, *file2;
02149
02150     // Getting the input file directory
02151     input->name = g_path_get_basename (filename);
02152     input->directory = g_path_get_dirname (filename);
02153     file = g_file_new_for_path (input->directory);
02154
02155     // Opening the input file
02156     doc = xmlNewDoc ((const xmlChar *) "1.0");
02157
02158     // Setting root XML node
02159     node = xmlNewDocNode (doc, 0, XML_CALIBRATE, 0);
02160     xmlDocSetRootElement (doc, node);
02161
02162     // Adding properties to the root XML node
02163     file2 = g_file_new_for_path (input->simulator);
02164     buffer = g_file_get_relative_path (file, file2);
02165     g_object_unref (file2);
02166     xmlSetProp (node, XML_SIMULATOR, (xmlChar *) buffer);
02167     g_free (buffer);
02168     if (input->evaluator)
02169     {

```

```

02170     file2 = g_file_new_for_path (input->evaluator);
02171     buffer = g_file_get_relative_path (file, file2);
02172     g_object_unref (file2);
02173     if (xmlStrlen ((xmlChar *) buffer))
02174         xmlSetProp (node, XML_EVALUATOR, (xmlChar *) buffer);
02175     g_free (buffer);
02176 }
02177 if (input->seed != DEFAULT_RANDOM_SEED)
02178     xml_node_set_uint (node, XML_SEED, input->seed);
02179
02180 // Setting the algorithm
02181 buffer = (char *) g_malloc (64);
02182 switch (input->algorithm)
02183 {
02184     case ALGORITHM_MONTE_CARLO:
02185         xmlSetProp (node, XML_ALGORITHM, XML_MONTE_CARLO);
02186         snprintf (buffer, 64, "%u", input->nsimulations);
02187         xmlSetProp (node, XML_NSIMULATIONS, (xmlChar *) buffer);
02188         snprintf (buffer, 64, "%u", input->niterations);
02189         xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02190         snprintf (buffer, 64, "%.3lg", input->tolerance);
02191         xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02192         snprintf (buffer, 64, "%u", input->nbest);
02193         xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02194         break;
02195     case ALGORITHM_SWEEP:
02196         xmlSetProp (node, XML_ALGORITHM, XML_SWEEP);
02197         snprintf (buffer, 64, "%u", input->niterations);
02198         xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02199         snprintf (buffer, 64, "%.3lg", input->tolerance);
02200         xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02201         snprintf (buffer, 64, "%u", input->nbest);
02202         xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02203         break;
02204     default:
02205         xmlSetProp (node, XML_ALGORITHM, XML_GENETIC);
02206         snprintf (buffer, 64, "%u", input->nsimulations);
02207         xmlSetProp (node, XML_NPOPULATION, (xmlChar *) buffer);
02208         snprintf (buffer, 64, "%u", input->niterations);
02209         xmlSetProp (node, XML_NGENERATIONS, (xmlChar *) buffer);
02210         snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
02211         xmlSetProp (node, XML_MUTATION, (xmlChar *) buffer);
02212         snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
02213         xmlSetProp (node, XML_REPRODUCTION, (xmlChar *) buffer);
02214         snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
02215         xmlSetProp (node, XML_ADAPTATION, (xmlChar *) buffer);
02216         break;
02217 }
02218 g_free (buffer);
02219
02220 // Setting the experimental data
02221 for (i = 0; i < input->nexperiments; ++i)
02222 {
02223     child = xmlNewChild (node, 0, XML_EXPERIMENT, 0);
02224     xmlSetProp (child, XML_NAME, (xmlChar *) input->experiment[i]);
02225     if (input->weight[i] != 1.)
02226         xml_node_set_float (child, XML_WEIGHT, input->
weight[i]);
02227     for (j = 0; j < input->ninputs; ++j)
02228         xmlSetProp (child, template[j], (xmlChar *) input->template[j][i]);
02229 }
02230
02231 // Setting the variables data
02232 for (i = 0; i < input->nvariables; ++i)
02233 {
02234     child = xmlNewChild (node, 0, XML_VARIABLE, 0);
02235     xmlSetProp (child, XML_NAME, (xmlChar *) input->label[i]);
02236     xml_node_set_float (child, XML_MINIMUM, input->
rangemin[i]);
02237     if (input->rangeminabs[i] != -G_MAXDOUBLE)
02238         xml_node_set_float (child, XML_ABSOLUTE_MINIMUM,
input->rangeminabs[i]);
02239     xml_node_set_float (child, XML_MAXIMUM, input->
rangemax[i]);
02240     if (input->rangemaxabs[i] != G_MAXDOUBLE)
02241         xml_node_set_float (child, XML_ABSOLUTE_MAXIMUM,
input->rangemaxabs[i]);
02242     if (input->precision[i] != DEFAULT_PRECISION)
02243         xml_node_set_uint (child, XML_PRECISION,
input->precision[i]);
02244     if (input->algorithm == ALGORITHM_SWEEP)
02245         xml_node_set_uint (child, XML_NSWEEPS, input->
nsweeps[i]);
02246     else if (input->algorithm == ALGORITHM_GENETIC)
02247         xml_node_set_uint (child, XML_NBITS, input->
nbits[i]);
02248 }

```

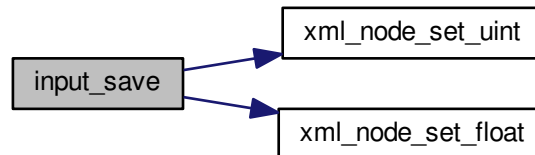


```

02249
02250 // Saving the XML file
02251 xmlSaveFormatFile (filename, doc, 1);
02252
02253 // Freeing memory
02254 xmlFreeDoc (doc);
02255 }

```

Here is the call graph for this function:



#### 5.1.2.12 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 3925 of file [calibrator.c](#).

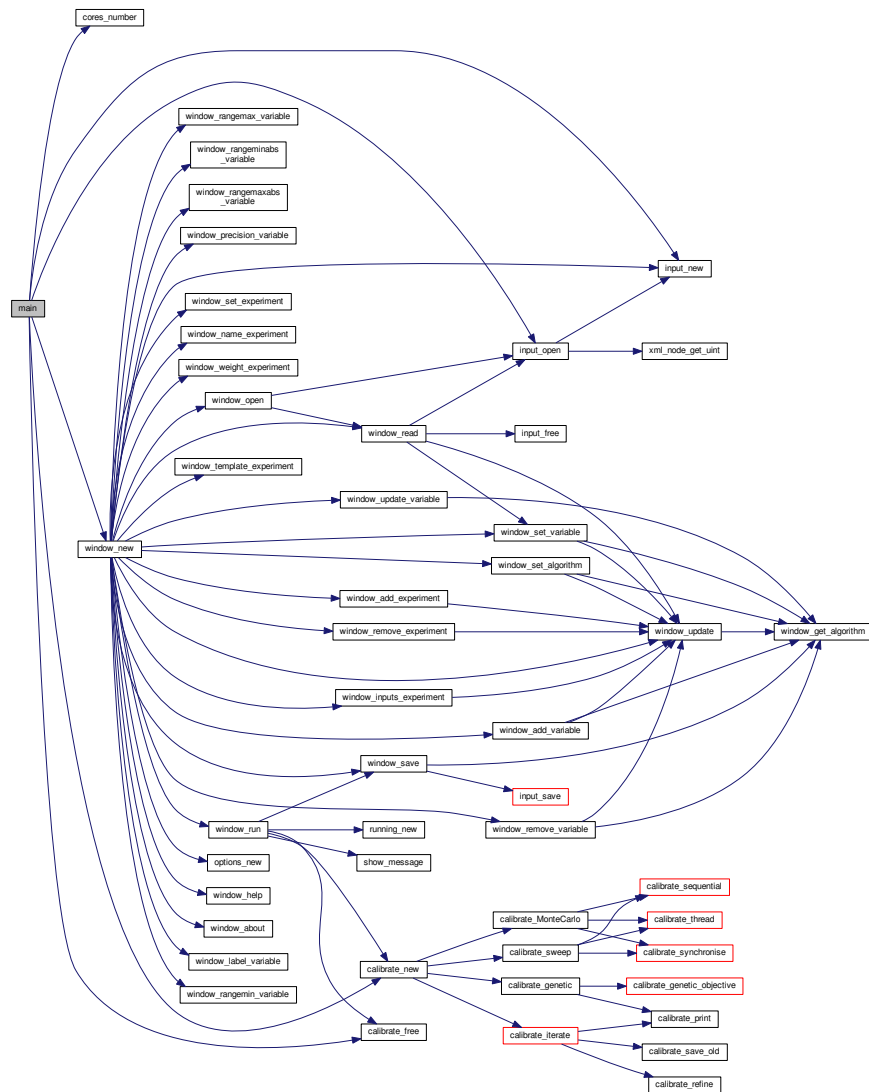
```

03926 {
03927 // Starting pseudo-random numbers generator
03928 calibrate->rng = gsl_rng_alloc (gsl_rng_taus2);
03929 calibrate->seed = DEFAULT_RANDOM_SEED;
03930
03931 // Allowing spaces in the XML data file
03932 xmlKeepBlanksDefault (0);
03933
03934 // Starting MPI
03935 #if HAVE_MPI
03936 MPI_Init (&argn, &argc);
03937 MPI_Comm_size (MPI_COMM_WORLD, &ntasks);
03938 MPI_Comm_rank (MPI_COMM_WORLD, &calibrate->mpi_rank);
03939 printf ("rank=%d tasks=%d\n", calibrate->mpi_rank, ntasks);
03940 #else
03941 ntasks = 1;
03942 #endif
03943
03944 #if HAVE_GTK
03945
03946 // Getting threads number
03947 nthreads = cores_number ();
03948
03949 // Setting local language and international floating point numbers notation
03950 setlocale (LC_ALL, "");
03951 setlocale (LC_NUMERIC, "C");
03952 window->application_directory = g_get_current_dir ();
03953 bindtextdomain (PROGRAM_INTERFACE,
03954                 g_build_filename (window->application_directory,
03955                                 LOCALE_DIR, NULL));
03956 bind_textdomain_codeset (PROGRAM_INTERFACE, "UTF-8");

```

```
03957  textdomain (PROGRAM_INTERFACE);
03958
03959  // Initing GTK+
03960  gtk_disable_setlocale ();
03961  gtk_init (&argn, &argc);
03962
03963  // Opening the main window
03964  window_new ();
03965  gtk_main ();
03966
03967  // Freeing memory
03968  gtk_widget_destroy (GTK_WIDGET (window->window));
03969  g_free (window->application_directory);
03970
03971  #else
03972
03973  // Checking syntax
03974  if (!(argn == 2 || (argn == 4 && !strcmp (argc[1], "-nthreads"))))
03975  {
03976      printf ("The syntax is:\ncalibratorbin [-nthreads x] data_file\n");
03977      return 1;
03978  }
03979
03980  // Getting threads number
03981  if (argn == 2)
03982      nthreads = cores_number ();
03983  else
03984      nthreads = atoi (argc[2]);
03985  printf ("nthreads=%u\n", nthreads);
03986
03987  // Making calibration
03988  input_new ();
03989  if (input_open (argc[argn - 1]))
03990      calibrate_new ();
03991
03992  // Freeing memory
03993  calibrate_free ();
03994
03995  #endif
03996
03997  // Closing MPI
03998  #if HAVE_MPI
03999  MPI_Finalize ();
04000  #endif
04001
04002  // Freeing memory
04003  gsl_rng_free (calibrate->rng);
04004
04005  // Closing
04006  return 0;
04007 }
```

Here is the call graph for this function:



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

Function to show a dialog with an error message.

Parameters

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

Definition at line 246 of file [calibrator.c](#).

```

00247 {
00248     show_message (gettext ("ERROR!"), msg, ERROR_TYPE);
00249 }
```

Here is the call graph for this function:



#### 5.1.2.14 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 216 of file [calibrator.c](#).

```

00217 {
00218     #if HAVE_GTK
00219         GtkMessageDialog *dlg;
00220
00221         // Creating the dialog
00222         dlg = (GtkMessageDialog *) gtk_message_dialog_new
00223             (window->window, GTK_DIALOG_MODAL, type, GTK_BUTTONS_OK, "%s", msg);
00224
00225         // Setting the dialog title
00226         gtk_window_set_title (GTK_WINDOW (dlg), title);
00227
00228         // Showing the dialog and waiting response
00229         gtk_dialog_run (GTK_DIALOG (dlg));
00230
00231         // Closing and freeing memory
00232         gtk_widget_destroy (GTK_WIDGET (dlg));
00233
00234     #else
00235         printf ("%s: %s\n", title, msg);
00236     #endif
00237 }
  
```

#### 5.1.2.15 int window\_get\_algorithm ( )

Function to get the algorithm number.

##### Returns

Algorithm number.

Definition at line 2515 of file [calibrator.c](#).

```

02516 {
02517     unsigned int i;
02518     for (i = 0; i < NALGORITHMS; ++i)
02519         if (gtk_toggle_button_get_active
02520             (GTK_TOGGLE_BUTTON (window->button_algorithm[i])))
02521             break;
02522     return i;
02523 }
  
```

#### 5.1.2.16 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 3266 of file `calibrator.c`.

```

03267 {
03268     unsigned int i;
03269     char *buffer;
03270     #if DEBUG
03271     fprintf (stderr, "window_read: start\n");
03272     #endif
03273
03274     // Reading new input file
03275     input_free ();
03276     if (!input_open (filename))
03277         return 0;
03278
03279     // Setting GTK+ widgets data
03280     buffer = g_build_filename (input->directory, input->
simulator, NULL);
03281     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
03282         (window->button_simulator), buffer);
03283     g_free (buffer);
03284     gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
03285         (size_t) input->evaluator);
03286     if (input->evaluator)
03287     {
03288         buffer = g_build_filename (input->directory, input->
evaluator, NULL);
03289         gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
03290             (window->button_evaluator), buffer);
03291         g_free (buffer);
03292     }
03293     gtk_toggle_button_set_active
03294         (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
algorithm]), TRUE);
03295     switch (input->algorithm)
03296     {
03297         case ALGORITHM_MONTE_CARLO:
03298             gtk_spin_button_set_value (window->spin_simulations,
03299                 (gdouble) input->nsimulations);
03300         case ALGORITHM_SWEEP:
03301             gtk_spin_button_set_value (window->spin_iterations,
03302                 (gdouble) input->niterations);
03303             gtk_spin_button_set_value (window->spin_bests, (gdouble)
input->nbest);
03304             gtk_spin_button_set_value (window->spin_tolerance,
input->tolerance);
03305             break;
03306         default:
03307             gtk_spin_button_set_value (window->spin_population,
03308                 (gdouble) input->nsimulations);
03309             gtk_spin_button_set_value (window->spin_generations,
03310                 (gdouble) input->niterations);
03311             gtk_spin_button_set_value (window->spin_mutation, input->
mutation_ratio);
03312             gtk_spin_button_set_value (window->spin_reproduction,
03313                 input->reproduction_ratio);
03314             gtk_spin_button_set_value (window->spin_adaptation,
03315                 input->adaptation_ratio);
03316     }
03317     g_signal_handler_block (window->combo_experiment, window->
id_experiment);
03318     g_signal_handler_block (window->button_experiment,
03319         window->id_experiment_name);
03320     gtk_combo_box_text_remove_all (window->combo_experiment);
03321     for (i = 0; i < input->nexperiments; ++i)
03322         gtk_combo_box_text_append_text (window->combo_experiment,
03323             input->experiment[i]);
03324     g_signal_handler_unblock
03325         (window->button_experiment, window->
id_experiment_name);
03326     g_signal_handler_unblock (window->combo_experiment,
03327         window->id_experiment);
03328     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
03329     g_signal_handler_block (window->combo_variable, window->
id_variable);
03329     g_signal_handler_block (window->entry_variable, window->

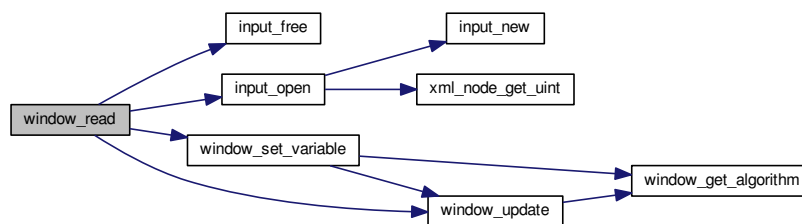
```

```

    id_variable_label);
03330   gtk_combo_box_text_remove_all (window->combo_variable);
03331   for (i = 0; i < input->nvariables; ++i)
03332     gtk_combo_box_text_append_text (window->combo_variable,
    input->label[i]);
03333   g_signal_handler_unblock (window->entry_variable, window->
    id_variable_label);
03334   g_signal_handler_unblock (window->combo_variable, window->
    id_variable_label);
03335   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
03336   window_set_variable ();
03337   window_update ();
03338
03339   #if DEBUG
03340     fprintf (stderr, "window_read: end\n");
03341   #endif
03342   return 1;
03343 }

```

Here is the call graph for this function:



#### 5.1.2.17 int window\_save ( )

Function to save the input file.

##### Returns

1 on OK, 0 on Cancel.

Definition at line 2330 of file [calibrator.c](#).

```

02331 {
02332   char *buffer;
02333   GtkFileChooserDialog *dlg;
02334
02335   #if DEBUG
02336     fprintf (stderr, "window_save: start\n");
02337   #endif
02338
02339   // Opening the saving dialog
02340   dlg = (GtkFileChooserDialog *)
02341     gtk_file_chooser_dialog_new (gettext ("Save file"),
02342     window->window,
02343     GTK_FILE_CHOOSER_ACTION_SAVE,
02344     gettext ("_Cancel"),
02345     GTK_RESPONSE_CANCEL,
02346     gettext ("_OK"), GTK_RESPONSE_OK, NULL);
02347   gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
02348   buffer = g_build_filename (input->directory, input->name, NULL);
02349   gtk_file_chooser_set_filename (GTK_FILE_CHOOSER (dlg), buffer);
02350   g_free (buffer);
02351
02352   // If OK response then saving
02353   if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
02354   {
02355     // Adding properties to the root XML node
02356     input->simulator = gtk_file_chooser_get_filename

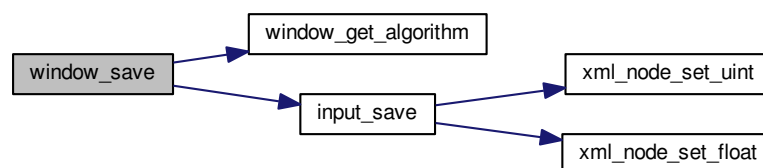
```

```

02358     (GTK_FILE_CHOOSER (window->button_simulator));
02359 if (gtk_toggle_button_get_active
02360     (GTK_TOGGLE_BUTTON (window->check_evaluator)))
02361     input->evaluator = gtk_file_chooser_get_filename
02362     (GTK_FILE_CHOOSER (window->button_evaluator));
02363 else
02364     input->evaluator = NULL;
02365
02366 // Setting the algorithm
02367 switch (window_get_algorithm ())
02368 {
02369     case ALGORITHM_MONTE_CARLO:
02370         input->algorithm = ALGORITHM_MONTE_CARLO;
02371         input->nsimulations
02372             = gtk_spin_button_get_value_as_int (window->spin_simulations);
02373         input->niterations
02374             = gtk_spin_button_get_value_as_int (window->spin_iterations);
02375         input->tolerance = gtk_spin_button_get_value (window->
spin_tolerance);
02376         input->nbest = gtk_spin_button_get_value_as_int (window->
spin_bests);
02377         break;
02378     case ALGORITHM_SWEEP:
02379         input->algorithm = ALGORITHM_SWEEP;
02380         input->niterations
02381             = gtk_spin_button_get_value_as_int (window->spin_iterations);
02382         input->tolerance = gtk_spin_button_get_value (window->
spin_tolerance);
02383         input->nbest = gtk_spin_button_get_value_as_int (window->
spin_bests);
02384         break;
02385     default:
02386         input->algorithm = ALGORITHM_GENETIC;
02387         input->nsimulations
02388             = gtk_spin_button_get_value_as_int (window->spin_population);
02389         input->niterations
02390             = gtk_spin_button_get_value_as_int (window->spin_generations);
02391         input->mutation_ratio
02392             = gtk_spin_button_get_value (window->spin_mutation);
02393         input->reproduction_ratio
02394             = gtk_spin_button_get_value (window->spin_reproduction);
02395         input->adaptation_ratio
02396             = gtk_spin_button_get_value (window->spin_adaptation);
02397         break;
02398 }
02399
02400 // Saving the XML file
02401 buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
02402 input_save (buffer);
02403
02404 // Closing and freeing memory
02405 g_free (buffer);
02406 gtk_widget_destroy (GTK_WIDGET (dlg));
02407 #if DEBUG
02408     fprintf (stderr, "window_save: end\n");
02409 #endif
02410     return 1;
02411 }
02412
02413 // Closing and freeing memory
02414 gtk_widget_destroy (GTK_WIDGET (dlg));
02415 #if DEBUG
02416     fprintf (stderr, "window_save: end\n");
02417 #endif
02418     return 0;
02419 }

```

Here is the call graph for this function:





**5.1.2.18 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 2902 of file [calibrator.c](#).

```

02903 {
02904     unsigned int i, j;
02905     char *buffer;
02906     GFile *file1, *file2;
02907     #if DEBUG
02908         fprintf (stderr, "window_template_experiment: start\n");
02909     #endif
02910     i = (size_t) data;
02911     j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02912     file1
02913         = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
02914     file2 = g_file_new_for_path (input->directory);
02915     buffer = g_file_get_relative_path (file2, file1);
02916     input->template[i][j] = (char *) xmlStrdup ((xmlChar *) buffer);
02917     g_free (buffer);
02918     g_object_unref (file2);
02919     g_object_unref (file1);
02920     #if DEBUG
02921         fprintf (stderr, "window_template_experiment: end\n");
02922     #endif
02923 }
```

**5.1.2.19 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 325 of file [calibrator.c](#).

```

00326 {
00327     double x = 0.;
00328     xmlChar *buffer;
00329     buffer = xmlGetProp (node, prop);
00330     if (!buffer)
00331         *error_code = 1;
00332     else
00333     {
00334         if (sscanf ((char *) buffer, "%lf", &x) != 1)
00335             *error_code = 2;
00336         else
00337             *error_code = 0;
00338         xmlFree (buffer);
00339     }
00340     return x;
00341 }
```

**5.1.2.20 int xml\_node\_get\_int ( xmlNode \* *node*, const xmlChar \* *prop*, int \* *error\_code* )**

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

**Parameters**

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

**Returns**

Integer number value.

Definition at line 263 of file [calibrator.c](#).

```

00264 {
00265     int i = 0;
00266     xmlChar *buffer;
00267     buffer = xmlGetProp (node, prop);
00268     if (!buffer)
00269         *error_code = 1;
00270     else
00271     {
00272         if (sscanf ((char *) buffer, "%d", &i) != 1)
00273             *error_code = 2;
00274         else
00275             *error_code = 0;
00276         xmlFree (buffer);
00277     }
00278     return i;
00279 }
```

**5.1.2.21** `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 294 of file [calibrator.c](#).

```

00295 {
00296     unsigned int i = 0;
00297     xmlChar *buffer;
00298     buffer = xmlGetProp (node, prop);
00299     if (!buffer)
00300         *error_code = 1;
00301     else
00302     {
00303         if (sscanf ((char *) buffer, "%u", &i) != 1)
00304             *error_code = 2;
00305         else
00306             *error_code = 0;
00307         xmlFree (buffer);
00308     }
00309     return i;
00310 }
```

**5.1.2.22** `void xml_node_set_float ( xmlDoc * 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 392 of file [calibrator.c](#).

```
00393 {
00394     xmlChar buffer[64];
00395     snprintf ((char *) buffer, 64, "%.14lg", value);
00396     xmlSetProp (node, prop, buffer);
00397 }
```

**5.1.2.23 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 354 of file [calibrator.c](#).

```
00355 {
00356     xmlChar buffer[64];
00357     snprintf ((char *) buffer, 64, "%d", value);
00358     xmlSetProp (node, prop, buffer);
00359 }
```

**5.1.2.24 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 373 of file [calibrator.c](#).

```
00374 {
00375     xmlChar buffer[64];
00376     snprintf ((char *) buffer, 64, "%u", value);
00377     xmlSetProp (node, prop, buffer);
00378 }
```

**5.1.3 Variable Documentation****5.1.3.1 const char\* format[NPRECISIONS]****Initial value:**

```
= {
    "%.1lg", "%.2lg", "%.3lg", "%.4lg", "%.5lg", "%.6lg", "%.7lg", "%.8lg",
    "%.9lg", "%.10lg", "%.11lg", "%.12lg", "%.13lg", "%.14lg", "%.15lg"
}
```

Array of C-strings with variable formats.

Definition at line 107 of file [calibrator.c](#).

### 5.1.3.2 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 112 of file [calibrator.c](#).

### 5.1.3.3 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 100 of file [calibrator.c](#).

## 5.2 calibrator.c

```
00001 /*
00002 Calibrator: a software to make calibrations of empirical parameters.
00003
00004 AUTHORS: Javier Burguete and Borja Latorre.
00005
00006 Copyright 2012-2015, 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
00030 #define _GNU_SOURCE
00031 #include "config.h"
00032 #include <stdio.h>
00033 #include <stdlib.h>
00034 #include <string.h>
00035 #include <math.h>
00036 #include <unistd.h>
00037 #include <locale.h>
00038 #include <gsl/gsl_rng.h>
00039 #include <libxml/parser.h>
00040 #include <libintl.h>
00041 #include <glib.h>
00042 #include <glib/gstdio.h>
00043 #ifdef G_OS_WIN32
00044 #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 "calibrator.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 #if HAVE_GTK
00077 #define ERROR_TYPE GTK_MESSAGE_ERROR
00078 #define INFO_TYPE GTK_MESSAGE_INFO
00079 #else
00080 #define ERROR_TYPE 0
00081 #define INFO_TYPE 0
00082 #endif
00083 #ifdef G_OS_WIN32
00084 #define INPUT_FILE "test-ga-win.xml"
00085 #define RM "del"
00086 #else
00087 #define INPUT_FILE "test-ga.xml"
00088 #define RM "rm"
00089 #endif
00090
00091 int ntasks;
00092 unsigned int nthreads;
00093 GMutex mutex[1];
00094 void (*calibrate_step) ();
00096 Input input[1];
00098 Calibrate calibrate[1];
00099
00100 const xmlChar *template[MAX_NINPUTS] = {
00101     XML_TEMPLATE1, XML_TEMPLATE2, XML_TEMPLATE3,
00102     XML_TEMPLATE4,
00103     XML_TEMPLATE5, XML_TEMPLATE6, XML_TEMPLATE7,
00104     XML_TEMPLATE8
00105 };
00106
00107 const char *format[NPRECISIONS] = {
00108     "%.11g", "%.21g", "%.31g", "%.41g", "%.51g", "%.61g", "%.71g", "%.81g",
00109     "%.91g", "%.101g", "%.111g", "%.121g", "%.131g", "%.141g", "%.151g"
00110 };
00111
00112 const double precision[NPRECISIONS] = {
00113     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,
00114     1e-13, 1e-14
00115 };
00116
00117 const char *logo[] = {
00118     "32 32 3 1",
00119     "      c None",
00120     "      c #0000FF",
00121     "      c #FF0000",
00122     "      ",
00123     "      ",
00124     "      ",
00125     "      .      .      .      .      ",
00126     "      .      .      .      .      ",
00127     "      .      .      .      .      ",
00128     "      .      .      .      .      ",
00129     "      .      .      +++      .      ",
00130     "      .      .      +++++      .      ",
00131     "      .      .      +++++      .      ",
00132     "      .      .      +++++      .      ",
00133     "      +++      .      +++      +++      ",
00134     "      +++++      .      .      +++++      ",
00135     "      +++++      .      .      +++++      ",
00136     "      +++++      .      .      +++++      ",
00137     "      +++      .      .      +++      ",
00138     "      .      .      .      .      ",
00139     "      .      +++      .      .      ",
00140     "      .      +++++      .      .      ",
00141     "      .      +++++      .      .      ",
00142     "      .      +++++      .      .      ",
00143     "      .      +++      .      .      ",
00144     "      .      .      .      .      ",
00145     "      .      .      .      .      ",
00146     "      .      .      .      .      ",
00147     "      .      .      .      .      ",

```

```

00148 " . . . . . ",
00149 " . . . . . ",
00150 " . . . . . ",
00151 " . . . . . ",
00152 " . . . . . ",
00153 " . . . . . ",
00154 };
00155
00156 /*
00157 const char * logo[] = {
00158 "32 32 3 1",
00159 " c #FFFFFFFFFFFF",
00160 ". c #00000000FFFF",
00161 "X c #FFFF00000000",
00162 " . . . . . ",
00163 " . . . . . ",
00164 " . . . . . ",
00165 " . . . . . ",
00166 " . . . . . ",
00167 " . . . . . ",
00168 " . . . . . ",
00169 " . . . . . ",
00170 " . . . . . ",
00171 " . . . . . ",
00172 " . . . . . ",
00173 " . . . . . ",
00174 " . . . . . ",
00175 " . . . . . ",
00176 " . . . . . ",
00177 " . . . . . ",
00178 " . . . . . ",
00179 " . . . . . ",
00180 " . . . . . ",
00181 " . . . . . ",
00182 " . . . . . ",
00183 " . . . . . ",
00184 " . . . . . ",
00185 " . . . . . ",
00186 " . . . . . ",
00187 " . . . . . ",
00188 " . . . . . ",
00189 " . . . . . ",
00190 " . . . . . ",
00191 " . . . . . ",
00192 " . . . . . ",
00193 " . . . . . ";
00194 */
00195
00196 #if HAVE_GTK
00197 Options options[1];
00199 Running running[1];
00201 Window window[1];
00203 #endif
00204
00215 void
00216 show_message (char *title, char *msg, int type)
00217 {
00218 #if HAVE_GTK
00219 GtkWidgetDialog *dlg;
00220
00221 // Creating the dialog
00222 dlg = (GtkWidgetDialog *) gtk_message_dialog_new
00223 (window->window, GTK_DIALOG_MODAL, type, GTK_BUTTONS_OK, "%s", msg);
00224
00225 // Setting the dialog title
00226 gtk_window_set_title (GTK_WINDOW (dlg), title);
00227
00228 // Showing the dialog and waiting response
00229 gtk_dialog_run (GTK_DIALOG (dlg));
00230
00231 // Closing and freeing memory
00232 gtk_widget_destroy (GTK_WIDGET (dlg));
00233
00234 #else
00235 printf ("%s: %s\n", title, msg);
00236 #endif
00237 }
00238
00245 void
00246 show_error (char *msg)
00247 {
00248 show_message (gettext ("ERROR!"), msg, ERROR_TYPE);
00249 }
00250
00262 int
00263 xml_node_get_int (xmlNode * node, const xmlChar * prop, int *error_code)
00264 {

```

```

00265     int i = 0;
00266     xmlChar *buffer;
00267     buffer = xmlGetProp (node, prop);
00268     if (!buffer)
00269         *error_code = 1;
00270     else
00271     {
00272         if (sscanf ((char *) buffer, "%d", &i) != 1)
00273             *error_code = 2;
00274         else
00275             *error_code = 0;
00276         xmlFree (buffer);
00277     }
00278     return i;
00279 }
00280
00293 unsigned int
00294 xml_node_get_uint (xmlNode * node, const xmlChar * prop, int *error_code)
00295 {
00296     unsigned int i = 0;
00297     xmlChar *buffer;
00298     buffer = xmlGetProp (node, prop);
00299     if (!buffer)
00300         *error_code = 1;
00301     else
00302     {
00303         if (sscanf ((char *) buffer, "%u", &i) != 1)
00304             *error_code = 2;
00305         else
00306             *error_code = 0;
00307         xmlFree (buffer);
00308     }
00309     return i;
00310 }
00311
00324 double
00325 xml_node_get_float (xmlNode * node, const xmlChar * prop, int *error_code)
00326 {
00327     double x = 0.;
00328     xmlChar *buffer;
00329     buffer = xmlGetProp (node, prop);
00330     if (!buffer)
00331         *error_code = 1;
00332     else
00333     {
00334         if (sscanf ((char *) buffer, "%lf", &x) != 1)
00335             *error_code = 2;
00336         else
00337             *error_code = 0;
00338         xmlFree (buffer);
00339     }
00340     return x;
00341 }
00342
00353 void
00354 xml_node_set_int (xmlNode * node, const xmlChar * prop, int value)
00355 {
00356     xmlChar buffer[64];
00357     snprintf ((char *) buffer, 64, "%d", value);
00358     xmlSetProp (node, prop, buffer);
00359 }
00360
00372 void
00373 xml_node_set_uint (xmlNode * node, const xmlChar * prop, unsigned int value)
00374 {
00375     xmlChar buffer[64];
00376     snprintf ((char *) buffer, 64, "%u", value);
00377     xmlSetProp (node, prop, buffer);
00378 }
00379
00391 void
00392 xml_node_set_float (xmlNode * node, const xmlChar * prop, double value)
00393 {
00394     xmlChar buffer[64];
00395     snprintf ((char *) buffer, 64, "%.14lg", value);
00396     xmlSetProp (node, prop, buffer);
00397 }
00398
00403 void
00404 input_new ()
00405 {
00406     unsigned int i;
00407     #if DEBUG
00408     fprintf (stderr, "input_init: start\n");
00409     #endif
00410     input->nvariables = input->nexperiments = input->ninputs = 0;
00411     input->simulator = input->evaluator = input->directory = input->

```

```

    name = NULL;
00412   input->experiment = input->label = NULL;
00413   input->precision = input->nsweeps = input->nbits = NULL;
00414   input->rangemin = input->rangemax = input->rangeminabs = input->
rangemaxabs
    = input->weight = NULL;
00416   for (i = 0; i < MAX_NINPUTS; ++i)
00417       input->template[i] = NULL;
00418   #if DEBUG
00419       fprintf (stderr, "input_init: end\n");
00420   #endif
00421   }
00422
00427 void
00428 input_free ()
00429 {
00430     unsigned int i, j;
00431     #if DEBUG
00432         fprintf (stderr, "input_free: start\n");
00433     #endif
00434     g_free (input->name);
00435     g_free (input->directory);
00436     for (i = 0; i < input->nexperiments; ++i)
00437     {
00438         xmlFree (input->experiment[i]);
00439         for (j = 0; j < input->ninputs; ++j)
00440             xmlFree (input->template[j][i]);
00441     }
00442     g_free (input->experiment);
00443     for (i = 0; i < input->ninputs; ++i)
00444         g_free (input->template[i]);
00445     for (i = 0; i < input->nvariables; ++i)
00446         xmlFree (input->label[i]);
00447     g_free (input->label);
00448     g_free (input->precision);
00449     g_free (input->rangemin);
00450     g_free (input->rangemax);
00451     g_free (input->rangeminabs);
00452     g_free (input->rangemaxabs);
00453     g_free (input->weight);
00454     g_free (input->nsweeps);
00455     g_free (input->nbits);
00456     xmlFree (input->evaluator);
00457     xmlFree (input->simulator);
00458     input->nexperiments = input->ninputs = input->nvariables = 0;
00459     #if DEBUG
00460         fprintf (stderr, "input_free: end\n");
00461     #endif
00462   }
00463
00471 int
00472 input_open (char *filename)
00473 {
00474     char buffer2[64];
00475     xmlDoc *doc;
00476     xmlNode *node, *child;
00477     xmlChar *buffer;
00478     char *msg;
00479     int error_code;
00480     unsigned int i;
00481
00482     #if DEBUG
00483         fprintf (stderr, "input_open: start\n");
00484     #endif
00485
00486     // Resetting input data
00487     input_new ();
00488
00489     // Parsing the input file
00490     doc = xmlParseFile (filename);
00491     if (!doc)
00492     {
00493         msg = gettext ("Unable to parse the input file");
00494         goto exit_on_error;
00495     }
00496
00497     // Getting the root node
00498     node = xmlDocGetRootElement (doc);
00499     if (xmlStrcmp (node->name, XML_CALIBRATE))
00500     {
00501         msg = gettext ("Bad root XML node");
00502         goto exit_on_error;
00503     }
00504
00505     // Opening simulator program name
00506     input->simulator = (char *) xmlGetProp (node, XML_SIMULATOR);
00507     if (!input->simulator)

```



```

00508     {
00509         msg = gettext ("Bad simulator program");
00510         goto exit_on_error;
00511     }
00512
00513     // Opening evaluator program name
00514     input->evaluator = (char *) xmlGetProp (node, XML_EVALUATOR);
00515
00516     // Obtaining pseudo-random numbers generator seed
00517     if (!xmlHasProp (node, XML_SEED))
00518         input->seed = DEFAULT_RANDOM_SEED;
00519     else
00520     {
00521         input->seed = xml_node_get_uint (node, XML_SEED, &error_code);
00522         if (error_code)
00523         {
00524             msg = gettext ("Bad pseudo-random numbers generator seed");
00525             goto exit_on_error;
00526         }
00527     }
00528
00529     // Opening algorithm
00530     buffer = xmlGetProp (node, XML_ALGORITHM);
00531     if (!xmlStrcmp (buffer, XML_MONTE_CARLO))
00532     {
00533         input->algorithm = ALGORITHM_MONTE_CARLO;
00534
00535         // Obtaining simulations number
00536         input->nsimulations
00537             = xml_node_get_int (node, XML_NSIMULATIONS, &error_code);
00538         if (error_code)
00539         {
00540             msg = gettext ("Bad simulations number");
00541             goto exit_on_error;
00542         }
00543     }
00544     else if (!xmlStrcmp (buffer, XML_SWEEP))
00545         input->algorithm = ALGORITHM_SWEEP;
00546     else if (!xmlStrcmp (buffer, XML_GENETIC))
00547     {
00548         input->algorithm = ALGORITHM_GENETIC;
00549
00550         // Obtaining population
00551         if (xmlHasProp (node, XML_NPOPULATION))
00552         {
00553             input->nsimulations
00554                 = xml_node_get_uint (node, XML_NPOPULATION, &error_code);
00555             if (error_code || input->nsimulations < 3)
00556             {
00557                 msg = gettext ("Invalid population number");
00558                 goto exit_on_error;
00559             }
00560         }
00561         else
00562         {
00563             msg = gettext ("No population number");
00564             goto exit_on_error;
00565         }
00566
00567         // Obtaining generations
00568         if (xmlHasProp (node, XML_NGENERATIONS))
00569         {
00570             input->niterations
00571                 = xml_node_get_uint (node, XML_NGENERATIONS, &error_code);
00572             if (error_code || !input->niterations)
00573             {
00574                 msg = gettext ("Invalid generations number");
00575                 goto exit_on_error;
00576             }
00577         }
00578         else
00579         {
00580             msg = gettext ("No generations number");
00581             goto exit_on_error;
00582         }
00583
00584         // Obtaining mutation probability
00585         if (xmlHasProp (node, XML_MUTATION))
00586         {
00587             input->mutation_ratio
00588                 = xml_node_get_float (node, XML_MUTATION, &error_code);
00589             if (error_code || input->mutation_ratio < 0.
00590                 || input->mutation_ratio >= 1.)
00591             {
00592                 msg = gettext ("Invalid mutation probability");
00593                 goto exit_on_error;
00594             }

```

```

00595     }
00596     else
00597     {
00598         msg = gettext ("No mutation probability");
00599         goto exit_on_error;
00600     }
00601
00602     // Obtaining reproduction probability
00603     if (xmlHasProp (node, XML_REPRODUCTION))
00604     {
00605         input->reproduction_ratio
00606         = xml_node_get_float (node, XML_REPRODUCTION, &error_code);
00607         if (error_code || input->reproduction_ratio < 0.
00608             || input->reproduction_ratio >= 1.0)
00609         {
00610             msg = gettext ("Invalid reproduction probability");
00611             goto exit_on_error;
00612         }
00613     }
00614     else
00615     {
00616         msg = gettext ("No reproduction probability");
00617         goto exit_on_error;
00618     }
00619
00620     // Obtaining adaptation probability
00621     if (xmlHasProp (node, XML_ADAPTATION))
00622     {
00623         input->adaptation_ratio
00624         = xml_node_get_float (node, XML_ADAPTATION, &error_code);
00625         if (error_code || input->adaptation_ratio < 0.
00626             || input->adaptation_ratio >= 1.)
00627         {
00628             msg = gettext ("Invalid adaptation probability");
00629             goto exit_on_error;
00630         }
00631     }
00632     else
00633     {
00634         msg = gettext ("No adaptation probability");
00635         goto exit_on_error;
00636     }
00637
00638     // Checking survivals
00639     i = input->mutation_ratio * input->nsimulations;
00640     i += input->reproduction_ratio * input->nsimulations;
00641     i += input->adaptation_ratio * input->nsimulations;
00642     if (i > input->nsimulations - 2)
00643     {
00644         msg = gettext
00645             ("No enough survival entities to reproduce the population");
00646         goto exit_on_error;
00647     }
00648 }
00649 else
00650 {
00651     msg = gettext ("Unknown algorithm");
00652     goto exit_on_error;
00653 }
00654
00655 if (input->algorithm == ALGORITHM_MONTE_CARLO
00656     || input->algorithm == ALGORITHM_SWEEP)
00657 {
00658
00659     // Obtaining iterations number
00660     input->niterations
00661     = xml_node_get_int (node, XML_NITERATIONS, &error_code);
00662     if (error_code == 1)
00663         input->niterations = 1;
00664     else if (error_code)
00665     {
00666         msg = gettext ("Bad iterations number");
00667         goto exit_on_error;
00668     }
00669
00670     // Obtaining best number
00671     if (xmlHasProp (node, XML_NBEST))
00672     {
00673         input->nbest = xml_node_get_uint (node,
XML_NBEST, &error_code);
00674         if (error_code || !input->nbest)
00675         {
00676             msg = gettext ("Invalid best number");
00677             goto exit_on_error;
00678         }
00679     }
00680     else

```

```

00681     input->nbest = 1;
00682
00683     // Obtaining tolerance
00684     if (xmlHasProp (node, XML_TOLERANCE))
00685     {
00686         input->tolerance
00687         = xml_node_get_float (node, XML_TOLERANCE, &error_code);
00688         if (error_code || input->tolerance < 0.)
00689         {
00690             msg = gettext ("Invalid tolerance");
00691             goto exit_on_error;
00692         }
00693     }
00694     else
00695         input->tolerance = 0.;
00696 }
00697
00698 // Reading the experimental data
00699 for (child = node->children; child; child = child->next)
00700 {
00701     if (xmlStrcmp (child->name, XML_EXPERIMENT))
00702         break;
00703 #if DEBUG
00704     fprintf (stderr, "input_open: nexperiments=%u\n", input->nexperiments);
00705 #endif
00706     if (xmlHasProp (child, XML_NAME))
00707     {
00708         input->experiment
00709         = g_realloc (input->experiment,
00710                     (1 + input->nexperiments) * sizeof (char *));
00711         input->experiment[input->nexperiments]
00712         = (char *) xmlGetProp (child, XML_NAME);
00713     }
00714     else
00715     {
00716         snprintf (buffer2, 64, "%s %u: %s",
00717                  gettext ("Experiment"),
00718                  input->nexperiments + 1, gettext ("no data file name"));
00719         msg = buffer2;
00720         goto exit_on_error;
00721     }
00722 #if DEBUG
00723     fprintf (stderr, "input_open: experiment=%s\n",
00724             input->experiment[input->nexperiments]);
00725 #endif
00726     input->weight = g_realloc (input->weight,
00727                               (1 + input->nexperiments) * sizeof (double));
00728     if (xmlHasProp (child, XML_WEIGHT))
00729     {
00730         input->weight[input->nexperiments]
00731         = xml_node_get_float (child, XML_WEIGHT, &error_code);
00732         if (error_code)
00733         {
00734             snprintf (buffer2, 64, "%s %u: %s",
00735                      gettext ("Experiment"),
00736                      input->nexperiments + 1, gettext ("bad weight"));
00737             msg = buffer2;
00738             goto exit_on_error;
00739         }
00740     }
00741     else
00742         input->weight[input->nexperiments] = 1.;
00743 #if DEBUG
00744     fprintf (stderr, "input_open: weight=%lg\n",
00745             input->weight[input->nexperiments]);
00746 #endif
00747     if (!input->nexperiments)
00748         input->ninputs = 0;
00749 #if DEBUG
00750     fprintf (stderr, "input_open: template[0]\n");
00751 #endif
00752     if (xmlHasProp (child, XML_TEMPLATE1))
00753     {
00754         input->template[0]
00755         = (char **) g_realloc (input->template[0],
00756                               (1 + input->nexperiments) * sizeof (char *));
00757         input->template[0][input->nexperiments]
00758         = (char *) xmlGetProp (child, template[0]);
00759 #if DEBUG
00760         fprintf (stderr, "input_open: experiment=%u templatel=%s\n",
00761                 input->nexperiments,
00762                 input->template[0][input->nexperiments]);
00763 #endif
00764         if (!input->nexperiments)
00765             ++input->ninputs;
00766 #if DEBUG
00767         fprintf (stderr, "input_open: ninputs=%u\n", input->ninputs);

```

```

00768 #endif
00769     }
00770     else
00771     {
00772         snprintf (buffer2, 64, "%s %u: %s",
00773             gettext ("Experiment"),
00774             input->nexperiments + 1, gettext ("no template"));
00775         msg = buffer2;
00776         goto exit_on_error;
00777     }
00778     for (i = 1; i < MAX_NINPUTS; ++i)
00779     {
00780 #if DEBUG
00781         fprintf (stderr, "input_open: template%u\n", i + 1);
00782 #endif
00783         if (xmlHasProp (child, template[i]))
00784         {
00785             if (input->nexperiments && input->ninputs <= i)
00786             {
00787                 snprintf (buffer2, 64, "%s %u: %s",
00788                     gettext ("Experiment"),
00789                     input->nexperiments + 1,
00790                     gettext ("bad templates number"));
00791                 msg = buffer2;
00792                 goto exit_on_error;
00793             }
00794             input->template[i] = (char **)
00795                 g_realloc (input->template[i],
00796                     (1 + input->nexperiments) * sizeof (char *));
00797             input->template[i][input->nexperiments]
00798                 = (char *) xmlGetProp (child, template[i]);
00799 #if DEBUG
00800             fprintf (stderr, "input_open: experiment=%u template%u=%s\n",
00801                 input->nexperiments, i + 1,
00802                 input->template[i][input->nexperiments]);
00803 #endif
00804             if (!input->nexperiments)
00805                 ++input->ninputs;
00806 #if DEBUG
00807             fprintf (stderr, "input_open: ninputs=%u\n", input->ninputs);
00808 #endif
00809         }
00810         else if (input->nexperiments && input->ninputs >= i)
00811         {
00812             snprintf (buffer2, 64, "%s %u: %s%u",
00813                 gettext ("Experiment"),
00814                 input->nexperiments + 1,
00815                 gettext ("no template"), i + 1);
00816             msg = buffer2;
00817             goto exit_on_error;
00818         }
00819         else
00820             break;
00821     }
00822     ++input->nexperiments;
00823 #if DEBUG
00824     fprintf (stderr, "input_open: nexperiments=%u\n", input->nexperiments);
00825 #endif
00826     }
00827     if (!input->nexperiments)
00828     {
00829         msg = gettext ("No calibration experiments");
00830         goto exit_on_error;
00831     }
00832
00833     // Reading the variables data
00834     for (; child; child = child->next)
00835     {
00836         if (xmlStrcmp (child->name, XML_VARIABLE))
00837         {
00838             snprintf (buffer2, 64, "%s %u: %s",
00839                 gettext ("Variable"),
00840                 input->nvariables + 1, gettext ("bad XML node"));
00841             msg = buffer2;
00842             goto exit_on_error;
00843         }
00844         if (xmlHasProp (child, XML_NAME))
00845         {
00846             input->label = g_realloc
00847                 (input->label, (1 + input->nvariables) * sizeof (char *));
00848             input->label[input->nvariables]
00849                 = (char *) xmlGetProp (child, XML_NAME);
00850         }
00851         else
00852         {
00853             snprintf (buffer2, 64, "%s %u: %s",
00854                 gettext ("Variable"),

```

```

00855         input->nvariables + 1, gettext ("no name"));
00856         msg = buffer2;
00857         goto exit_on_error;
00858     }
00859     if (xmlHasProp (child, XML_MINIMUM))
00860     {
00861         input->rangemin = g_realloc
00862             (input->rangemin, (1 + input->nvariables) * sizeof (double));
00863         input->rangeminabs = g_realloc
00864             (input->rangeminabs, (1 + input->nvariables) * sizeof (double));
00865         input->rangemin[input->nvariables]
00866             = xml_node_get_float (child, XML_MINIMUM, &error_code);
00867         if (xmlHasProp (child, XML_ABSOLUTE_MINIMUM))
00868         {
00869             input->rangeminabs[input->nvariables]
00870                 = xml_node_get_float (child,
00871                     XML_ABSOLUTE_MINIMUM, &error_code);
00872         }
00873         else
00874             input->rangeminabs[input->nvariables] = -G_MAXDOUBLE;
00875         if (input->rangemin[input->nvariables]
00876             < input->rangeminabs[input->nvariables])
00877         {
00878             snprintf (buffer2, 64, "%s %u: %s",
00879                 gettext ("Variable"),
00880                 input->nvariables + 1,
00881                 gettext ("minimum range not allowed"));
00882             msg = buffer2;
00883             goto exit_on_error;
00884         }
00885     }
00886     else
00887     {
00888         snprintf (buffer2, 64, "%s %u: %s",
00889             gettext ("Variable"),
00890             input->nvariables + 1, gettext ("no minimum range"));
00891         msg = buffer2;
00892         goto exit_on_error;
00893     }
00894     if (xmlHasProp (child, XML_MAXIMUM))
00895     {
00896         input->rangemax = g_realloc
00897             (input->rangemax, (1 + input->nvariables) * sizeof (double));
00898         input->rangemaxabs = g_realloc
00899             (input->rangemaxabs, (1 + input->nvariables) * sizeof (double));
00900         input->rangemax[input->nvariables]
00901             = xml_node_get_float (child, XML_MAXIMUM, &error_code);
00902         if (xmlHasProp (child, XML_ABSOLUTE_MAXIMUM))
00903             input->rangemaxabs[input->nvariables]
00904                 = xml_node_get_float (child,
00905                     XML_ABSOLUTE_MAXIMUM, &error_code);
00906         else
00907             input->rangemaxabs[input->nvariables] = G_MAXDOUBLE;
00908         if (input->rangemax[input->nvariables]
00909             > input->rangemaxabs[input->nvariables])
00910         {
00911             snprintf (buffer2, 64, "%s %u: %s",
00912                 gettext ("Variable"),
00913                 input->nvariables + 1,
00914                 gettext ("maximum range not allowed"));
00915             msg = buffer2;
00916             goto exit_on_error;
00917         }
00918     }
00919     else
00920     {
00921         snprintf (buffer2, 64, "%s %u: %s",
00922             gettext ("Variable"),
00923             input->nvariables + 1, gettext ("no maximum range"));
00924         msg = buffer2;
00925         goto exit_on_error;
00926     }
00927     if (input->rangemax[input->nvariables]
00928         < input->rangemin[input->nvariables])
00929     {
00930         snprintf (buffer2, 64, "%s %u: %s",
00931             gettext ("Variable"),
00932             input->nvariables + 1, gettext ("bad range"));
00933         msg = buffer2;
00934         goto exit_on_error;
00935     }
00936     input->precision = g_realloc
00937         (input->precision, (1 + input->nvariables) * sizeof (unsigned int));
00938     if (xmlHasProp (child, XML_PRECISION))
00939         input->precision[input->nvariables]
00940             = xml_node_get_uint (child, XML_PRECISION, &error_code);
00941     else

```

```

00940     input->precision[input->nvariables] =
    DEFAULT_PRECISION;
00941     if (input->algorithm == ALGORITHM_SWEEP)
00942     {
00943         if (xmlHasProp (child, XML_NSWEEPS))
00944         {
00945             input->nsweeps = (unsigned int *)
00946                 g_realloc (input->nsweeps,
00947                     (1 + input->nvariables) * sizeof (unsigned int));
00948             input->nsweeps[input->nvariables]
00949                 = xml_node_get_uint (child, XML_NSWEEPS, &error_code);
00950         }
00951         else
00952         {
00953             snprintf (buffer2, 64, "%s %u: %s",
00954                 gettext ("Variable"),
00955                 input->nvariables + 1, gettext ("no sweeps number"));
00956             msg = buffer2;
00957             goto exit_on_error;
00958         }
00959 #if DEBUG
00960         fprintf (stderr, "input_open: nsweeps=%u nsimulations=%u\n",
00961             input->nsweeps[input->nvariables], input->
    nsimulations);
00962 #endif
00963     }
00964     if (input->algorithm == ALGORITHM_GENETIC)
00965     {
00966         // Obtaining bits representing each variable
00967         if (xmlHasProp (child, XML_NBITS))
00968         {
00969             input->nbits = (unsigned int *)
00970                 g_realloc (input->nbits,
00971                     (1 + input->nvariables) * sizeof (unsigned int));
00972             i = xml_node_get_uint (child, XML_NBITS, &error_code);
00973             if (error_code || !i)
00974             {
00975                 snprintf (buffer2, 64, "%s %u: %s",
00976                     gettext ("Variable"),
00977                     input->nvariables + 1,
00978                     gettext ("invalid bits number"));
00979                 msg = buffer2;
00980                 goto exit_on_error;
00981             }
00982             input->nbits[input->nvariables] = i;
00983         }
00984         else
00985         {
00986             snprintf (buffer2, 64, "%s %u: %s",
00987                 gettext ("Variable"),
00988                 input->nvariables + 1, gettext ("no bits number"));
00989             msg = buffer2;
00990             goto exit_on_error;
00991         }
00992     }
00993     ++input->nvariables;
00994 }
00995 if (!input->nvariables)
00996 {
00997     msg = gettext ("No calibration variables");
00998     goto exit_on_error;
00999 }
01000
01001 // Getting the working directory
01002 input->directory = g_path_get_dirname (filename);
01003 input->name = g_path_get_basename (filename);
01004
01005 // Closing the XML document
01006 xmlFreeDoc (doc);
01007
01008 #if DEBUG
01009     fprintf (stderr, "input_open: end\n");
01010 #endif
01011     return 1;
01012
01013 exit_on_error:
01014     show_error (msg);
01015     input_free ();
01016 #if DEBUG
01017     fprintf (stderr, "input_open: end\n");
01018 #endif
01019     return 0;
01020 }
01021
01022 void
01034 calibrate_input (unsigned int simulation, char *input, GMappedFile * template)
01035 {

```

```

01036 unsigned int i;
01037 char buffer[32], value[32], *buffer2, *buffer3, *content;
01038 FILE *file;
01039 gsize length;
01040 GRegex *regex;
01041
01042 #if DEBUG
01043 fprintf (stderr, "calibrate_input: start\n");
01044 #endif
01045 // Checking the file
01046 if (!template)
01047     goto calibrate_input_end;
01048 // Opening template
01049 content = g_mapped_file_get_contents (template);
01050 length = g_mapped_file_get_length (template);
01051 #if DEBUG
01052 fprintf (stderr, "calibrate_input: length=%lu\ncontent:\n%s", length,
01053         content);
01054 #endif
01055 file = g_fopen (input, "w");
01056 // Parsing template
01057 for (i = 0; i < calibrate->nvariables; ++i)
01058 {
01059     #if DEBUG
01060     fprintf (stderr, "calibrate_input: variable=%u\n", i);
01061     #endif
01062     snprintf (buffer, 32, "@variable%u@", i + 1);
01063     regex = g_regex_new (buffer, 0, 0, NULL);
01064     if (i == 0)
01065     {
01066         buffer2 = g_regex_replace_literal (regex, content, length, 0,
01067             calibrate->label[i], 0, NULL);
01068     }
01069     #if DEBUG
01070     fprintf (stderr, "calibrate_input: buffer2\n%s", buffer2);
01071     #endif
01072     else
01073     {
01074         length = strlen (buffer3);
01075         buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
01076             calibrate->label[i], 0, NULL);
01077         g_free (buffer3);
01078     }
01079     g_regex_unref (regex);
01080     length = strlen (buffer2);
01081     snprintf (buffer, 32, "@value%u@", i + 1);
01082     regex = g_regex_new (buffer, 0, 0, NULL);
01083     snprintf (value, 32, format[calibrate->precision[i]],
01084         calibrate->value[simulation * calibrate->nvariables + i]);
01085     #if DEBUG
01086     fprintf (stderr, "calibrate_input: value=%s\n", value);
01087     #endif
01088     buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
01089         0, NULL);
01090     g_free (buffer2);
01091     g_regex_unref (regex);
01092 }
01093 // Saving input file
01094 fwrite (buffer3, strlen (buffer3), sizeof (char), file);
01095 g_free (buffer3);
01096 fclose (file);
01097
01098 calibrate_input_end:
01099 #if DEBUG
01100 fprintf (stderr, "calibrate_input: end\n");
01101 #endif
01102 return;
01103 }
01104
01105 double
01106 calibrate_parse (unsigned int simulation, unsigned int experiment)
01107 {
01108     unsigned int i;
01109     double e;
01110     char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
01111         *buffer3, *buffer4;
01112     FILE *file_result;
01113     #if DEBUG
01114     fprintf (stderr, "calibrate_parse: start\n");
01115     fprintf (stderr, "calibrate_parse: simulation=%u experiment=%u\n", simulation,
01116         experiment);
01117     #endif

```

```

01133 #endif
01134
01135 // Opening input files
01136 for (i = 0; i < calibrate->ninputs; ++i)
01137 {
01138     snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
01139 #if DEBUG
01140     fprintf (stderr, "calibrate_parse: i=%u input=%s\n", i, &input[i][0]);
01141 #endif
01142     calibrate_input (simulation, &input[i][0],
01143                     calibrate->file[i][experiment]);
01144 }
01145 for (; i < MAX_NINPUTS; ++i)
01146     strcpy (&input[i][0], "");
01147 #if DEBUG
01148     fprintf (stderr, "calibrate_parse: parsing end\n");
01149 #endif
01150
01151 // Performing the simulation
01152 snprintf (output, 32, "output-%u-%u", simulation, experiment);
01153 buffer2 = g_path_get_dirname (calibrate->simulator);
01154 buffer3 = g_path_get_basename (calibrate->simulator);
01155 buffer4 = g_build_filename (buffer2, buffer3, NULL);
01156 snprintf (buffer, 512, "%s\\%s %s %s %s %s %s %s %s %s",
01157           buffer4, input[0], input[1], input[2], input[3], input[4], input[5],
01158           input[6], input[7], output);
01159 g_free (buffer4);
01160 g_free (buffer3);
01161 g_free (buffer2);
01162 #if DEBUG
01163     fprintf (stderr, "calibrate_parse: %s\n", buffer);
01164 #endif
01165     system (buffer);
01166
01167 // Checking the objective value function
01168 if (calibrate->evaluator)
01169 {
01170     snprintf (result, 32, "result-%u-%u", simulation, experiment);
01171     buffer2 = g_path_get_dirname (calibrate->evaluator);
01172     buffer3 = g_path_get_basename (calibrate->evaluator);
01173     buffer4 = g_build_filename (buffer2, buffer3, NULL);
01174     snprintf (buffer, 512, "%s\\%s %s %s %s",
01175             buffer4, output, calibrate->experiment[experiment], result);
01176     g_free (buffer4);
01177     g_free (buffer3);
01178     g_free (buffer2);
01179 #if DEBUG
01180     fprintf (stderr, "calibrate_parse: %s\n", buffer);
01181 #endif
01182     system (buffer);
01183     file_result = g_fopen (result, "r");
01184     e = atof (fgets (buffer, 512, file_result));
01185     fclose (file_result);
01186 }
01187 else
01188 {
01189     strcpy (result, "");
01190     file_result = g_fopen (output, "r");
01191     e = atof (fgets (buffer, 512, file_result));
01192     fclose (file_result);
01193 }
01194
01195 // Removing files
01196 #if !DEBUG
01197     for (i = 0; i < calibrate->ninputs; ++i)
01198     {
01199         if (calibrate->file[i][0])
01200         {
01201             snprintf (buffer, 512, RM " %s", &input[i][0]);
01202             system (buffer);
01203         }
01204     }
01205     snprintf (buffer, 512, RM " %s %s", output, result);
01206     system (buffer);
01207 #endif
01208
01209 #if DEBUG
01210     fprintf (stderr, "calibrate_parse: end\n");
01211 #endif
01212
01213 // Returning the objective function
01214 return e * calibrate->weight[experiment];
01215 }
01216
01221 void
01222 calibrate_print ()
01223 {

```



```

01224 unsigned int i;
01225 char buffer[512];
01226 #if HAVE_MPI
01227 if (!calibrate->mpi_rank)
01228 {
01229 #endif
01230 printf ("THE BEST IS\n");
01231 fprintf (calibrate->file_result, "THE BEST IS\n");
01232 printf ("error=%.15le\n", calibrate->error_old[0]);
01233 fprintf (calibrate->file_result, "error=%.15le\n",
01234         calibrate->error_old[0]);
01235 for (i = 0; i < calibrate->nvariables; ++i)
01236 {
01237     snprintf (buffer, 512, "%s=%s\n",
01238             calibrate->label[i], format[calibrate->precision[i]]);
01239     printf (buffer, calibrate->value_old[i]);
01240     fprintf (calibrate->file_result, buffer, calibrate->
01241             value_old[i]);
01242     fflush (calibrate->file_result);
01243 #if HAVE_MPI
01244 }
01245 #endif
01246 }
01247
01256 void
01257 calibrate_save_variables (unsigned int simulation, double error)
01258 {
01259     unsigned int i;
01260     char buffer[64];
01261 #if DEBUG
01262     fprintf (stderr, "calibrate_save_variables: start\n");
01263 #endif
01264     for (i = 0; i < calibrate->nvariables; ++i)
01265     {
01266         snprintf (buffer, 64, "%s ", format[calibrate->precision[i]]);
01267         fprintf (calibrate->file_variables, buffer,
01268                 calibrate->value[simulation * calibrate->nvariables + i]);
01269     }
01270     fprintf (calibrate->file_variables, "%.14le\n", error);
01271 #if DEBUG
01272     fprintf (stderr, "calibrate_save_variables: end\n");
01273 #endif
01274 }
01275
01284 void
01285 calibrate_best_thread (unsigned int simulation, double value)
01286 {
01287     unsigned int i, j;
01288     double e;
01289 #if DEBUG
01290     fprintf (stderr, "calibrate_best_thread: start\n");
01291 #endif
01292     if (calibrate->nsaveds < calibrate->nbest
01293         || value < calibrate->error_best[calibrate->nsaveds - 1])
01294     {
01295         g_mutex_lock (mutex);
01296         if (calibrate->nsaveds < calibrate->nbest)
01297             ++calibrate->nsaveds;
01298         calibrate->error_best[calibrate->nsaveds - 1] = value;
01299         calibrate->simulation_best[calibrate->nsaveds - 1] = simulation;
01300         for (i = calibrate->nsaveds; --i;)
01301         {
01302             if (calibrate->error_best[i] < calibrate->error_best[i - 1])
01303             {
01304                 j = calibrate->simulation_best[i];
01305                 e = calibrate->error_best[i];
01306                 calibrate->simulation_best[i] = calibrate->
01307                 simulation_best[i - 1];
01308                 calibrate->error_best[i] = calibrate->error_best[i - 1];
01309                 calibrate->simulation_best[i - 1] = j;
01310                 calibrate->error_best[i - 1] = e;
01311             }
01312             else
01313                 break;
01314         }
01315         g_mutex_unlock (mutex);
01316 #if DEBUG
01317     fprintf (stderr, "calibrate_best_thread: end\n");
01318 #endif
01319 }
01320
01329 void
01330 calibrate_best_sequential (unsigned int simulation, double value)
01331 {
01332     unsigned int i, j;

```

```

01333     double e;
01334     #if DEBUG
01335     fprintf (stderr, "calibrate_best_sequential: start\n");
01336     #endif
01337     if (calibrate->nsaveds < calibrate->nbest
01338         || value < calibrate->error_best[calibrate->nsaveds - 1])
01339     {
01340         if (calibrate->nsaveds < calibrate->nbest)
01341             ++calibrate->nsaveds;
01342         calibrate->error_best[calibrate->nsaveds - 1] = value;
01343         calibrate->simulation_best[calibrate->nsaveds - 1] = simulation;
01344         for (i = calibrate->nsaveds; --i;)
01345         {
01346             if (calibrate->error_best[i] < calibrate->error_best[i - 1])
01347             {
01348                 j = calibrate->simulation_best[i];
01349                 e = calibrate->error_best[i];
01350                 calibrate->simulation_best[i] = calibrate->
simulation_best[i - 1];
01351                 calibrate->error_best[i] = calibrate->error_best[i - 1];
01352                 calibrate->simulation_best[i - 1] = j;
01353                 calibrate->error_best[i - 1] = e;
01354             }
01355             else
01356                 break;
01357         }
01358     }
01359     #if DEBUG
01360     fprintf (stderr, "calibrate_best_sequential: end\n");
01361     #endif
01362 }
01363
01371 void *
01372 calibrate_thread (ParallelData * data)
01373 {
01374     unsigned int i, j, thread;
01375     double e;
01376     #if DEBUG
01377     fprintf (stderr, "calibrate_thread: start\n");
01378     #endif
01379     thread = data->thread;
01380     #if DEBUG
01381     fprintf (stderr, "calibrate_thread: thread=%u start=%u end=%u\n", thread,
01382             calibrate->thread[thread], calibrate->thread[thread + 1]);
01383     #endif
01384     for (i = calibrate->thread[thread]; i < calibrate->thread[thread + 1]; ++i)
01385     {
01386         e = 0.;
01387         for (j = 0; j < calibrate->nexperiments; ++j)
01388             e += calibrate_parse (i, j);
01389         calibrate_best_thread (i, e);
01390         g_mutex_lock (mutex);
01391         calibrate_save_variables (i, e);
01392         g_mutex_unlock (mutex);
01393     #if DEBUG
01394     fprintf (stderr, "calibrate_thread: i=%u e=%lg\n", i, e);
01395     #endif
01396     }
01397     #if DEBUG
01398     fprintf (stderr, "calibrate_thread: end\n");
01399     #endif
01400     g_thread_exit (NULL);
01401     return NULL;
01402 }
01403
01408 void
01409 calibrate_sequential ()
01410 {
01411     unsigned int i, j;
01412     double e;
01413     #if DEBUG
01414     fprintf (stderr, "calibrate_sequential: start\n");
01415     fprintf (stderr, "calibrate_sequential: nstart=%u nend=%u\n",
01416             calibrate->nstart, calibrate->nend);
01417     #endif
01418     for (i = calibrate->nstart; i < calibrate->nend; ++i)
01419     {
01420         e = 0.;
01421         for (j = 0; j < calibrate->nexperiments; ++j)
01422             e += calibrate_parse (i, j);
01423         calibrate_best_sequential (i, e);
01424         calibrate_save_variables (i, e);
01425     #if DEBUG
01426     fprintf (stderr, "calibrate_sequential: i=%u e=%lg\n", i, e);
01427     #endif
01428     }
01429     #if DEBUG

```

```

01430     fprintf (stderr, "calibrate_sequential: end\n");
01431 #endif
01432 }
01433
01445 void
01446 calibrate_merge (unsigned int nsaveds, unsigned int *simulation_best,
01447                 double *error_best)
01448 {
01449     unsigned int i, j, k, s[calibrate->nbest];
01450     double e[calibrate->nbest];
01451     #if DEBUG
01452     fprintf (stderr, "calibrate_merge: start\n");
01453 #endif
01454     i = j = k = 0;
01455     do
01456     {
01457         if (i == calibrate->nsaveds)
01458         {
01459             s[k] = simulation_best[j];
01460             e[k] = error_best[j];
01461             ++j;
01462             ++k;
01463             if (j == nsaveds)
01464                 break;
01465         }
01466         else if (j == nsaveds)
01467         {
01468             s[k] = calibrate->simulation_best[i];
01469             e[k] = calibrate->error_best[i];
01470             ++i;
01471             ++k;
01472             if (i == calibrate->nsaveds)
01473                 break;
01474         }
01475         else if (calibrate->error_best[i] > error_best[j])
01476         {
01477             s[k] = simulation_best[j];
01478             e[k] = error_best[j];
01479             ++j;
01480             ++k;
01481         }
01482         else
01483         {
01484             s[k] = calibrate->simulation_best[i];
01485             e[k] = calibrate->error_best[i];
01486             ++i;
01487             ++k;
01488         }
01489     }
01490     while (k < calibrate->nbest);
01491     calibrate->nsaveds = k;
01492     memcpy (calibrate->simulation_best, s, k * sizeof (unsigned int));
01493     memcpy (calibrate->error_best, e, k * sizeof (double));
01494     #if DEBUG
01495     fprintf (stderr, "calibrate_merge: end\n");
01496 #endif
01497 }
01498
01503 #if HAVE_MPI
01504 void
01505 calibrate_synchronise ()
01506 {
01507     unsigned int i, nsaveds, simulation_best[calibrate->nbest];
01508     double error_best[calibrate->nbest];
01509     MPI_Status mpi_stat;
01510     #if DEBUG
01511     fprintf (stderr, "calibrate_synchronise: start\n");
01512 #endif
01513     if (calibrate->mpi_rank == 0)
01514     {
01515         for (i = 1; i < ntasks; ++i)
01516         {
01517             MPI_Recv (&nsaveds, 1, MPI_INT, i, 1, MPI_COMM_WORLD, &mpi_stat);
01518             MPI_Recv (simulation_best, nsaveds, MPI_INT, i, 1,
01519                     MPI_COMM_WORLD, &mpi_stat);
01520             MPI_Recv (error_best, nsaveds, MPI_DOUBLE, i, 1,
01521                     MPI_COMM_WORLD, &mpi_stat);
01522             calibrate_merge (nsaveds, simulation_best, error_best);
01523         }
01524     }
01525     else
01526     {
01527         MPI_Send (&calibrate->nsaveds, 1, MPI_INT, 0, 1, MPI_COMM_WORLD);
01528         MPI_Send (calibrate->simulation_best, calibrate->nsaveds, MPI_INT, 0, 1,
01529                 MPI_COMM_WORLD);
01530         MPI_Send (calibrate->error_best, calibrate->nsaveds, MPI_DOUBLE, 0, 1,
01531                 MPI_COMM_WORLD);
01532     }
01533 }

```

```

01532     }
01533     #if DEBUG
01534     fprintf (stderr, "calibrate_synchronise: end\n");
01535     #endif
01536 }
01537 #endif
01538
01539 void
01540 01544 calibrate_sweep ()
01541 {
01542     unsigned int i, j, k, l;
01543     double e;
01544     GThread *thread[nthreads];
01545     ParallelData data[nthreads];
01546     #if DEBUG
01547     fprintf (stderr, "calibrate_sweep: start\n");
01548     #endif
01549     for (i = 0; i < calibrate->nsimulations; ++i)
01550     {
01551         k = i;
01552         for (j = 0; j < calibrate->nvariables; ++j)
01553         {
01554             l = k % calibrate->nsweeps[j];
01555             k /= calibrate->nsweeps[j];
01556             e = calibrate->rangemin[j];
01557             if (calibrate->nsweeps[j] > 1)
01558                 e += 1 * (calibrate->rangemax[j] - calibrate->rangemin[j])
01559                     / (calibrate->nsweeps[j] - 1);
01560             calibrate->value[i * calibrate->nvariables + j] = e;
01561         }
01562     }
01563     calibrate->nsaveds = 0;
01564     if (nthreads <= 1)
01565         calibrate_sequential ();
01566     else
01567     {
01568         for (i = 0; i < nthreads; ++i)
01569         {
01570             data[i].thread = i;
01571             thread[i]
01572                 = g_thread_new (NULL, (void (*) ) calibrate_thread, &data[i]);
01573         }
01574         for (i = 0; i < nthreads; ++i)
01575             g_thread_join (thread[i]);
01576     }
01577     #if HAVE_MPI
01578     // Communicating tasks results
01579     calibrate_synchronise ();
01580     #endif
01581     #if DEBUG
01582     fprintf (stderr, "calibrate_sweep: end\n");
01583     #endif
01584 }
01585
01586 void
01587 01595 calibrate_MonteCarlo ()
01588 {
01589     unsigned int i, j;
01590     GThread *thread[nthreads];
01591     ParallelData data[nthreads];
01592     #if DEBUG
01593     fprintf (stderr, "calibrate_MonteCarlo: start\n");
01594     #endif
01595     for (i = 0; i < calibrate->nsimulations; ++i)
01596     {
01597         for (j = 0; j < calibrate->nvariables; ++j)
01598             calibrate->value[i * calibrate->nvariables + j]
01599                 = calibrate->rangemin[j] + gsl_rng_uniform (calibrate->rng)
01600                     * (calibrate->rangemax[j] - calibrate->rangemin[j]);
01601     }
01602     calibrate->nsaveds = 0;
01603     if (nthreads <= 1)
01604         calibrate_sequential ();
01605     else
01606     {
01607         for (i = 0; i < nthreads; ++i)
01608         {
01609             data[i].thread = i;
01610             thread[i]
01611                 = g_thread_new (NULL, (void (*) ) calibrate_thread, &data[i]);
01612         }
01613         for (i = 0; i < nthreads; ++i)
01614             g_thread_join (thread[i]);
01615     }
01616     #if HAVE_MPI
01617     // Communicating tasks results
01618     calibrate_synchronise ();
01619     #endif
01620     #if DEBUG

```

```

01627     fprintf (stderr, "calibrate_MonteCarlo: end\n");
01628 #endif
01629 }
01630
01631 double
01632 calibrate_genetic_objective (Entity * entity)
01633 {
01634     unsigned int j;
01635     double objective;
01636     char buffer[64];
01637     #if DEBUG
01638     fprintf (stderr, "calibrate_genetic_objective: start\n");
01639 #endif
01640     for (j = 0; j < calibrate->nvariables; ++j)
01641     {
01642         calibrate->value[entity->id * calibrate->nvariables + j]
01643             = genetic_get_variable (entity, calibrate->genetic_variable + j);
01644     }
01645     for (j = 0, objective = 0.; j < calibrate->nexperiments; ++j)
01646     {
01647         objective += calibrate_parse (entity->id, j);
01648         g_mutex_lock (mutex);
01649         for (j = 0; j < calibrate->nvariables; ++j)
01650         {
01651             snprintf (buffer, 64, "%s ", format[calibrate->precision[j]]);
01652             fprintf (calibrate->file_variables, buffer,
01653                     genetic_get_variable (entity, calibrate->genetic_variable + j));
01654         }
01655         fprintf (calibrate->file_variables, "%.14le\n", objective);
01656         g_mutex_unlock (mutex);
01657     }
01658     #if DEBUG
01659     fprintf (stderr, "calibrate_genetic_objective: end\n");
01660 #endif
01661     return objective;
01662 }
01663
01664 void
01665 calibrate_genetic ()
01666 {
01667     char *best_genome;
01668     double best_objective, *best_variable;
01669     #if DEBUG
01670     fprintf (stderr, "calibrate_genetic: start\n");
01671     fprintf (stderr, "calibrate_genetic: ntasks=%u nthreads=%u\n", ntasks,
01672             nthreads);
01673     fprintf (stderr,
01674             "calibrate_genetic: nvariables=%u population=%u generations=%u\n",
01675             calibrate->nvariables, calibrate->nsimulations,
01676             calibrate->niterations);
01677     fprintf (stderr,
01678             "calibrate_genetic: mutation=%lg reproduction=%lg adaptation=%lg\n",
01679             calibrate->mutation_ratio, calibrate->
01680             reproduction_ratio,
01681             calibrate->adaptation_ratio);
01682     #endif
01683     genetic_algorithm_default (calibrate->nvariables,
01684                               calibrate->genetic_variable,
01685                               calibrate->nsimulations,
01686                               calibrate->niterations,
01687                               calibrate->mutation_ratio,
01688                               calibrate->reproduction_ratio,
01689                               calibrate->adaptation_ratio,
01690                               &calibrate_genetic_objective,
01691                               &best_genome, &best_variable, &best_objective);
01692     #if DEBUG
01693     fprintf (stderr, "calibrate_genetic: the best\n");
01694     #endif
01695     calibrate->error_old = (double *) g_malloc (sizeof (double));
01696     calibrate->value_old
01697         = (double *) g_malloc (calibrate->nvariables * sizeof (double));
01698     calibrate->error_old[0] = best_objective;
01699     memcpy (calibrate->value_old, best_variable,
01700            calibrate->nvariables * sizeof (double));
01701     g_free (best_genome);
01702     g_free (best_variable);
01703     calibrate_print ();
01704     #if DEBUG
01705     fprintf (stderr, "calibrate_genetic: end\n");
01706     #endif
01707 }
01708
01709 void
01710 calibrate_save_old ()
01711 {
01712     unsigned int i, j;
01713     #if DEBUG
01714     fprintf (stderr, "calibrate_save_old: start\n");
01715     #endif

```

```

01728     memcpy (calibrate->error_old, calibrate->error_best,
01729             calibrate->nbest * sizeof (double));
01730     for (i = 0; i < calibrate->nbest; ++i)
01731     {
01732         j = calibrate->simulation_best[i];
01733         memcpy (calibrate->value_old + i * calibrate->nvariables,
01734                 calibrate->value + j * calibrate->nvariables,
01735                 calibrate->nvariables * sizeof (double));
01736     }
01737     #if DEBUG
01738     for (i = 0; i < calibrate->nvariables; ++i)
01739         fprintf (stderr, "calibrate_save_old: best variable %u=%lg\n",
01740                 i, calibrate->value_old[i]);
01741     fprintf (stderr, "calibrate_save_old: end\n");
01742     #endif
01743 }
01744
01750 void
01751 calibrate_merge_old ()
01752 {
01753     unsigned int i, j, k;
01754     double v[calibrate->nbest * calibrate->nvariables], e[calibrate->
nbest],
01755            *enew, *eold;
01756     #if DEBUG
01757     fprintf (stderr, "calibrate_merge_old: start\n");
01758     #endif
01759     enew = calibrate->error_best;
01760     eold = calibrate->error_old;
01761     i = j = k = 0;
01762     do
01763     {
01764         if (*enew < *eold)
01765         {
01766             memcpy (v + k * calibrate->nvariables,
01767                     calibrate->value
01768                     + calibrate->simulation_best[i] * calibrate->
nvariables,
01769                     calibrate->nvariables * sizeof (double));
01770             e[k] = *enew;
01771             ++k;
01772             ++enew;
01773             ++i;
01774         }
01775         else
01776         {
01777             memcpy (v + k * calibrate->nvariables,
01778                     calibrate->value_old + j * calibrate->nvariables,
01779                     calibrate->nvariables * sizeof (double));
01780             e[k] = *eold;
01781             ++k;
01782             ++eold;
01783             ++j;
01784         }
01785     }
01786     while (k < calibrate->nbest);
01787     memcpy (calibrate->value_old, v, k * calibrate->nvariables * sizeof (double));
01788     memcpy (calibrate->error_old, e, k * sizeof (double));
01789     #if DEBUG
01790     fprintf (stderr, "calibrate_merge_old: end\n");
01791     #endif
01792 }
01793
01799 void
01800 calibrate_refine ()
01801 {
01802     unsigned int i, j;
01803     double d;
01804     #if HAVE_MPI
01805     MPI_Status mpi_stat;
01806     #endif
01807     #if DEBUG
01808     fprintf (stderr, "calibrate_refine: start\n");
01809     #endif
01810     #if HAVE_MPI
01811     if (!calibrate->mpi_rank)
01812     {
01813     #endif
01814         for (j = 0; j < calibrate->nvariables; ++j)
01815         {
01816             calibrate->rangemin[j] = calibrate->rangemax[j]
01817             = calibrate->value_old[j];
01818         }
01819         for (i = 0; ++i < calibrate->nbest;)
01820         {
01821             for (j = 0; j < calibrate->nvariables; ++j)
01822             {

```

```

01823         calibrate->rangemin[j]
01824         = fmin (calibrate->rangemin[j],
01825                 calibrate->value_old[i * calibrate->nvariables + j]);
01826         calibrate->rangemax[j]
01827         = fmax (calibrate->rangemax[j],
01828                 calibrate->value_old[i * calibrate->nvariables + j]);
01829     }
01830 }
01831 for (j = 0; j < calibrate->nvariables; ++j)
01832 {
01833     d = 0.5 * calibrate->tolerance
01834       * (calibrate->rangemax[j] - calibrate->rangemin[j]);
01835     calibrate->rangemin[j] -= d;
01836     calibrate->rangemin[j]
01837     = fmax (calibrate->rangemin[j], calibrate->rangeminabs[j]);
01838     calibrate->rangemax[j] += d;
01839     calibrate->rangemax[j]
01840     = fmin (calibrate->rangemax[j], calibrate->rangemaxabs[j]);
01841     printf ("%s min=%lg max=%lg\n", calibrate->label[j],
01842            calibrate->rangemin[j], calibrate->rangemax[j]);
01843     fprintf (calibrate->file_result, "%s min=%lg max=%lg\n",
01844            calibrate->label[j], calibrate->rangemin[j],
01845            calibrate->rangemax[j]);
01846 }
01847 #if HAVE_MPI
01848 for (i = 1; i < ntasks; ++i)
01849 {
01850     MPI_Send (calibrate->rangemin, calibrate->nvariables, MPI_DOUBLE, i,
01851              1, MPI_COMM_WORLD);
01852     MPI_Send (calibrate->rangemax, calibrate->nvariables, MPI_DOUBLE, i,
01853              1, MPI_COMM_WORLD);
01854 }
01855 }
01856 else
01857 {
01858     MPI_Recv (calibrate->rangemin, calibrate->nvariables, MPI_DOUBLE, 0, 1,
01859              MPI_COMM_WORLD, &mpi_stat);
01860     MPI_Recv (calibrate->rangemax, calibrate->nvariables, MPI_DOUBLE, 0, 1,
01861              MPI_COMM_WORLD, &mpi_stat);
01862 }
01863 #endif
01864 #if DEBUG
01865 fprintf (stderr, "calibrate_refine: end\n");
01866 #endif
01867 }
01868
01873 void
01874 calibrate_iterate ()
01875 {
01876     unsigned int i;
01877     #if DEBUG
01878     fprintf (stderr, "calibrate_iterate: start\n");
01879     #endif
01880     calibrate->error_old
01881     = (double *) g_malloc (calibrate->nbest * sizeof (double));
01882     calibrate->value_old = (double *)
01883     g_malloc (calibrate->nbest * calibrate->nvariables * sizeof (double));
01884     calibrate_step ();
01885     calibrate_save_old ();
01886     calibrate_refine ();
01887     calibrate_print ();
01888     for (i = 1; i < calibrate->niterations; ++i)
01889     {
01890         calibrate_step ();
01891         calibrate_merge_old ();
01892         calibrate_refine ();
01893         calibrate_print ();
01894     }
01895     #if DEBUG
01896     fprintf (stderr, "calibrate_iterate: end\n");
01897     #endif
01898 }
01899
01904 void
01905 calibrate_free ()
01906 {
01907     unsigned int i, j;
01908     #if DEBUG
01909     fprintf (stderr, "calibrate_free: start\n");
01910     #endif
01911     for (i = 0; i < calibrate->nexperiments; ++i)
01912     {
01913         for (j = 0; j < calibrate->ninputs; ++j)
01914             g_mapped_file_unref (calibrate->file[j][i]);
01915     }
01916     for (i = 0; i < calibrate->ninputs; ++i)
01917         g_free (calibrate->file[i]);

```

```

01918     g_free (calibrate->error_old);
01919     g_free (calibrate->value_old);
01920     g_free (calibrate->value);
01921     g_free (calibrate->genetic_variable);
01922     g_free (calibrate->rangemax);
01923     g_free (calibrate->rangemin);
01924 #if DEBUG
01925     fprintf (stderr, "calibrate_free: end\n");
01926 #endif
01927 }
01928
01933 void
01934 calibrate_new ()
01935 {
01936     unsigned int i, j, *nbits;
01937
01938 #if DEBUG
01939     fprintf (stderr, "calibrate_new: start\n");
01940 #endif
01941
01942     // Obtaining and initing the pseudo-random numbers generator seed
01943     calibrate->seed = input->seed;
01944     gsl_rng_set (calibrate->rng, calibrate->seed);
01945
01946     // Replacing the working dir
01947     g_chdir (input->directory);
01948
01949     // Obtaining the simulator file
01950     calibrate->simulator = input->simulator;
01951
01952     // Obtaining the evaluator file
01953     calibrate->evaluator = input->evaluator;
01954
01955     // Reading the algorithm
01956     calibrate->algorithm = input->algorithm;
01957     switch (calibrate->algorithm)
01958     {
01959         case ALGORITHM_MONTE_CARLO:
01960             calibrate_step = calibrate_MonteCarlo;
01961             break;
01962         case ALGORITHM_SWEEP:
01963             calibrate_step = calibrate_sweep;
01964             break;
01965         default:
01966             calibrate_step = calibrate_genetic;
01967             calibrate->mutation_ratio = input->mutation_ratio;
01968             calibrate->reproduction_ratio = input->
01969 reproduction_ratio;
01970             calibrate->adaptation_ratio = input->adaptation_ratio;
01971     }
01972     calibrate->nsimulations = input->nsimulations;
01973     calibrate->niterations = input->niterations;
01974     calibrate->nbest = input->nbest;
01975     calibrate->tolerance = input->tolerance;
01976
01977     calibrate->simulation_best
01978     = (unsigned int *) alloca (calibrate->nbest * sizeof (unsigned int));
01979     calibrate->error_best
01980     = (double *) alloca (calibrate->nbest * sizeof (double));
01981
01982     // Reading the experimental data
01983 #if DEBUG
01984     fprintf (stderr, "calibrate_new: current directory=%s\n",
01985             g_get_current_dir ());
01986 #endif
01987     calibrate->nexperiments = input->nexperiments;
01988     calibrate->ninputs = input->ninputs;
01989     calibrate->experiment = input->experiment;
01990     calibrate->weight = input->weight;
01991     for (i = 0; i < input->ninputs; ++i)
01992     {
01993         calibrate->template[i] = input->template[i];
01994         calibrate->file[i]
01995         = g_malloc (input->nexperiments * sizeof (GMappedFile *));
01996     }
01997     for (i = 0; i < input->nexperiments; ++i)
01998     {
01999 #if DEBUG
02000         fprintf (stderr, "calibrate_new: i=%u\n", i);
02001         fprintf (stderr, "calibrate_new: experiment=%s\n",
02002                 calibrate->experiment[i]);
02003         fprintf (stderr, "calibrate_new: weight=%lg\n", calibrate->weight[i]);
02004 #endif
02005         for (j = 0; j < input->ninputs; ++j)
02006         {
02007 #if DEBUG
02008             fprintf (stderr, "calibrate_new: template%u\n", j + 1);

```



```

02008         fprintf (stderr, "calibrate_new: experiment=%u template%u=%s\n",
02009                     i, j + 1, calibrate->template[j][i]);
02010 #endif
02011         calibrate->file[j][i]
02012         = g_mapped_file_new (input->template[j][i], 0, NULL);
02013     }
02014 }
02015
02016 // Reading the variables data
02017 #if DEBUG
02018 fprintf (stderr, "calibrate_new: reading variables\n");
02019 #endif
02020 calibrate->nvariables = input->nvariables;
02021 calibrate->label = input->label;
02022 j = input->nvariables * sizeof (double);
02023 calibrate->rangemin = (double *) g_malloc (j);
02024 calibrate->rangemax = (double *) g_malloc (j);
02025 memcpy (calibrate->rangemin, input->rangemin, j);
02026 memcpy (calibrate->rangemax, input->rangemax, j);
02027 calibrate->rangeminabs = input->rangeminabs;
02028 calibrate->rangemaxabs = input->rangemaxabs;
02029 calibrate->precision = input->precision;
02030 calibrate->nsweeps = input->nsweeps;
02031 nbits = input->nbits;
02032 if (input->algorithm == ALGORITHM_SWEEP)
02033     calibrate->nsimulations = 1;
02034 else if (input->algorithm == ALGORITHM_GENETIC)
02035     for (i = 0; i < input->nvariables; ++i)
02036     {
02037         if (calibrate->algorithm == ALGORITHM_SWEEP)
02038         {
02039             calibrate->nsimulations *= input->nsweeps[i];
02040 #if DEBUG
02041             fprintf (stderr, "calibrate_new: nsweeps=%u nsimulations=%u\n",
02042                     calibrate->nsweeps[i], calibrate->nsimulations);
02043 #endif
02044         }
02045     }
02046
02047 // Allocating values
02048 #if DEBUG
02049 fprintf (stderr, "calibrate_new: allocating variables\n");
02050 fprintf (stderr, "calibrate_new: nvariables=%u\n", calibrate->nvariables);
02051 #endif
02052 calibrate->genetic_variable = NULL;
02053 if (calibrate->algorithm == ALGORITHM_GENETIC)
02054 {
02055     calibrate->genetic_variable = (GeneticVariable *)
02056     g_malloc (calibrate->nvariables * sizeof (GeneticVariable));
02057     for (i = 0; i < calibrate->nvariables; ++i)
02058     {
02059 #if DEBUG
02060         fprintf (stderr, "calibrate_new: i=%u min=%lg max=%lg nbits=%u\n",
02061                 i, calibrate->rangemin[i], calibrate->rangemax[i], nbits[i]);
02062 #endif
02063         calibrate->genetic_variable[i].minimum = calibrate->
02064         rangemin[i];
02065         calibrate->genetic_variable[i].maximum = calibrate->
02066         rangemax[i];
02067         calibrate->genetic_variable[i].nbits = nbits[i];
02068     }
02069 #if DEBUG
02070     fprintf (stderr, "calibrate_new: nvariables=%u nsimulations=%u\n",
02071             calibrate->nvariables, calibrate->nsimulations);
02072 #endif
02073 calibrate->value = (double *) g_malloc (calibrate->nsimulations *
02074     calibrate->nvariables *
02075     sizeof (double));
02076
02077 // Calculating simulations to perform on each task
02078 #if HAVE_MPI
02079 #if DEBUG
02080     fprintf (stderr, "calibrate_new: rank=%u ntasks=%u\n",
02081             calibrate->mpi_rank, ntasks);
02082 #endif
02083 calibrate->nstart = calibrate->mpi_rank * calibrate->
02084     nsimulations / ntasks;
02085 calibrate->nend = (1 + calibrate->mpi_rank) * calibrate->
02086     nsimulations
02087     / ntasks;
02088 #else
02089 calibrate->nstart = 0;
02090 calibrate->nend = calibrate->nsimulations;
02091 #endif
02092 #if DEBUG
02093     fprintf (stderr, "calibrate_new: nstart=%u nend=%u\n", calibrate->nstart,

```

```

02091         calibrate->nend);
02092 #endif
02093
02094 // Calculating simulations to perform on each thread
02095 calibrate->thread
02096     = (unsigned int *) alloca ((1 + nthreads) * sizeof (unsigned int));
02097 for (i = 0; i <= nthreads; ++i)
02098 {
02099     calibrate->thread[i] = calibrate->nstart
02100         + i * (calibrate->nend - calibrate->nstart) / nthreads;
02101 #if DEBUG
02102     fprintf (stderr, "calibrate_new: i=%u thread=%u\n", i,
02103             calibrate->thread[i]);
02104 #endif
02105 }
02106
02107 // Opening result files
02108 calibrate->file_result = g_fopen ("result", "w");
02109 calibrate->file_variables = g_fopen ("variables", "w");
02110
02111 // Performing the algorithm
02112 switch (calibrate->algorithm)
02113 {
02114     // Genetic algorithm
02115     case ALGORITHM_GENETIC:
02116         calibrate_genetic ();
02117         break;
02118
02119     // Iterative algorithm
02120     default:
02121         calibrate_iterate ();
02122 }
02123
02124 // Closing result files
02125 fclose (calibrate->file_variables);
02126 fclose (calibrate->file_result);
02127
02128 #if DEBUG
02129     fprintf (stderr, "calibrate_new: end\n");
02130 #endif
02131 }
02132
02133 #if HAVE_GTK
02134 void
02142 input_save (char *filename)
02143 {
02144     unsigned int i, j;
02145     char *buffer;
02146     xmlDoc *doc;
02147     xmlNode *node, *child;
02148     GFile *file, *file2;
02149
02150     // Getting the input file directory
02151     input->name = g_path_get_basename (filename);
02152     input->directory = g_path_get_dirname (filename);
02153     file = g_file_new_for_path (input->directory);
02154
02155     // Opening the input file
02156     doc = xmlNewDoc ((const xmlChar *) "1.0");
02157
02158     // Setting root XML node
02159     node = xmlNewDocNode (doc, 0, XML_CALIBRATE, 0);
02160     xmlDocSetRootElement (doc, node);
02161
02162     // Adding properties to the root XML node
02163     file2 = g_file_new_for_path (input->simulator);
02164     buffer = g_file_get_relative_path (file, file2);
02165     g_object_unref (file2);
02166     xmlSetProp (node, XML_SIMULATOR, (xmlChar *) buffer);
02167     g_free (buffer);
02168     if (input->evaluator)
02169     {
02170         file2 = g_file_new_for_path (input->evaluator);
02171         buffer = g_file_get_relative_path (file, file2);
02172         g_object_unref (file2);
02173         if (xmlStrlen ((xmlChar *) buffer))
02174             xmlSetProp (node, XML_EVALUATOR, (xmlChar *) buffer);
02175         g_free (buffer);
02176     }
02177     if (input->seed != DEFAULT_RANDOM_SEED)
02178         xml_node_set_uint (node, XML_SEED, input->seed);
02179
02180     // Setting the algorithm
02181     buffer = (char *) g_malloc (64);
02182     switch (input->algorithm)
02183     {

```

```

02184     case ALGORITHM_MONTE_CARLO:
02185         xmlSetProp (node, XML_ALGORITHM, XML_MONTE_CARLO);
02186         snprintf (buffer, 64, "%u", input->nsimulations);
02187         xmlSetProp (node, XML_NSIMULATIONS, (xmlChar *) buffer);
02188         snprintf (buffer, 64, "%u", input->niterations);
02189         xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02190         snprintf (buffer, 64, "%.3lg", input->tolerance);
02191         xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02192         snprintf (buffer, 64, "%u", input->nbest);
02193         xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02194         break;
02195     case ALGORITHM_SWEEP:
02196         xmlSetProp (node, XML_ALGORITHM, XML_SWEEP);
02197         snprintf (buffer, 64, "%u", input->niterations);
02198         xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02199         snprintf (buffer, 64, "%.3lg", input->tolerance);
02200         xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02201         snprintf (buffer, 64, "%u", input->nbest);
02202         xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02203         break;
02204     default:
02205         xmlSetProp (node, XML_ALGORITHM, XML_GENETIC);
02206         snprintf (buffer, 64, "%u", input->nsimulations);
02207         xmlSetProp (node, XML_NPOPULATION, (xmlChar *) buffer);
02208         snprintf (buffer, 64, "%u", input->niterations);
02209         xmlSetProp (node, XML_NGENERATIONS, (xmlChar *) buffer);
02210         snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
02211         xmlSetProp (node, XML_MUTATION, (xmlChar *) buffer);
02212         snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
02213         xmlSetProp (node, XML_REPRODUCTION, (xmlChar *) buffer);
02214         snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
02215         xmlSetProp (node, XML_ADAPTATION, (xmlChar *) buffer);
02216         break;
02217     }
02218     g_free (buffer);
02219
02220     // Setting the experimental data
02221     for (i = 0; i < input->nexperiments; ++i)
02222     {
02223         child = xmlNewChild (node, 0, XML_EXPERIMENT, 0);
02224         xmlSetProp (child, XML_NAME, (xmlChar *) input->experiment[i]);
02225         if (input->weight[i] != 1.)
02226             xml_node_set_float (child, XML_WEIGHT, input->
02227 weight[i]);
02228         for (j = 0; j < input->ninputs; ++j)
02229             xmlSetProp (child, template[j], (xmlChar *) input->template[j][i]);
02230     }
02231
02232     // Setting the variables data
02233     for (i = 0; i < input->nvariables; ++i)
02234     {
02235         child = xmlNewChild (node, 0, XML_VARIABLE, 0);
02236         xmlSetProp (child, XML_NAME, (xmlChar *) input->label[i]);
02237         xml_node_set_float (child, XML_MINIMUM, input->
02238 rangemin[i]);
02239         if (input->rangeminabs[i] != -G_MAXDOUBLE)
02240             xml_node_set_float (child, XML_ABSOLUTE_MINIMUM, input->
02241 rangeminabs[i]);
02242         xml_node_set_float (child, XML_MAXIMUM, input->
02243 rangemax[i]);
02244         if (input->rangemaxabs[i] != G_MAXDOUBLE)
02245             xml_node_set_float (child, XML_ABSOLUTE_MAXIMUM, input->
02246 rangemaxabs[i]);
02247         if (input->precision[i] != DEFAULT_PRECISION)
02248             xml_node_set_uint (child, XML_PRECISION, input->
02249 precision[i]);
02250         if (input->algorithm == ALGORITHM_SWEEP)
02251             xml_node_set_uint (child, XML_NSWEEPS, input->
02252 nsweeps[i]);
02253         else if (input->algorithm == ALGORITHM_GENETIC)
02254             xml_node_set_uint (child, XML_NBITS, input->
02255 nbits[i]);
02256     }
02257
02258     // Saving the XML file
02259     xmlSaveFormatFile (filename, doc, 1);
02260
02261     // Freeing memory
02262     xmlFreeDoc (doc);
02263 }
02264
02265 void
02266 options_new ()
02267 {
02268     options->label_processors
02269         = (GtkLabel *) gtk_label_new (gettext ("Processors number"));
02270     options->spin_processors

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```

02267     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
02268     gtk_spin_button_set_value (options->spin_processors, (gdouble)
nthreads);
02269     options->label_seed = (GtkLabel *)
02270     gtk_label_new (gettext ("Pseudo-random numbers generator seed"));
02271     options->spin_seed = (GtkSpinButton *)
02272     gtk_spin_button_new_with_range (0., (gdouble) G_MAXULONG, 1.);
02273     gtk_spin_button_set_value (options->spin_seed, (gdouble) input->seed);
02274     options->grid = (GtkGrid *) gtk_grid_new ();
02275     gtk_grid_attach (options->grid, GTK_WIDGET (options->label_processors),
02276     0, 0, 1, 1);
02277     gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_processors),
02278     1, 0, 1, 1);
02279     gtk_grid_attach (options->grid, GTK_WIDGET (options->label_seed), 0, 1, 1, 1);
02280     gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_seed), 1, 1, 1, 1);
02281     gtk_widget_show_all (GTK_WIDGET (options->grid));
02282     options->dialog = (GtkDialog *)
02283     gtk_dialog_new_with_buttons (gettext ("Options"),
02284     window->window,
02285     GTK_DIALOG_MODAL,
02286     gettext ("_OK"), GTK_RESPONSE_OK,
02287     gettext ("_Cancel"), GTK_RESPONSE_CANCEL,
02288     NULL);
02289     gtk_container_add
02290     (GTK_CONTAINER (gtk_dialog_get_content_area (options->dialog)),
02291     GTK_WIDGET (options->grid));
02292     if (gtk_dialog_run (options->dialog) == GTK_RESPONSE_OK)
02293     {
02294         nthreads = gtk_spin_button_get_value_as_int (options->spin_processors);
02295         input->seed
02296         = (unsigned long int) gtk_spin_button_get_value (options->spin_seed);
02297     }
02298     gtk_widget_destroy (GTK_WIDGET (options->dialog));
02299 }
02300
02305 void
02306 running_new ()
02307 {
02308     #if DEBUG
02309     fprintf (stderr, "running_new: start\n");
02310     #endif
02311     running->label = (GtkLabel *) gtk_label_new (gettext ("Calculating ..."));
02312     running->dialog = (GtkDialog *)
02313     gtk_dialog_new_with_buttons (gettext ("Calculating"),
02314     window->window, GTK_DIALOG_MODAL, NULL, NULL);
02315     gtk_container_add
02316     (GTK_CONTAINER (gtk_dialog_get_content_area (running->dialog)),
02317     GTK_WIDGET (running->label));
02318     gtk_widget_show_all (GTK_WIDGET (running->dialog));
02319     #if DEBUG
02320     fprintf (stderr, "running_new: end\n");
02321     #endif
02322 }
02323
02329 int
02330 window_save ()
02331 {
02332     char *buffer;
02333     GtkFileChooserDialog *dlg;
02334
02335     #if DEBUG
02336     fprintf (stderr, "window_save: start\n");
02337     #endif
02338
02339     // Opening the saving dialog
02340     dlg = (GtkFileChooserDialog *)
02341     gtk_file_chooser_dialog_new (gettext ("Save file"),
02342     window->window,
02343     GTK_FILE_CHOOSER_ACTION_SAVE,
02344     gettext ("_Cancel"),
02345     GTK_RESPONSE_CANCEL,
02346     gettext ("_OK"), GTK_RESPONSE_OK, NULL);
02347     gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
02348     buffer = g_build_filename (input->directory, input->name, NULL);
02349     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER (dlg), buffer);
02350     g_free (buffer);
02351
02352     // If OK response then saving
02353     if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
02354     {
02355         // Adding properties to the root XML node
02356         input->simulator = gtk_file_chooser_get_filename
02357         (GTK_FILE_CHOOSER (window->button_simulator));
02358         if (gtk_toggle_button_get_active
02359         (GTK_TOGGLE_BUTTON (window->check_evaluator)))
02360             input->evaluator = gtk_file_chooser_get_filename

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02362         (GTK_FILE_CHOOSER (window->button_evaluator));
02363     else
02364         input->evaluator = NULL;
02365
02366     // Setting the algorithm
02367     switch (window_get_algorithm ())
02368     {
02369         case ALGORITHM_MONTE_CARLO:
02370             input->algorithm = ALGORITHM_MONTE_CARLO;
02371             input->nsimulations
02372                 = gtk_spin_button_get_value_as_int (window->spin_simulations);
02373             input->niterations
02374                 = gtk_spin_button_get_value_as_int (window->spin_iterations);
02375             input->tolerance = gtk_spin_button_get_value (window->
spin_tolerance);
02376             input->nbest = gtk_spin_button_get_value_as_int (window->
spin_bests);
02377             break;
02378         case ALGORITHM_SWEEP:
02379             input->algorithm = ALGORITHM_SWEEP;
02380             input->niterations
02381                 = gtk_spin_button_get_value_as_int (window->spin_iterations);
02382             input->tolerance = gtk_spin_button_get_value (window->
spin_tolerance);
02383             input->nbest = gtk_spin_button_get_value_as_int (window->
spin_bests);
02384             break;
02385         default:
02386             input->algorithm = ALGORITHM_GENETIC;
02387             input->nsimulations
02388                 = gtk_spin_button_get_value_as_int (window->spin_population);
02389             input->niterations
02390                 = gtk_spin_button_get_value_as_int (window->spin_generations);
02391             input->mutation_ratio
02392                 = gtk_spin_button_get_value (window->spin_mutation);
02393             input->reproduction_ratio
02394                 = gtk_spin_button_get_value (window->spin_reproduction);
02395             input->adaptation_ratio
02396                 = gtk_spin_button_get_value (window->spin_adaptation);
02397             break;
02398     }
02399
02400     // Saving the XML file
02401     buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
02402     input_save (buffer);
02403
02404     // Closing and freeing memory
02405     g_free (buffer);
02406     gtk_widget_destroy (GTK_WIDGET (dlg));
02407     #if DEBUG
02408         fprintf (stderr, "window_save: end\n");
02409     #endif
02410     return 1;
02411 }
02412
02413 // Closing and freeing memory
02414 gtk_widget_destroy (GTK_WIDGET (dlg));
02415 #if DEBUG
02416     fprintf (stderr, "window_save: end\n");
02417 #endif
02418     return 0;
02419 }
02420
02425 void
02426 window_run ()
02427 {
02428     unsigned int i;
02429     char *msg, *msg2, buffer[64], buffer2[64];
02430     #if DEBUG
02431         fprintf (stderr, "window_run: start\n");
02432     #endif
02433     if (!window_save ())
02434     {
02435         #if DEBUG
02436             fprintf (stderr, "window_run: end\n");
02437         #endif
02438         return;
02439     }
02440     running_new ();
02441     while (gtk_events_pending ())
02442         gtk_main_iteration ();
02443     calibrate_new ();
02444     gtk_widget_destroy (GTK_WIDGET (running->dialog));
02445     snprintf (buffer, 64, "error=%.15le\n", calibrate->error_old[0]);
02446     msg2 = g_strdup (buffer);
02447     for (i = 0; i < calibrate->nvariables; ++i, msg2 = msg)
02448     {

```

```

02449     snprintf (buffer, 64, "%s=%s\n",
02450               calibrate->label[i], format[calibrate->precision[i]]);
02451     snprintf (buffer2, 64, buffer, calibrate->value_old[i]);
02452     msg = g_strconcat (msg2, buffer2, NULL);
02453     g_free (msg2);
02454 }
02455 show_message (gettext ("Best result"), msg2, INFO_TYPE);
02456 g_free (msg2);
02457 calibrate_free ();
02458 #if DEBUG
02459 fprintf (stderr, "window_run: end\n");
02460 #endif
02461 }
02462
02463 void
02464 window_help ()
02465 {
02466     char *buffer, *buffer2;
02467     buffer2 = g_build_filename (window->application_directory, "..", "manuals",
02468                               gettext ("user-manual.pdf"), NULL);
02469     buffer = g_filename_to_uri (buffer2, NULL, NULL);
02470     g_free (buffer2);
02471     gtk_show_uri (NULL, buffer, GDK_CURRENT_TIME, NULL);
02472     g_free (buffer);
02473 }
02474
02475 void
02476 window_about ()
02477 {
02478     gchar *authors[] = {
02479         "Javier Burguete Tolosa (jburguete@eead.csic.es)",
02480         "Borja Latorre Garcés (borja.latorre@csic.es)",
02481         NULL
02482     };
02483     gtk_show_about_dialog (window->window,
02484                           "program_name",
02485                           "Calibrator",
02486                           "comments",
02487                           gettext ("A software to make calibrations of "
02488                                   "empirical parameters"),
02489                           "authors", authors,
02490                           "translator-credits",
02491                           "Javier Burguete Tolosa (jburguete@eead.csic.es)",
02492                           "version", "1.0.2",
02493                           "copyright",
02494                           "Copyright 2012-2015 Javier Burguete Tolosa",
02495                           "logo", window->logo,
02496                           "website-label", gettext ("Website"),
02497                           "website",
02498                           "https://github.com/jburguete/calibrator", NULL);
02499 }
02500
02501 int
02502 window_get_algorithm ()
02503 {
02504     unsigned int i;
02505     for (i = 0; i < NALGORITHMS; ++i)
02506         if (gtk_toggle_button_get_active
02507             (GTK_TOGGLE_BUTTON (window->button_algorithm[i])))
02508             break;
02509     return i;
02510 }
02511
02512 void
02513 window_update ()
02514 {
02515     unsigned int i;
02516     gtk_widget_set_sensitive
02517         (GTK_WIDGET (window->button_evaluator),
02518          gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
02519                                       (window->check_evaluator)));
02520     gtk_widget_hide (GTK_WIDGET (window->label_simulations));
02521     gtk_widget_hide (GTK_WIDGET (window->spin_simulations));
02522     gtk_widget_hide (GTK_WIDGET (window->label_iterations));
02523     gtk_widget_hide (GTK_WIDGET (window->spin_iterations));
02524     gtk_widget_hide (GTK_WIDGET (window->label_tolerance));
02525     gtk_widget_hide (GTK_WIDGET (window->spin_tolerance));
02526     gtk_widget_hide (GTK_WIDGET (window->label_bests));
02527     gtk_widget_hide (GTK_WIDGET (window->spin_bests));
02528     gtk_widget_hide (GTK_WIDGET (window->label_population));
02529     gtk_widget_hide (GTK_WIDGET (window->spin_population));
02530     gtk_widget_hide (GTK_WIDGET (window->label_generations));
02531     gtk_widget_hide (GTK_WIDGET (window->spin_generations));
02532     gtk_widget_hide (GTK_WIDGET (window->label_mutation));
02533     gtk_widget_hide (GTK_WIDGET (window->spin_mutation));
02534     gtk_widget_hide (GTK_WIDGET (window->label_reproduction));
02535     gtk_widget_hide (GTK_WIDGET (window->spin_reproduction));

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```

02553 gtk_widget_hide (GTK_WIDGET (window->label_adaptation));
02554 gtk_widget_hide (GTK_WIDGET (window->spin_adaptation));
02555 gtk_widget_hide (GTK_WIDGET (window->label_sweeps));
02556 gtk_widget_hide (GTK_WIDGET (window->spin_sweeps));
02557 gtk_widget_hide (GTK_WIDGET (window->label_bits));
02558 gtk_widget_hide (GTK_WIDGET (window->spin_bits));
02559 i = gtk_spin_button_get_value_as_int (window->spin_iterations);
02560 switch (window_get_algorithm ())
02561 {
02562     case ALGORITHM_MONTE_CARLO:
02563         gtk_widget_show (GTK_WIDGET (window->label_simulations));
02564         gtk_widget_show (GTK_WIDGET (window->spin_simulations));
02565         gtk_widget_show (GTK_WIDGET (window->label_iterations));
02566         gtk_widget_show (GTK_WIDGET (window->spin_iterations));
02567         if (i > 1)
02568         {
02569             gtk_widget_show (GTK_WIDGET (window->label_tolerance));
02570             gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
02571             gtk_widget_show (GTK_WIDGET (window->label_bests));
02572             gtk_widget_show (GTK_WIDGET (window->spin_bests));
02573         }
02574         break;
02575     case ALGORITHM_SWEEP:
02576         gtk_widget_show (GTK_WIDGET (window->label_iterations));
02577         gtk_widget_show (GTK_WIDGET (window->spin_iterations));
02578         if (i > 1)
02579         {
02580             gtk_widget_show (GTK_WIDGET (window->label_tolerance));
02581             gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
02582             gtk_widget_show (GTK_WIDGET (window->label_bests));
02583             gtk_widget_show (GTK_WIDGET (window->spin_bests));
02584         }
02585         gtk_widget_show (GTK_WIDGET (window->label_sweeps));
02586         gtk_widget_show (GTK_WIDGET (window->spin_sweeps));
02587         break;
02588     default:
02589         gtk_widget_show (GTK_WIDGET (window->label_population));
02590         gtk_widget_show (GTK_WIDGET (window->spin_population));
02591         gtk_widget_show (GTK_WIDGET (window->label_generations));
02592         gtk_widget_show (GTK_WIDGET (window->spin_generations));
02593         gtk_widget_show (GTK_WIDGET (window->label_mutation));
02594         gtk_widget_show (GTK_WIDGET (window->spin_mutation));
02595         gtk_widget_show (GTK_WIDGET (window->label_reproduction));
02596         gtk_widget_show (GTK_WIDGET (window->spin_reproduction));
02597         gtk_widget_show (GTK_WIDGET (window->label_adaptation));
02598         gtk_widget_show (GTK_WIDGET (window->spin_adaptation));
02599         gtk_widget_show (GTK_WIDGET (window->label_bits));
02600         gtk_widget_show (GTK_WIDGET (window->spin_bits));
02601     }
02602 gtk_widget_set_sensitive
02603 (GTK_WIDGET (window->button_remove_experiment), input->
nexperiments > 1);
02604 gtk_widget_set_sensitive
02605 (GTK_WIDGET (window->button_remove_variable), input->
nvariables > 1);
02606 for (i = 0; i < input->ninputs; ++i)
02607 {
02608     gtk_widget_show (GTK_WIDGET (window->check_template[i]));
02609     gtk_widget_show (GTK_WIDGET (window->button_template[i]));
02610     gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 0);
02611     gtk_widget_set_sensitive (GTK_WIDGET (window->button_template[i]), 1);
02612     g_signal_handler_block
02613         (window->check_template[i], window->id_template[i]);
02614     g_signal_handler_block (window->button_template[i], window->
id_input[i]);
02615     gtk_toggle_button_set_active
02616         (GTK_TOGGLE_BUTTON (window->check_template[i]), 1);
02617     g_signal_handler_unblock
02618         (window->button_template[i], window->id_input[i]);
02619     g_signal_handler_unblock
02620         (window->check_template[i], window->id_template[i]);
02621 }
02622 if (i > 0)
02623 {
02624     gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i - 1]), 1);
02625     gtk_widget_set_sensitive
02626         (GTK_WIDGET (window->button_template[i - 1]),
02627          gtk_toggle_button_get_active
02628              (GTK_TOGGLE_BUTTON (window->check_template[i - 1])));
02629 }
02630 if (i < MAX_NINPUTS)
02631 {
02632     gtk_widget_show (GTK_WIDGET (window->check_template[i]));
02633     gtk_widget_show (GTK_WIDGET (window->button_template[i]));
02634     gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 1);
02635     gtk_widget_set_sensitive
02636         (GTK_WIDGET (window->button_template[i]),

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02637         gtk_toggle_button_get_active
02638         GTK_TOGGLE_BUTTON (window->check_template[i]));
02639     g_signal_handler_block
02640     (window->check_template[i], window->id_template[i]);
02641     g_signal_handler_block (window->button_template[i], window->
id_input[i]);
02642     gtk_toggle_button_set_active
02643     (GTK_TOGGLE_BUTTON (window->check_template[i]), 0);
02644     g_signal_handler_unblock
02645     (window->button_template[i], window->id_input[i]);
02646     g_signal_handler_unblock
02647     (window->check_template[i], window->id_template[i]);
02648     }
02649     while (++i < MAX_NINPUTS)
02650     {
02651         gtk_widget_hide (GTK_WIDGET (window->check_template[i]));
02652         gtk_widget_hide (GTK_WIDGET (window->button_template[i]));
02653     }
02654     gtk_widget_set_sensitive
02655     (GTK_WIDGET (window->spin_minabs),
02656     gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (window->check_minabs)));
02657     gtk_widget_set_sensitive
02658     (GTK_WIDGET (window->spin_maxabs),
02659     gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (window->check_maxabs)));
02660 }
02661 void
02662 window_set_algorithm ()
02663 {
02664     int i;
02665     #if DEBUG
02666     fprintf (stderr, "window_set_algorithm: start\n");
02667     #endif
02668     i = window_get_algorithm ();
02669     switch (i)
02670     {
02671     case ALGORITHM_SWEEP:
02672         input->nsweeps = (unsigned int *) g_realloc
02673         (input->nsweeps, input->nvariables * sizeof (unsigned int));
02674         i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
02675         if (i < 0)
02676             i = 0;
02677         gtk_spin_button_set_value (window->spin_sweeps,
02678         (gdouble) input->nsweeps[i]);
02679         break;
02680     case ALGORITHM_GENETIC:
02681         input->nbits = (unsigned int *) g_realloc
02682         (input->nbits, input->nvariables * sizeof (unsigned int));
02683         i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
02684         if (i < 0)
02685             i = 0;
02686         gtk_spin_button_set_value (window->spin_bits, (gdouble) input->
nbits[i]);
02687     }
02688     window_update ();
02689     #if DEBUG
02690     fprintf (stderr, "window_set_algorithm: end\n");
02691     #endif
02692 }
02693 void
02694 window_set_experiment ()
02695 {
02696     unsigned int i, j;
02697     char *buffer1, *buffer2;
02698     #if DEBUG
02699     fprintf (stderr, "window_set_experiment: start\n");
02700     #endif
02701     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02702     gtk_spin_button_set_value (window->spin_weight, input->weight[i]);
02703     buffer1 = gtk_combo_box_text_get_active_text (window->combo_experiment);
02704     buffer2 = g_build_filename (input->directory, buffer1, NULL);
02705     g_free (buffer1);
02706     g_signal_handler_block
02707     (window->button_experiment, window->id_experiment_name);
02708     gtk_file_chooser_set_filename
02709     (GTK_FILE_CHOOSER (window->button_experiment), buffer2);
02710     g_signal_handler_unblock
02711     (window->button_experiment, window->id_experiment_name);
02712     g_free (buffer2);
02713     for (j = 0; j < input->ninputs; ++j)
02714     {
02715         g_signal_handler_block (window->button_template[j], window->
id_input[j]);
02716         buffer2
02717         = g_build_filename (input->directory, input->template[j][i], NULL);
02718         gtk_file_chooser_set_filename

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02729         (GTK_FILE_CHOOSER (window->button_template[j]), buffer2);
02730         g_free (buffer2);
02731         g_signal_handler_unblock
02732         (window->button_template[j], window->id_input[j]);
02733     }
02734     #if DEBUG
02735     fprintf (stderr, "window_set_experiment: end\n");
02736     #endif
02737 }
02738
02739 void
02740 window_remove_experiment ()
02741 {
02742     unsigned int i, j;
02743     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02744     g_signal_handler_block (window->combo_experiment, window->
02745     id_experiment);
02746     gtk_combo_box_text_remove (window->combo_experiment, i);
02747     g_signal_handler_unblock (window->combo_experiment, window->
02748     id_experiment);
02749     xmlFree (input->experiment[i]);
02750     --input->nexperiments;
02751     for (j = i; j < input->nexperiments; ++j)
02752     {
02753         input->experiment[j] = input->experiment[j + 1];
02754         input->weight[j] = input->weight[j + 1];
02755     }
02756     j = input->nexperiments - 1;
02757     if (i > j)
02758         i = j;
02759     for (j = 0; j < input->ninputs; ++j)
02760     g_signal_handler_block (window->button_template[j], window->
02761     id_input[j]);
02762     g_signal_handler_block
02763     (window->button_experiment, window->id_experiment_name);
02764     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
02765     g_signal_handler_unblock
02766     (window->button_experiment, window->id_experiment_name);
02767     for (j = 0; j < input->ninputs; ++j)
02768     g_signal_handler_unblock (window->button_template[j], window->
02769     id_input[j]);
02770     window_update ();
02771 }
02772
02773 void
02774 window_add_experiment ()
02775 {
02776     unsigned int i, j;
02777     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02778     g_signal_handler_block (window->combo_experiment, window->
02779     id_experiment);
02780     gtk_combo_box_text_insert_text
02781     (window->combo_experiment, i, input->experiment[i]);
02782     g_signal_handler_unblock (window->combo_experiment, window->
02783     id_experiment);
02784     input->experiment = (char **) g_realloc
02785     (input->experiment, (input->nexperiments + 1) * sizeof (char *));
02786     input->weight = (double *) g_realloc
02787     (input->weight, (input->nexperiments + 1) * sizeof (double));
02788     for (j = input->nexperiments - 1; j > i; --j)
02789     {
02790         input->experiment[j + 1] = input->experiment[j];
02791         input->weight[j + 1] = input->weight[j];
02792     }
02793     input->experiment[j + 1]
02794     = (char *) xmlStrdup ((xmlChar *) input->experiment[j]);
02795     input->weight[j + 1] = input->weight[j];
02796     ++input->nexperiments;
02797     for (j = 0; j < input->ninputs; ++j)
02798     g_signal_handler_block (window->button_template[j], window->
02799     id_input[j]);
02800     g_signal_handler_block
02801     (window->button_experiment, window->id_experiment_name);
02802     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i + 1);
02803     g_signal_handler_unblock
02804     (window->button_experiment, window->id_experiment_name);
02805     for (j = 0; j < input->ninputs; ++j)
02806     g_signal_handler_unblock (window->button_template[j], window->
02807     id_input[j]);
02808     window_update ();
02809 }
02810
02811 void
02812 window_name_experiment ()
02813 {
02814     unsigned int i;
02815     char *buffer;

```

```

02820  GFile *file1, *file2;
02821  #if DEBUG
02822  fprintf (stderr, "window_name_experiment: start\n");
02823  #endif
02824  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02825  file1
02826  = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_experiment));
02827  file2 = g_file_new_for_path (input->directory);
02828  buffer = g_file_get_relative_path (file2, file1);
02829  g_signal_handler_block (window->combo_experiment, window->
id_experiment);
02830  gtk_combo_box_text_remove (window->combo_experiment, i);
02831  gtk_combo_box_text_insert_text (window->combo_experiment, i, buffer);
02832  gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
02833  g_signal_handler_unblock (window->combo_experiment, window->
id_experiment);
02834  g_free (buffer);
02835  g_object_unref (file2);
02836  g_object_unref (file1);
02837  #if DEBUG
02838  fprintf (stderr, "window_name_experiment: end\n");
02839  #endif
02840  }
02841
02842 void
02843 window_weight_experiment ()
02844 {
02845  unsigned int i;
02846  #if DEBUG
02847  fprintf (stderr, "window_weight_experiment: start\n");
02848  #endif
02849  i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02850  input->weight[i] = gtk_spin_button_get_value (window->spin_weight);
02851  #if DEBUG
02852  fprintf (stderr, "window_weight_experiment: end\n");
02853  #endif
02854  }
02855
02856 void
02857 window_inputs_experiment ()
02858 {
02859  unsigned int j;
02860  #if DEBUG
02861  fprintf (stderr, "window_inputs_experiment: start\n");
02862  #endif
02863  j = input->ninputs - 1;
02864  if (j
02865      && !gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
(window->check_template[j])))
02866      --input->ninputs;
02867  if (input->ninputs < MAX_NINPUTS
02868      && gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
(window->check_template[j])))
02869      {
02870          ++input->ninputs;
02871          for (j = 0; j < input->ninputs; ++j)
02872          {
02873              input->template[j] = (char **)
02874                  g_realloc (input->template[j], input->nvariables * sizeof (char *));
02875          }
02876      }
02877  window_update ();
02878  #if DEBUG
02879  fprintf (stderr, "window_inputs_experiment: end\n");
02880  #endif
02881  }
02882
02883 void
02884 window_template_experiment (void *data)
02885 {
02886  unsigned int i, j;
02887  char *buffer;
02888  GFile *file1, *file2;
02889  #if DEBUG
02890  fprintf (stderr, "window_template_experiment: start\n");
02891  #endif
02892  i = (size_t) data;
02893  j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02894  file1
02895  = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
02896  file2 = g_file_new_for_path (input->directory);
02897  buffer = g_file_get_relative_path (file2, file1);
02898  input->template[i][j] = (char *) xmlStrdup ((xmlChar *) buffer);
02899  g_free (buffer);
02900  g_object_unref (file2);
02901  g_object_unref (file1);
02902  #if DEBUG

```

```

02921     fprintf (stderr, "window_template_experiment: end\n");
02922 #endif
02923 }
02924
02925 void
02930 window_set_variable ()
02931 {
02932     unsigned int i;
02933     #if DEBUG
02934         fprintf (stderr, "window_set_variable: start\n");
02935     #endif
02936     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
02937     g_signal_handler_block (window->entry_variable, window->
02938         id_variable_label);
02938     gtk_entry_set_text (window->entry_variable, input->label[i]);
02939     g_signal_handler_unblock (window->entry_variable, window->
02940         id_variable_label);
02940     gtk_spin_button_set_value (window->spin_min, input->rangemin[i]);
02941     gtk_spin_button_set_value (window->spin_max, input->rangemax[i]);
02942     if (input->rangeminabs[i] != -G_MAXDOUBLE)
02943     {
02944         gtk_spin_button_set_value (window->spin_minabs, input->
02945             rangeminabs[i]);
02945         gtk_toggle_button_set_active
02946             (GTK_TOGGLE_BUTTON (window->check_minabs), 1);
02947     }
02948     else
02949     {
02950         gtk_spin_button_set_value (window->spin_minabs, -G_MAXDOUBLE);
02951         gtk_toggle_button_set_active
02952             (GTK_TOGGLE_BUTTON (window->check_minabs), 0);
02953     }
02954     if (input->rangemaxabs[i] != G_MAXDOUBLE)
02955     {
02956         gtk_spin_button_set_value (window->spin_maxabs, input->
02957             rangemaxabs[i]);
02958         gtk_toggle_button_set_active
02959             (GTK_TOGGLE_BUTTON (window->check_maxabs), 1);
02960     }
02961     else
02962     {
02963         gtk_spin_button_set_value (window->spin_maxabs, G_MAXDOUBLE);
02964         gtk_toggle_button_set_active
02965             (GTK_TOGGLE_BUTTON (window->check_maxabs), 0);
02966     }
02966     gtk_spin_button_set_value (window->spin_precision, input->
02967         precision[i]);
02967     #if DEBUG
02968         fprintf (stderr, "window_set_variable: precision[%u]=%u\n", i,
02969             input->precision[i]);
02970     #endif
02971     switch (window_get_algorithm ())
02972     {
02973     case ALGORITHM_SWEEP:
02974         gtk_spin_button_set_value (window->spin_sweeps,
02975             (gdouble) input->nsweeps[i]);
02976     #if DEBUG
02977         fprintf (stderr, "window_set_variable: nsweeps[%u]=%u\n", i,
02978             input->nsweeps[i]);
02979     #endif
02980         break;
02981     case ALGORITHM_GENETIC:
02982         gtk_spin_button_set_value (window->spin_bits, (gdouble) input->
02983             nbits[i]);
02984     #if DEBUG
02985         fprintf (stderr, "window_set_variable: nbits[%u]=%u\n", i,
02986             input->nbits[i]);
02987     #endif
02988         break;
02989     }
02989     window_update ();
02990     #if DEBUG
02991         fprintf (stderr, "window_set_variable: end\n");
02992     #endif
02993 }
02994
02995 void
03000 window_remove_variable ()
03001 {
03002     unsigned int i, j;
03003     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03004     g_signal_handler_block (window->combo_variable, window->
03005         id_variable);
03005     gtk_combo_box_text_remove (window->combo_variable, i);
03006     g_signal_handler_unblock (window->combo_variable, window->
03007         id_variable);
03007     xmlFree (input->label[i]);

```

```

03008 --input->nvariables;
03009 for (j = i; j < input->nvariables; ++j)
03010 {
03011     input->label[j] = input->label[j + 1];
03012     input->rangemin[j] = input->rangemin[j + 1];
03013     input->rangemax[j] = input->rangemax[j + 1];
03014     input->rangeminabs[j] = input->rangeminabs[j + 1];
03015     input->rangemaxabs[j] = input->rangemaxabs[j + 1];
03016     input->precision[j] = input->precision[j + 1];
03017     switch (window_get_algorithm ())
03018     {
03019         case ALGORITHM_SWEEP:
03020             input->nsweeps[j] = input->nsweeps[j + 1];
03021             break;
03022         case ALGORITHM_GENETIC:
03023             input->nbits[j] = input->nbits[j + 1];
03024     }
03025 }
03026 j = input->nvariables - 1;
03027 if (i > j)
03028     i = j;
03029 g_signal_handler_block (window->entry_variable, window->
id_variable_label);
03030 gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
03031 g_signal_handler_unblock (window->entry_variable, window->
id_variable_label);
03032 window_update ();
03033 }
03034
03039 void
03040 window_add_variable ()
03041 {
03042     unsigned int i, j;
03043     #if DEBUG
03044     fprintf (stderr, "window_add_variable: start\n");
03045     #endif
03046     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03047     g_signal_handler_block (window->combo_variable, window->
id_variable_label);
03048     gtk_combo_box_text_insert_text (window->combo_variable, i, input->
label[i]);
03049     g_signal_handler_unblock (window->combo_variable, window->
id_variable_label);
03050     input->label = (char **) g_realloc
03051         (input->label, (input->nvariables + 1) * sizeof (char *));
03052     input->rangemin = (double *) g_realloc
03053         (input->rangemin, (input->nvariables + 1) * sizeof (double));
03054     input->rangemax = (double *) g_realloc
03055         (input->rangemax, (input->nvariables + 1) * sizeof (double));
03056     input->rangeminabs = (double *) g_realloc
03057         (input->rangeminabs, (input->nvariables + 1) * sizeof (double));
03058     input->rangemaxabs = (double *) g_realloc
03059         (input->rangemaxabs, (input->nvariables + 1) * sizeof (double));
03060     input->precision = (unsigned int *) g_realloc
03061         (input->precision, (input->nvariables + 1) * sizeof (unsigned int));
03062     for (j = input->nvariables - 1; j > i; --j)
03063     {
03064         input->label[j + 1] = input->label[j];
03065         input->rangemin[j + 1] = input->rangemin[j];
03066         input->rangemax[j + 1] = input->rangemax[j];
03067         input->rangeminabs[j + 1] = input->rangeminabs[j];
03068         input->rangemaxabs[j + 1] = input->rangemaxabs[j];
03069         input->precision[j + 1] = input->precision[j];
03070     }
03071     input->label[j + 1] = (char *) xmlStrdup ((xmlChar *) input->label[j]);
03072     input->rangemin[j + 1] = input->rangemin[j];
03073     input->rangemax[j + 1] = input->rangemax[j];
03074     input->rangeminabs[j + 1] = input->rangeminabs[j];
03075     input->rangemaxabs[j + 1] = input->rangemaxabs[j];
03076     input->precision[j + 1] = input->precision[j];
03077     switch (window_get_algorithm ())
03078     {
03079         case ALGORITHM_SWEEP:
03080             input->nsweeps = (unsigned int *) g_realloc
03081                 (input->nsweeps, (input->nvariables + 1) * sizeof (unsigned int));
03082             for (j = input->nvariables - 1; j > i; --j)
03083                 input->nsweeps[j + 1] = input->nsweeps[j];
03084             input->nsweeps[j + 1] = input->nsweeps[j];
03085             break;
03086         case ALGORITHM_GENETIC:
03087             input->nbits = (unsigned int *) g_realloc
03088                 (input->nbits, (input->nvariables + 1) * sizeof (unsigned int));
03089             for (j = input->nvariables - 1; j > i; --j)
03090                 input->nbits[j + 1] = input->nbits[j];
03091             input->nbits[j + 1] = input->nbits[j];
03092     }
03093     ++input->nvariables;

```

```

03094 g_signal_handler_block (window->entry_variable, window->
id_variable_label);
03095 gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i + 1);
03096 g_signal_handler_unblock (window->entry_variable, window->
id_variable_label);
03097 window_update ();
03098 #if DEBUG
03099 fprintf (stderr, "window_add_variable: end\n");
03100 #endif
03101 }
03102
03107 void
03108 window_label_variable ()
03109 {
03110     unsigned int i;
03111     const char *buffer;
03112     #if DEBUG
03113     fprintf (stderr, "window_label_variable: start\n");
03114     #endif
03115     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03116     buffer = gtk_entry_get_text (window->entry_variable);
03117     g_signal_handler_block (window->combo_variable, window->
id_variable_label);
03118     gtk_combo_box_text_remove (window->combo_variable, i);
03119     gtk_combo_box_text_insert_text (window->combo_variable, i, buffer);
03120     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
03121     g_signal_handler_unblock (window->combo_variable, window->
id_variable_label);
03122     #if DEBUG
03123     fprintf (stderr, "window_label_variable: end\n");
03124     #endif
03125 }
03126
03131 void
03132 window_precision_variable ()
03133 {
03134     unsigned int i;
03135     #if DEBUG
03136     fprintf (stderr, "window_precision_variable: start\n");
03137     #endif
03138     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03139     input->precision[i]
03140     = (unsigned int) gtk_spin_button_get_value_as_int (window->spin_precision);
03141     gtk_spin_button_set_digits (window->spin_min, input->precision[i]);
03142     gtk_spin_button_set_digits (window->spin_max, input->precision[i]);
03143     gtk_spin_button_set_digits (window->spin_minabs, input->precision[i]);
03144     gtk_spin_button_set_digits (window->spin_maxabs, input->precision[i]);
03145     #if DEBUG
03146     fprintf (stderr, "window_precision_variable: end\n");
03147     #endif
03148 }
03149
03154 void
03155 window_rangemin_variable ()
03156 {
03157     unsigned int i;
03158     #if DEBUG
03159     fprintf (stderr, "window_rangemin_variable: start\n");
03160     #endif
03161     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03162     input->rangemin[i] = gtk_spin_button_get_value (window->spin_min);
03163     #if DEBUG
03164     fprintf (stderr, "window_rangemin_variable: end\n");
03165     #endif
03166 }
03167
03172 void
03173 window_rangemax_variable ()
03174 {
03175     unsigned int i;
03176     #if DEBUG
03177     fprintf (stderr, "window_rangemax_variable: start\n");
03178     #endif
03179     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03180     input->rangemax[i] = gtk_spin_button_get_value (window->spin_max);
03181     #if DEBUG
03182     fprintf (stderr, "window_rangemax_variable: end\n");
03183     #endif
03184 }
03185
03190 void
03191 window_rangeminabs_variable ()
03192 {
03193     unsigned int i;
03194     #if DEBUG
03195     fprintf (stderr, "window_rangeminabs_variable: start\n");
03196     #endif

```

```

03197 i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03198 input->rangeminabs[i] = gtk_spin_button_get_value (window->
    spin_minabs);
03199 #if DEBUG
03200 fprintf (stderr, "window_rangeminabs_variable: end\n");
03201 #endif
03202 }
03203
03208 void
03209 window_rangemaxabs_variable ()
03210 {
03211     unsigned int i;
03212     #if DEBUG
03213     fprintf (stderr, "window_rangemaxabs_variable: start\n");
03214     #endif
03215     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03216     input->rangemaxabs[i] = gtk_spin_button_get_value (window->
        spin_maxabs);
03217     #if DEBUG
03218     fprintf (stderr, "window_rangemaxabs_variable: end\n");
03219     #endif
03220 }
03221
03226 void
03227 window_update_variable ()
03228 {
03229     int i;
03230     #if DEBUG
03231     fprintf (stderr, "window_update_variable: start\n");
03232     #endif
03233     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03234     if (i < 0)
03235         i = 0;
03236     switch (window_get_algorithm ())
03237     {
03238     case ALGORITHM_SWEEP:
03239         input->nsweeps[i]
03240         = gtk_spin_button_get_value_as_int (window->spin_sweeps);
03241     #if DEBUG
03242         fprintf (stderr, "window_update_variable: nsweeps[%d]=%u\n", i,
03243             input->nsweeps[i]);
03244     #endif
03245         break;
03246     case ALGORITHM_GENETIC:
03247         input->nbits[i] = gtk_spin_button_get_value_as_int (window->spin_bits);
03248     #if DEBUG
03249         fprintf (stderr, "window_update_variable: nbits[%d]=%u\n", i,
03250             input->nbits[i]);
03251     #endif
03252     }
03253     #if DEBUG
03254     fprintf (stderr, "window_update_variable: end\n");
03255     #endif
03256 }
03257
03265 int
03266 window_read (char *filename)
03267 {
03268     unsigned int i;
03269     char *buffer;
03270     #if DEBUG
03271     fprintf (stderr, "window_read: start\n");
03272     #endif
03273
03274     // Reading new input file
03275     input_free ();
03276     if (!input_open (filename))
03277         return 0;
03278
03279     // Setting GTK+ widgets data
03280     buffer = g_build_filename (input->directory, input->simulator, NULL);
03281     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
        (window->button_simulator), buffer);
03282     g_free (buffer);
03283     gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
        (size_t) input->evaluator);
03284
03285     if (input->evaluator)
03286     {
03287         buffer = g_build_filename (input->directory, input->evaluator, NULL);
03288         gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
            (window->button_evaluator), buffer);
03289         g_free (buffer);
03290     }
03291     gtk_toggle_button_set_active
03292     (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
        algorithm]), TRUE);
03293     switch (input->algorithm)

```

```

03296     {
03297         case ALGORITHM_MONTE_CARLO:
03298             gtk_spin_button_set_value (window->spin_simulations,
03299                                     (gdouble) input->nsimulations);
03300         case ALGORITHM_SWEEP:
03301             gtk_spin_button_set_value (window->spin_iterations,
03302                                     (gdouble) input->niterations);
03303             gtk_spin_button_set_value (window->spin_bests, (gdouble) input->
03304 nbest);
03305             gtk_spin_button_set_value (window->spin_tolerance, input->
03306 tolerance);
03307             break;
03308         default:
03309             gtk_spin_button_set_value (window->spin_population,
03310                                     (gdouble) input->nsimulations);
03311             gtk_spin_button_set_value (window->spin_generations,
03312                                     (gdouble) input->niterations);
03313             gtk_spin_button_set_value (window->spin_mutation, input->
03314 mutation_ratio);
03315             gtk_spin_button_set_value (window->spin_reproduction,
03316                                     input->reproduction_ratio);
03317             gtk_spin_button_set_value (window->spin_adaptation,
03318                                     input->adaptation_ratio);
03319     }
03320     g_signal_handler_block (window->combo_experiment, window->
03321 id_experiment);
03322     g_signal_handler_block (window->button_experiment,
03323                             window->id_experiment_name);
03324     gtk_combo_box_text_remove_all (window->combo_experiment);
03325     for (i = 0; i < input->nexperiments; ++i)
03326         gtk_combo_box_text_append_text (window->combo_experiment,
03327                                         input->experiment[i]);
03328     g_signal_handler_unblock
03329         (window->button_experiment, window->id_experiment_name);
03330     g_signal_handler_unblock (window->combo_experiment, window->
03331 id_experiment);
03332     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
03333     g_signal_handler_block (window->combo_variable, window->
03334 id_variable);
03335     g_signal_handler_block (window->entry_variable, window->
03336 id_variable_label);
03337     gtk_combo_box_text_remove_all (window->combo_variable);
03338     for (i = 0; i < input->nvariables; ++i)
03339         gtk_combo_box_text_append_text (window->combo_variable, input->
03340 label[i]);
03341     g_signal_handler_unblock (window->entry_variable, window->
03342 id_variable_label);
03343     g_signal_handler_unblock (window->combo_variable, window->
03344 id_variable);
03345     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
03346     window_set_variable ();
03347     window_update ();
03348 }
03349 #if DEBUG
03350 fprintf (stderr, "window_read: end\n");
03351 #endif
03352 return 1;
03353 }
03354 void
03355 window_open ()
03356 {
03357     char *buffer, *directory, *name;
03358     GtkFileChooserDialog *dlg;
03359 #if DEBUG
03360     fprintf (stderr, "window_open: start\n");
03361 #endif
03362     // Saving a backup of the current input file
03363     directory = g_strdup (input->directory);
03364     name = g_strdup (input->name);
03365     // Opening dialog
03366     dlg = (GtkFileChooserDialog *)
03367         gtk_file_chooser_dialog_new (gettext ("Open input file"),
03368                                     window->window,
03369                                     GTK_FILE_CHOOSER_ACTION_OPEN,
03370                                     gettext ("Cancel"), GTK_RESPONSE_CANCEL,
03371                                     gettext ("OK"), GTK_RESPONSE_OK, NULL);
03372     while (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
03373     {
03374         // Trying to open the input file
03375         buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
03376         if (!window_read (buffer))
03377             {

```

```

03377 #if DEBUG
03378     fprintf (stderr, "window_open: error reading input file\n");
03379 #endif
03380
03381     // Reading backup file on error
03382     buffer = g_build_filename (directory, name, NULL);
03383     if (!input_open (buffer))
03384     {
03385
03386         // Closing on backup file reading error
03387         #if DEBUG
03388             fprintf (stderr, "window_read: error reading backup file\n");
03389         #endif
03390         g_free (buffer);
03391         g_free (name);
03392         g_free (directory);
03393         #if DEBUG
03394             fprintf (stderr, "window_open: end\n");
03395         #endif
03396         gtk_main_quit ();
03397     }
03398     g_free (buffer);
03399 }
03400 else
03401     break;
03402 }
03403
03404 // Freeing and closing
03405 g_free (name);
03406 g_free (directory);
03407 gtk_widget_destroy (GTK_WIDGET (dlg));
03408 #if DEBUG
03409     fprintf (stderr, "window_open: end\n");
03410 #endif
03411 }
03412
03417 void
03418 window_new ()
03419 {
03420     unsigned int i;
03421     char *buffer, *buffer2, buffer3[64];
03422     GtkViewport *viewport;
03423     char *label_algorithm[NALGORITHMS] = {
03424         "_Monte-Carlo", gettext ("_Sweep"), gettext ("_Genetic")
03425     };
03426
03427     // Creating the window
03428     window->window = (GtkWindow *) gtk_window_new (GTK_WINDOW_TOPLEVEL);
03429
03430     // Finish when closing the window
03431     g_signal_connect (window->window, "delete-event", gtk_main_quit, NULL);
03432
03433     // Setting the window title
03434     gtk_window_set_title (window->window, PROGRAM_INTERFACE);
03435
03436     // Creating the open button
03437     window->button_open = (GtkToolButton *) gtk_tool_button_new
03438         (gtk_image_new_from_icon_name ("document-open",
03439             GTK_ICON_SIZE_LARGE_TOOLBAR),
03440         gettext ("Open"));
03441     g_signal_connect (window->button_open, "clicked", window_open, NULL);
03442
03443     // Creating the save button
03444     window->button_save = (GtkToolButton *) gtk_tool_button_new
03445         (gtk_image_new_from_icon_name ("document-save",
03446             GTK_ICON_SIZE_LARGE_TOOLBAR),
03447         gettext ("Save"));
03448     g_signal_connect (window->button_save, "clicked", (void (*)(void))
03449         window_save,
03450         NULL);
03451
03452     // Creating the run button
03453     window->button_run = (GtkToolButton *) gtk_tool_button_new
03454         (gtk_image_new_from_icon_name ("system-run",
03455             GTK_ICON_SIZE_LARGE_TOOLBAR),
03456         gettext ("Run"));
03457     g_signal_connect (window->button_run, "clicked", window_run, NULL);
03458
03459     // Creating the options button
03460     window->button_options = (GtkToolButton *) gtk_tool_button_new
03461         (gtk_image_new_from_icon_name ("preferences-system",
03462             GTK_ICON_SIZE_LARGE_TOOLBAR),
03463         gettext ("Options"));
03464     g_signal_connect (window->button_options, "clicked", options_new, NULL);
03465
03466     // Creating the help button
03467     window->button_help = (GtkToolButton *) gtk_tool_button_new

```



```

03467     (gtk_image_new_from_icon_name ("help-browser",
03468                                   GTK_ICON_SIZE_LARGE_TOOLBAR),
03469     gettext ("Help"));
03470 g_signal_connect (window->button_help, "clicked", window_help, NULL);
03471
03472 // Creating the about button
03473 window->button_about = (GtkToolButton *) gtk_tool_button_new
03474     (gtk_image_new_from_icon_name ("help-about",
03475                                   GTK_ICON_SIZE_LARGE_TOOLBAR),
03476     gettext ("About"));
03477 g_signal_connect (window->button_about, "clicked", window_about, NULL);
03478
03479 // Creating the exit button
03480 window->button_exit = (GtkToolButton *) gtk_tool_button_new
03481     (gtk_image_new_from_icon_name ("application-exit",
03482                                   GTK_ICON_SIZE_LARGE_TOOLBAR),
03483     gettext ("Exit"));
03484 g_signal_connect (window->button_exit, "clicked", gtk_main_quit, NULL);
03485
03486 // Creating the buttons bar
03487 window->bar_buttons = (GtkToolbar *) gtk_toolbar_new ();
03488 gtk_toolbar_insert
03489     (window->bar_buttons, GTK_TOOL_ITEM (window->button_open), 0);
03490 gtk_toolbar_insert
03491     (window->bar_buttons, GTK_TOOL_ITEM (window->button_save), 1);
03492 gtk_toolbar_insert
03493     (window->bar_buttons, GTK_TOOL_ITEM (window->button_run), 2);
03494 gtk_toolbar_insert
03495     (window->bar_buttons, GTK_TOOL_ITEM (window->button_options), 3);
03496 gtk_toolbar_insert
03497     (window->bar_buttons, GTK_TOOL_ITEM (window->button_help), 4);
03498 gtk_toolbar_insert
03499     (window->bar_buttons, GTK_TOOL_ITEM (window->button_about), 5);
03500 gtk_toolbar_insert
03501     (window->bar_buttons, GTK_TOOL_ITEM (window->button_exit), 6);
03502 gtk_toolbar_set_style (window->bar_buttons, GTK_TOOLBAR_BOTH);
03503
03504 // Creating the simulator program label and entry
03505 window->label_simulator
03506     = (GtkLabel *) gtk_label_new (gettext ("Simulator program"));
03507 window->button_simulator = (GtkFileChooserButton *)
03508     gtk_file_chooser_button_new (gettext ("Simulator program"),
03509     GTK_FILE_CHOOSER_ACTION_OPEN);
03510 gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_simulator),
03511     gettext ("Simulator program executable file"));
03512
03513 // Creating the evaluator program label and entry
03514 window->check_evaluator = (GtkCheckButton *)
03515     gtk_check_button_new_with_mnemonic (gettext ("Evaluator program"));
03516 g_signal_connect (window->check_evaluator, "toggled",
03517 window_update, NULL);
03518 window->button_evaluator = (GtkFileChooserButton *)
03519     gtk_file_chooser_button_new (gettext ("Evaluator program"),
03520     GTK_FILE_CHOOSER_ACTION_OPEN);
03521 gtk_widget_set_tooltip_text
03522     (GTK_WIDGET (window->button_evaluator),
03523     gettext ("Optional evaluator program executable file"));
03524
03525 // Creating the algorithm properties
03526 window->label_simulations = (GtkLabel *) gtk_label_new
03527     (gettext ("Simulations number"));
03528 window->spin_simulations
03529     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
03530 window->label_iterations = (GtkLabel *)
03531     gtk_label_new (gettext ("Iterations number"));
03532 window->spin_iterations
03533     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
03534 g_signal_connect
03535     (window->spin_iterations, "value-changed", window_update, NULL);
03536 window->label_tolerance = (GtkLabel *) gtk_label_new (gettext ("Tolerance"));
03537 window->spin_tolerance
03538     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
03539 window->label_bests = (GtkLabel *) gtk_label_new (gettext ("Bests number"));
03540 window->spin_bests
03541     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
03542 window->label_population
03543     = (GtkLabel *) gtk_label_new (gettext ("Population number"));
03544 window->spin_population
03545     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
03546 window->label_generations
03547     = (GtkLabel *) gtk_label_new (gettext ("Generations number"));
03548 window->spin_generations
03549     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
03550 window->label_mutation
03551     = (GtkLabel *) gtk_label_new (gettext ("Mutation ratio"));
03552 window->spin_mutation
03553     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);

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```

03553 window->label_reproduction
03554     = (GtkLabel *) gtk_label_new (gettext ("Reproduction ratio"));
03555 window->spin_reproduction
03556     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
03557 window->label_adaptation
03558     = (GtkLabel *) gtk_label_new (gettext ("Adaptation ratio"));
03559 window->spin_adaptation
03560     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
03561
03562 // Creating the array of algorithms
03563 window->grid_algorithm = (GtkGrid *) gtk_grid_new ();
03564 window->button_algorithm[0] = (GtkRadioButton *)
03565     gtk_radio_button_new_with_mnemonic (NULL, label_algorithm[0]);
03566 gtk_grid_attach (window->grid_algorithm,
03567     GTK_WIDGET (window->button_algorithm[0]), 0, 0, 1, 1);
03568 g_signal_connect (window->button_algorithm[0], "clicked",
03569     window_set_algorithm, NULL);
03570 for (i = 0; ++i < NALGORITHMS;)
03571 {
03572     window->button_algorithm[i] = (GtkRadioButton *)
03573     gtk_radio_button_new_with_mnemonic
03574     (gtk_radio_button_get_group (window->button_algorithm[0]),
03575     label_algorithm[i]);
03576     gtk_grid_attach (window->grid_algorithm,
03577     GTK_WIDGET (window->button_algorithm[i]), 0, i, 1, 1);
03578     g_signal_connect (window->button_algorithm[i], "clicked",
03579     window_set_algorithm, NULL);
03580 }
03581 gtk_grid_attach (window->grid_algorithm,
03582     GTK_WIDGET (window->label_simulations), 0,
03583     NALGORITHMS, 1, 1);
03584 gtk_grid_attach (window->grid_algorithm,
03585     GTK_WIDGET (window->spin_simulations), 1, NALGORITHMS, 1, 1);
03586 gtk_grid_attach (window->grid_algorithm,
03587     GTK_WIDGET (window->label_iterations), 0,
03588     NALGORITHMS + 1, 1, 1);
03589 gtk_grid_attach (window->grid_algorithm,
03590     GTK_WIDGET (window->spin_iterations), 1,
03591     NALGORITHMS + 1, 1, 1);
03592 gtk_grid_attach (window->grid_algorithm,
03593     GTK_WIDGET (window->label_tolerance), 0,
03594     NALGORITHMS + 2, 1, 1);
03595 gtk_grid_attach (window->grid_algorithm,
03596     GTK_WIDGET (window->spin_tolerance), 1,
03597     NALGORITHMS + 2, 1, 1);
03598 gtk_grid_attach (window->grid_algorithm,
03599     GTK_WIDGET (window->label_bests), 0, NALGORITHMS + 3, 1, 1);
03600 gtk_grid_attach (window->grid_algorithm,
03601     GTK_WIDGET (window->spin_bests), 1, NALGORITHMS + 3, 1, 1);
03602 gtk_grid_attach (window->grid_algorithm,
03603     GTK_WIDGET (window->label_population), 0,
03604     NALGORITHMS + 4, 1, 1);
03605 gtk_grid_attach (window->grid_algorithm,
03606     GTK_WIDGET (window->spin_population), 1,
03607     NALGORITHMS + 4, 1, 1);
03608 gtk_grid_attach (window->grid_algorithm,
03609     GTK_WIDGET (window->label_generations), 0,
03610     NALGORITHMS + 5, 1, 1);
03611 gtk_grid_attach (window->grid_algorithm,
03612     GTK_WIDGET (window->spin_generations), 1,
03613     NALGORITHMS + 5, 1, 1);
03614 gtk_grid_attach (window->grid_algorithm,
03615     GTK_WIDGET (window->label_mutation), 0,
03616     NALGORITHMS + 6, 1, 1);
03617 gtk_grid_attach (window->grid_algorithm,
03618     GTK_WIDGET (window->spin_mutation), 1,
03619     NALGORITHMS + 6, 1, 1);
03620 gtk_grid_attach (window->grid_algorithm,
03621     GTK_WIDGET (window->label_reproduction), 0,
03622     NALGORITHMS + 7, 1, 1);
03623 gtk_grid_attach (window->grid_algorithm,
03624     GTK_WIDGET (window->spin_reproduction), 1,
03625     NALGORITHMS + 7, 1, 1);
03626 gtk_grid_attach (window->grid_algorithm,
03627     GTK_WIDGET (window->label_adaptation), 0,
03628     NALGORITHMS + 8, 1, 1);
03629 gtk_grid_attach (window->grid_algorithm,
03630     GTK_WIDGET (window->spin_adaptation), 1,
03631     NALGORITHMS + 8, 1, 1);
03632 window->frame_algorithm = (GtkFrame *) gtk_frame_new (gettext ("Algorithm"));
03633 gtk_container_add (GTK_CONTAINER (window->frame_algorithm),
03634     GTK_WIDGET (window->grid_algorithm));
03635
03636 // Creating the variable widgets
03637 window->combo_variable = (GtkComboBoxText *) gtk_combo_box_text_new ();
03638 gtk_widget_set_tooltip_text (GTK_WIDGET (window->combo_variable),
03639     gettext ("Variables selector"));

```

```

03640 window->id_variable = g_signal_connect
03641 (window->combo_variable, "changed", window_set_variable, NULL);
03642 window->button_add_variable
03643 = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
03644 GTK_ICON_SIZE_BUTTON);
03645 g_signal_connect
03646 (window->button_add_variable, "clicked",
window_add_variable, NULL);
03647 gtk_widget_set_tooltip_text (GTK_WIDGET
03648 (window->button_add_variable),
03649 gettext ("Add variable"));
03650 window->button_remove_variable
03651 = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
03652 GTK_ICON_SIZE_BUTTON);
03653 g_signal_connect
03654 (window->button_remove_variable, "clicked",
window_remove_variable, NULL);
03655 gtk_widget_set_tooltip_text (GTK_WIDGET
03656 (window->button_remove_variable),
03657 gettext ("Remove variable"));
03658 window->label_variable = (GtkLabel *) gtk_label_new (gettext ("Name"));
03659 window->entry_variable = (GtkEntry *) gtk_entry_new ();
03660 window->id_variable_label = g_signal_connect
03661 (window->entry_variable, "changed", window_label_variable, NULL);
03662 window->label_min = (GtkLabel *) gtk_label_new (gettext ("Minimum"));
03663 window->spin_min = (GtkSpinButton *) gtk_spin_button_new_with_range
03664 (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
03665 viewport = (GtkViewport *) gtk_viewport_new (NULL, NULL);
03666 gtk_container_add (GTK_CONTAINER (viewport), GTK_WIDGET (window->spin_min));
03667 window->scrolled_min
03668 = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
03669 gtk_container_add (GTK_CONTAINER (window->scrolled_min),
03670 GTK_WIDGET (viewport));
03671 g_signal_connect (window->spin_min, "value-changed",
03672 window_rangemin_variable, NULL);
03673 window->label_max = (GtkLabel *) gtk_label_new (gettext ("Maximum"));
03674 window->spin_max = (GtkSpinButton *) gtk_spin_button_new_with_range
03675 (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
03676 viewport = (GtkViewport *) gtk_viewport_new (NULL, NULL);
03677 gtk_container_add (GTK_CONTAINER (viewport), GTK_WIDGET (window->spin_max));
03678 window->scrolled_max
03679 = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
03680 gtk_container_add (GTK_CONTAINER (window->scrolled_max),
03681 GTK_WIDGET (viewport));
03682 g_signal_connect (window->spin_max, "value-changed",
03683 window_rangemax_variable, NULL);
03684 window->check_minabs = (GtkCheckButton *)
03685 gtk_check_button_new_with_mnemonic (gettext ("Absolute minimum"));
03686 g_signal_connect (window->check_minabs, "toggled", window_update, NULL);
03687 window->spin_minabs = (GtkSpinButton *) gtk_spin_button_new_with_range
03688 (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
03689 viewport = (GtkViewport *) gtk_viewport_new (NULL, NULL);
03690 gtk_container_add (GTK_CONTAINER (viewport),
03691 GTK_WIDGET (window->spin_minabs));
03692 window->scrolled_minabs
03693 = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
03694 gtk_container_add (GTK_CONTAINER (window->scrolled_minabs),
03695 GTK_WIDGET (viewport));
03696 g_signal_connect (window->spin_minabs, "value-changed",
03697 window_rangeminabs_variable, NULL);
03698 window->check_maxabs = (GtkCheckButton *)
03699 gtk_check_button_new_with_mnemonic (gettext ("Absolute maximum"));
03700 g_signal_connect (window->check_maxabs, "toggled", window_update, NULL);
03701 window->spin_maxabs = (GtkSpinButton *) gtk_spin_button_new_with_range
03702 (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
03703 viewport = (GtkViewport *) gtk_viewport_new (NULL, NULL);
03704 gtk_container_add (GTK_CONTAINER (viewport),
03705 GTK_WIDGET (window->spin_maxabs));
03706 window->scrolled_maxabs
03707 = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
03708 gtk_container_add (GTK_CONTAINER (window->scrolled_maxabs),
03709 GTK_WIDGET (viewport));
03710 g_signal_connect (window->spin_maxabs, "value-changed",
03711 window_rangemaxabs_variable, NULL);
03712 window->label_precision
03713 = (GtkLabel *) gtk_label_new (gettext ("Precision digits"));
03714 window->spin_precision = (GtkSpinButton *)
03715 gtk_spin_button_new_with_range (0., (gdouble) DEFAULT_PRECISION, 1.);
03716 g_signal_connect (window->spin_precision, "value-changed",
03717 window_precision_variable, NULL);
03718 window->label_sweeps = (GtkLabel *) gtk_label_new (gettext ("Sweeps number"));
03719 window->spin_sweeps
03720 = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
03721 g_signal_connect
03722 (window->spin_sweeps, "value-changed", window_update_variable, NULL);
03723 window->label_bits = (GtkLabel *) gtk_label_new (gettext ("Bits number"));
03724 window->spin_bits

```

```

03725     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
03726 g_signal_connect
03727     (window->spin_bits, "value-changed", window_update_variable, NULL);
03728 window->grid_variable = (GtkGrid *) gtk_grid_new ();
03729 gtk_grid_attach (window->grid_variable,
03730     GTK_WIDGET (window->combo_variable), 0, 0, 2, 1);
03731 gtk_grid_attach (window->grid_variable,
03732     GTK_WIDGET (window->button_add_variable), 2, 0, 1, 1);
03733 gtk_grid_attach (window->grid_variable,
03734     GTK_WIDGET (window->button_remove_variable), 3, 0, 1, 1);
03735 gtk_grid_attach (window->grid_variable,
03736     GTK_WIDGET (window->label_variable), 0, 1, 1, 1);
03737 gtk_grid_attach (window->grid_variable,
03738     GTK_WIDGET (window->entry_variable), 1, 1, 3, 1);
03739 gtk_grid_attach (window->grid_variable,
03740     GTK_WIDGET (window->label_min), 0, 2, 1, 1);
03741 gtk_grid_attach (window->grid_variable,
03742     GTK_WIDGET (window->scrolled_min), 1, 2, 3, 1);
03743 gtk_grid_attach (window->grid_variable,
03744     GTK_WIDGET (window->label_max), 0, 3, 1, 1);
03745 gtk_grid_attach (window->grid_variable,
03746     GTK_WIDGET (window->scrolled_max), 1, 3, 3, 1);
03747 gtk_grid_attach (window->grid_variable,
03748     GTK_WIDGET (window->check_minabs), 0, 4, 1, 1);
03749 gtk_grid_attach (window->grid_variable,
03750     GTK_WIDGET (window->scrolled_minabs), 1, 4, 3, 1);
03751 gtk_grid_attach (window->grid_variable,
03752     GTK_WIDGET (window->check_maxabs), 0, 5, 1, 1);
03753 gtk_grid_attach (window->grid_variable,
03754     GTK_WIDGET (window->scrolled_maxabs), 1, 5, 3, 1);
03755 gtk_grid_attach (window->grid_variable,
03756     GTK_WIDGET (window->label_precision), 0, 6, 1, 1);
03757 gtk_grid_attach (window->grid_variable,
03758     GTK_WIDGET (window->spin_precision), 1, 6, 3, 1);
03759 gtk_grid_attach (window->grid_variable,
03760     GTK_WIDGET (window->label_sweeps), 0, 7, 1, 1);
03761 gtk_grid_attach (window->grid_variable,
03762     GTK_WIDGET (window->spin_sweeps), 1, 7, 3, 1);
03763 gtk_grid_attach (window->grid_variable,
03764     GTK_WIDGET (window->label_bits), 0, 8, 1, 1);
03765 gtk_grid_attach (window->grid_variable,
03766     GTK_WIDGET (window->spin_bits), 1, 8, 3, 1);
03767 window->frame_variable = (GtkFrame *) gtk_frame_new (gettext ("Variable"));
03768 gtk_container_add (GTK_CONTAINER (window->frame_variable),
03769     GTK_WIDGET (window->grid_variable));
03770
03771 // Creating the experiment widgets
03772 window->combo_experiment = (GtkComboBoxText *) gtk_combo_box_text_new ();
03773 gtk_widget_set_tooltip_text (GTK_WIDGET (window->combo_experiment),
03774     gettext ("Experiment selector"));
03775 window->id_experiment = g_signal_connect
03776     (window->combo_experiment, "changed", window_set_experiment, NULL);
03777
03778 window->button_add_experiment
03779     = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
03780     GTK_ICON_SIZE_BUTTON);
03781 g_signal_connect
03782     (window->button_add_experiment, "clicked",
03783     window_add_experiment, NULL);
03784 gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_experiment),
03785     gettext ("Add experiment"));
03786 window->button_remove_experiment
03787     = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
03788     GTK_ICON_SIZE_BUTTON);
03789 g_signal_connect (window->button_remove_experiment, "clicked",
03790     window_remove_experiment, NULL);
03791 gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_remove_experiment),
03792     gettext ("Remove experiment"));
03793 window->label_experiment
03794     = (GtkLabel *) gtk_label_new (gettext ("Experimental data file"));
03795 window->button_experiment = (GtkFileChooserButton *)
03796     gtk_file_chooser_button_new (gettext ("Experimental data file"),
03797     GTK_FILE_CHOOSER_ACTION_OPEN);
03798 gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_experiment),
03799     gettext ("Experimental data file"));
03800 window->id_experiment_name
03801     = g_signal_connect (window->button_experiment, "selection-changed",
03802     window_name_experiment, NULL);
03803 window->label_weight = (GtkLabel *) gtk_label_new (gettext ("Weight"));
03804 window->spin_weight
03805     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
03806 gtk_widget_set_tooltip_text
03807     (GTK_WIDGET (window->spin_weight),
03808     gettext ("Weight factor to build the objective function"));
03809 g_signal_connect
03810     (window->spin_weight, "value-changed", window_weight_experiment,
03811     NULL);

```

```

03809 window->grid_experiment = (GtkGrid *) gtk_grid_new ();
03810 gtk_grid_attach (window->grid_experiment,
03811                 GTK_WIDGET (window->combo_experiment), 0, 0, 2, 1);
03812 gtk_grid_attach (window->grid_experiment,
03813                 GTK_WIDGET (window->button_add_experiment), 2, 0, 1, 1);
03814 gtk_grid_attach (window->grid_experiment,
03815                 GTK_WIDGET (window->button_remove_experiment), 3, 0, 1, 1);
03816 gtk_grid_attach (window->grid_experiment,
03817                 GTK_WIDGET (window->label_experiment), 0, 1, 1, 1);
03818 gtk_grid_attach (window->grid_experiment,
03819                 GTK_WIDGET (window->button_experiment), 1, 1, 3, 1);
03820 gtk_grid_attach (window->grid_experiment,
03821                 GTK_WIDGET (window->label_weight), 0, 2, 1, 1);
03822 gtk_grid_attach (window->grid_experiment,
03823                 GTK_WIDGET (window->spin_weight), 1, 2, 3, 1);
03824 for (i = 0; i < MAX_NINPITS; ++i)
03825 {
03826     snprintf (buffer3, 64, "%s %u", gettext ("Input template"), i + 1);
03827     window->check_template[i] = (GtkCheckButton *)
03828     gtk_check_button_new_with_label (buffer3);
03829     window->id_template[i]
03830     = g_signal_connect (window->check_template[i], "toggled",
03831                         window_inputs_experiment, NULL);
03832     gtk_grid_attach (window->grid_experiment,
03833                     GTK_WIDGET (window->check_template[i]), 0, 3 + i, 1, 1);
03834     window->button_template[i] = (GtkFileChooserButton *)
03835     gtk_file_chooser_button_new (gettext ("Input template"),
03836                                 GTK_FILE_CHOOSER_ACTION_OPEN);
03837     gtk_widget_set_tooltip_text
03838     (GTK_WIDGET (window->button_template[i]),
03839      gettext ("Experimental input template file"));
03840     window->id_input[i]
03841     = g_signal_connect_swapped (window->button_template[i],
03842                                "selection-changed",
03843                                (void (*)(void *)) window_template_experiment,
03844                                (void *) (size_t) i);
03845     gtk_grid_attach (window->grid_experiment,
03846                     GTK_WIDGET (window->button_template[i]), 1, 3 + i, 3, 1);
03847 }
03848 window->frame_experiment
03849 = (GtkFrame *) gtk_frame_new (gettext ("Experiment"));
03850 gtk_container_add (GTK_CONTAINER (window->frame_experiment),
03851                   GTK_WIDGET (window->grid_experiment));
03852
03853 // Creating the grid and attaching the widgets to the grid
03854 window->grid = (GtkGrid *) gtk_grid_new ();
03855 gtk_grid_attach (window->grid, GTK_WIDGET (window->bar_buttons), 0, 0, 6, 1);
03856 gtk_grid_attach (window->grid,
03857                 GTK_WIDGET (window->label_simulator), 0, 1, 1, 1);
03858 gtk_grid_attach (window->grid,
03859                 GTK_WIDGET (window->button_simulator), 1, 1, 1, 1);
03860 gtk_grid_attach (window->grid,
03861                 GTK_WIDGET (window->check_evaluator), 2, 1, 1, 1);
03862 gtk_grid_attach (window->grid,
03863                 GTK_WIDGET (window->button_evaluator), 3, 1, 1, 1);
03864 gtk_grid_attach (window->grid,
03865                 GTK_WIDGET (window->frame_algorithm), 0, 2, 2, 1);
03866 gtk_grid_attach (window->grid,
03867                 GTK_WIDGET (window->frame_variable), 2, 2, 2, 1);
03868 gtk_grid_attach (window->grid,
03869                 GTK_WIDGET (window->frame_experiment), 4, 2, 2, 1);
03870 gtk_container_add (GTK_CONTAINER (window->window), GTK_WIDGET (window->
grid));
03871
03872 // Setting the window logo
03873 window->logo = gdk_pixbuf_new_from_xpm_data (logo);
03874 gtk_window_set_icon (window->window, window->logo);
03875
03876 // Showing the window
03877 gtk_widget_show_all (GTK_WIDGET (window->window));
03878
03879 // In Windows the default scrolled size is wrong
03880 #ifdef G_OS_WIN32
03881     gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_min), -1, 40);
03882     gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_max), -1, 40);
03883     gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_minabs), -1, 40);
03884     gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_maxabs), -1, 40);
03885 #endif
03886
03887 // Reading initial example
03888 input_new ();
03889 buffer2 = g_get_current_dir ();
03890 buffer = g_build_filename (buffer2, "..", "tests", "test1", INPUT_FILE, NULL);
03891 g_free (buffer2);
03892 window_read (buffer);
03893 g_free (buffer);
03894 }

```

```

03895
03896 #endif
03897
03903 int
03904 cores_number ()
03905 {
03906 #ifdef G_OS_WIN32
03907     SYSTEM_INFO sysinfo;
03908     GetSystemInfo (&sysinfo);
03909     return sysinfo.dwNumberOfProcessors;
03910 #else
03911     return (int) sysconf (_SC_NPROCESSORS_ONLN);
03912 #endif
03913 }
03914
03924 int
03925 main (int argn, char **argc)
03926 {
03927     // Starting pseudo-random numbers generator
03928     calibrate->rng = gsl_rng_alloc (gsl_rng_taus2);
03929     calibrate->seed = DEFAULT_RANDOM_SEED;
03930
03931     // Allowing spaces in the XML data file
03932     xmlKeepBlanksDefault (0);
03933
03934     // Starting MPI
03935     #if HAVE_MPI
03936     MPI_Init (&argn, &argc);
03937     MPI_Comm_size (MPI_COMM_WORLD, &ntasks);
03938     MPI_Comm_rank (MPI_COMM_WORLD, &calibrate->mpi_rank);
03939     printf ("rank=%d tasks=%d\n", calibrate->mpi_rank, ntasks);
03940     #else
03941     ntasks = 1;
03942     #endif
03943
03944     #if HAVE_GTK
03945
03946     // Getting threads number
03947     nthreads = cores_number ();
03948
03949     // Setting local language and international floating point numbers notation
03950     setlocale (LC_ALL, "");
03951     setlocale (LC_NUMERIC, "C");
03952     window->application_directory = g_get_current_dir ();
03953     bindtextdomain (PROGRAM_INTERFACE,
03954                     g_build_filename (window->application_directory,
03955                                     LOCALE_DIR, NULL));
03956     bind_textdomain_codeset (PROGRAM_INTERFACE, "UTF-8");
03957     textdomain (PROGRAM_INTERFACE);
03958
03959     // Initing GTK+
03960     gtk_disable_setlocale ();
03961     gtk_init (&argn, &argc);
03962
03963     // Opening the main window
03964     window_new ();
03965     gtk_main ();
03966
03967     // Freeing memory
03968     gtk_widget_destroy (GTK_WIDGET (window->window));
03969     g_free (window->application_directory);
03970
03971     #else
03972
03973     // Checking syntax
03974     if (!(argn == 2 || (argn == 4 && !strcmp (argc[1], "-nthreads"))))
03975     {
03976         printf ("The syntax is:\ncalibratorbin [-nthreads x] data_file\n");
03977         return 1;
03978     }
03979
03980     // Getting threads number
03981     if (argn == 2)
03982         nthreads = cores_number ();
03983     else
03984         nthreads = atoi (argc[2]);
03985     printf ("nthreads=%u\n", nthreads);
03986
03987     // Making calibration
03988     input_new ();
03989     if (input_open (argc[argn - 1]))
03990         calibrate_new ();
03991
03992     // Freeing memory
03993     calibrate_free ();
03994
03995 #endif

```

```

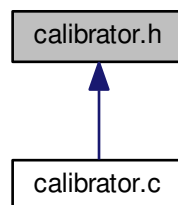
03996
03997 // Closing MPI
03998 #if HAVE_MPI
03999 MPI_Finalize ();
04000 #endif
04001
04002 // Freeing memory
04003 gsl_rng_free (calibrate->rng);
04004
04005 // Closing
04006 return 0;
04007 }

```

## 5.3 calibrator.h File Reference

Header file of the calibrator.

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.*

### 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.*

  - 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.*

  - 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\\_thread](#) (unsigned int simulation, double value)
- Function to save the best simulations of a thread.*

  - void [calibrate\\_best\\_sequential](#) (unsigned int simulation, double value)
- Function to save the best simulations.*

  - void \* [calibrate\\_thread](#) ([ParallelData](#) \*data)
- Function to calibrate on a thread.*

  - void [calibrate\\_sequential](#) ()
- Function to calibrate sequentially.*

  - 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.*

  - 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\\_iterate](#) ()  
*Function to iterate the algorithm.*
- void [calibrate\\_new](#) ()  
*Function to open and perform a calibration.*

### 5.3.1 Detailed Description

Header file of the calibrator.

#### Authors

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#### Copyright

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

### 5.3.2 Enumeration Type Documentation

#### 5.3.2.1 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 [calibrator.h](#).

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

### 5.3.3 Function Documentation

#### 5.3.3.1 void calibrate\_best\_sequential ( 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 1330 of file [calibrator.c](#).

```
01331 {
01332     unsigned int i, j;
01333     double e;
01334     #if DEBUG
01335     fprintf (stderr, "calibrate_best_sequential: start\n");
01336     #endif
01337     if (calibrate->nsaveds < calibrate->nbest
```

```

01338     || value < calibrate->error_best[calibrate->nsaveds - 1])
01339     {
01340         if (calibrate->nsaveds < calibrate->nbest)
01341             ++calibrate->nsaveds;
01342         calibrate->error_best[calibrate->nsaveds - 1] = value;
01343         calibrate->simulation_best[calibrate->
nsaveds - 1] = simulation;
01344         for (i = calibrate->nsaveds; --i;)
01345         {
01346             if (calibrate->error_best[i] < calibrate->
error_best[i - 1])
01347             {
01348                 j = calibrate->simulation_best[i];
01349                 e = calibrate->error_best[i];
01350                 calibrate->simulation_best[i] = calibrate->
simulation_best[i - 1];
01351                 calibrate->error_best[i] = calibrate->
error_best[i - 1];
01352                 calibrate->simulation_best[i - 1] = j;
01353                 calibrate->error_best[i - 1] = e;
01354             }
01355             else
01356                 break;
01357         }
01358     }
01359     #if DEBUG
01360     fprintf (stderr, "calibrate_best_sequential: end\n");
01361     #endif
01362 }

```

### 5.3.3.2 void calibrate\_best\_thread ( unsigned int *simulation*, double *value* )

Function to save the best simulations of a thread.

#### Parameters

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

Definition at line 1285 of file [calibrator.c](#).

```

01286 {
01287     unsigned int i, j;
01288     double e;
01289     #if DEBUG
01290     fprintf (stderr, "calibrate_best_thread: start\n");
01291     #endif
01292     if (calibrate->nsaveds < calibrate->nbest
01293         || value < calibrate->error_best[calibrate->nsaveds - 1])
01294     {
01295         g_mutex_lock (mutex);
01296         if (calibrate->nsaveds < calibrate->nbest)
01297             ++calibrate->nsaveds;
01298         calibrate->error_best[calibrate->nsaveds - 1] = value;
01299         calibrate->simulation_best[calibrate->
nsaveds - 1] = simulation;
01300         for (i = calibrate->nsaveds; --i;)
01301         {
01302             if (calibrate->error_best[i] < calibrate->
error_best[i - 1])
01303             {
01304                 j = calibrate->simulation_best[i];
01305                 e = calibrate->error_best[i];
01306                 calibrate->simulation_best[i] = calibrate->
simulation_best[i - 1];
01307                 calibrate->error_best[i] = calibrate->
error_best[i - 1];
01308                 calibrate->simulation_best[i - 1] = j;
01309                 calibrate->error_best[i - 1] = e;
01310             }
01311             else
01312                 break;
01313         }
01314         g_mutex_unlock (mutex);
01315     }
01316     #if DEBUG
01317     fprintf (stderr, "calibrate_best_thread: end\n");
01318     #endif
01319 }

```

5.3.3.3 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.

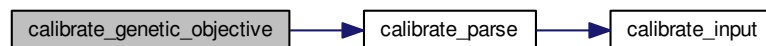
Definition at line 1639 of file [calibrator.c](#).

```

01640 {
01641     unsigned int j;
01642     double objective;
01643     char buffer[64];
01644     #if DEBUG
01645     fprintf (stderr, "calibrate_genetic_objective: start\n");
01646     #endif
01647     for (j = 0; j < calibrate->nvariables; ++j)
01648     {
01649         calibrate->value[entity->id * calibrate->nvariables + j]
01650             = genetic_get_variable (entity, calibrate->genetic_variable + j);
01651     }
01652     for (j = 0, objective = 0.; j < calibrate->nexperiments; ++j)
01653         objective += calibrate_parse (entity->id, j);
01654     g_mutex_lock (mutex);
01655     for (j = 0; j < calibrate->nvariables; ++j)
01656     {
01657         snprintf (buffer, 64, "%s ", format[calibrate->precision[j]]);
01658         fprintf (calibrate->file_variables, buffer,
01659             genetic_get_variable (entity, calibrate->
01660                 genetic_variable + j));
01661     }
01662     fprintf (calibrate->file_variables, "%.14le\n", objective);
01663     g_mutex_unlock (mutex);
01664     #if DEBUG
01665     fprintf (stderr, "calibrate_genetic_objective: end\n");
01666     #endif
01667     return objective;
01668 }

```

Here is the call graph for this function:



### 5.3.3.4 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>	<a href="#">Input</a> file name.
<i>template</i>	Template of the input file name.

Definition at line 1034 of file [calibrator.c](#).

```

01035 {
01036     unsigned int i;
01037     char buffer[32], value[32], *buffer2, *buffer3, *content;
01038     FILE *file;
01039     gsize length;
01040     GRegex *regex;
01041 }

```

```

01042 #if DEBUG
01043     fprintf (stderr, "calibrate_input: start\n");
01044 #endif
01045
01046     // Checking the file
01047     if (!template)
01048         goto calibrate_input_end;
01049
01050     // Opening template
01051     content = g_mapped_file_get_contents (template);
01052     length = g_mapped_file_get_length (template);
01053 #if DEBUG
01054     fprintf (stderr, "calibrate_input: length=%lu\ncontent:\n%s", length,
01055             content);
01056 #endif
01057     file = g_fopen (input, "w");
01058
01059     // Parsing template
01060     for (i = 0; i < calibrate->nvariables; ++i)
01061     {
01062 #if DEBUG
01063         fprintf (stderr, "calibrate_input: variable=%u\n", i);
01064 #endif
01065         snprintf (buffer, 32, "@variable%u@", i + 1);
01066         regex = g_regex_new (buffer, 0, 0, NULL);
01067         if (i == 0)
01068         {
01069             buffer2 = g_regex_replace_literal (regex, content, length, 0,
01070                                             calibrate->label[i], 0, NULL);
01071 #if DEBUG
01072             fprintf (stderr, "calibrate_input: buffer2\n%s", buffer2);
01073 #endif
01074         }
01075         else
01076         {
01077             length = strlen (buffer3);
01078             buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
01079                                             calibrate->label[i], 0, NULL);
01080             g_free (buffer3);
01081         }
01082         g_regex_unref (regex);
01083         length = strlen (buffer2);
01084         snprintf (buffer, 32, "@value%u@", i + 1);
01085         regex = g_regex_new (buffer, 0, 0, NULL);
01086         snprintf (value, 32, format[calibrate->precision[i]],
01087                 calibrate->value[simulation * calibrate->
nvariables + i]);
01088 #if DEBUG
01089         fprintf (stderr, "calibrate_input: value=%s\n", value);
01090 #endif
01091         buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
01092                                         0, NULL);
01093         g_free (buffer2);
01094         g_regex_unref (regex);
01095     }
01096
01097     // Saving input file
01098     fwrite (buffer3, strlen (buffer3), sizeof (char), file);
01099     g_free (buffer3);
01100     fclose (file);
01101
01102 calibrate_input_end:
01103 #if DEBUG
01104     fprintf (stderr, "calibrate_input: end\n");
01105 #endif
01106     return;
01107 }

```

### 5.3.3.5 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 1446 of file [calibrator.c](#).

```

01448 {
01449     unsigned int i, j, k, s[calibrate->nbest];
01450     double e[calibrate->nbest];
01451     #if DEBUG
01452     fprintf (stderr, "calibrate_merge: start\n");
01453     #endif
01454     i = j = k = 0;
01455     do
01456     {
01457         if (i == calibrate->nsaveds)
01458         {
01459             s[k] = simulation_best[j];
01460             e[k] = error_best[j];
01461             ++j;
01462             ++k;
01463             if (j == nsaveds)
01464                 break;
01465         }
01466         else if (j == nsaveds)
01467         {
01468             s[k] = calibrate->simulation_best[i];
01469             e[k] = calibrate->error_best[i];
01470             ++i;
01471             ++k;
01472             if (i == calibrate->nsaveds)
01473                 break;
01474         }
01475         else if (calibrate->error_best[i] > error_best[j])
01476         {
01477             s[k] = simulation_best[j];
01478             e[k] = error_best[j];
01479             ++j;
01480             ++k;
01481         }
01482         else
01483         {
01484             s[k] = calibrate->simulation_best[i];
01485             e[k] = calibrate->error_best[i];
01486             ++i;
01487             ++k;
01488         }
01489     }
01490     while (k < calibrate->nbest);
01491     calibrate->nsaveds = k;
01492     memcpy (calibrate->simulation_best, s, k * sizeof (unsigned int));
01493     memcpy (calibrate->error_best, e, k * sizeof (double));
01494     #if DEBUG
01495     fprintf (stderr, "calibrate_merge: end\n");
01496     #endif
01497 }

```

### 5.3.3.6 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 1121 of file [calibrator.c](#).

```

01122 {
01123     unsigned int i;
01124     double e;
01125     char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,

```

```

01126     *buffer3, *buffer4;
01127     FILE *file_result;
01128
01129 #if DEBUG
01130     fprintf (stderr, "calibrate_parse: start\n");
01131     fprintf (stderr, "calibrate_parse: simulation=%u experiment=%u\n", simulation,
01132             experiment);
01133 #endif
01134
01135     // Opening input files
01136     for (i = 0; i < calibrate->ninputs; ++i)
01137     {
01138         snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
01139 #if DEBUG
01140         fprintf (stderr, "calibrate_parse: i=%u input=%s\n", i, &input[i][0]);
01141 #endif
01142         calibrate_input (simulation, &input[i][0],
01143                         calibrate->file[i][experiment]);
01144     }
01145     for (; i < MAX_NINPUTS; ++i)
01146         strcpy (&input[i][0], "");
01147 #if DEBUG
01148     fprintf (stderr, "calibrate_parse: parsing end\n");
01149 #endif
01150
01151     // Performing the simulation
01152     snprintf (output, 32, "output-%u-%u", simulation, experiment);
01153     buffer2 = g_path_get_dirname (calibrate->simulator);
01154     buffer3 = g_path_get_basename (calibrate->simulator);
01155     buffer4 = g_build_filename (buffer2, buffer3, NULL);
01156     snprintf (buffer, 512, "\"%s\" %s %s %s %s %s %s %s %s %s",
01157             buffer4, input[0], input[1], input[2], input[3], input[4], input[5],
01158             input[6], input[7], output);
01159     g_free (buffer4);
01160     g_free (buffer3);
01161     g_free (buffer2);
01162 #if DEBUG
01163     fprintf (stderr, "calibrate_parse: %s\n", buffer);
01164 #endif
01165     system (buffer);
01166
01167     // Checking the objective value function
01168     if (calibrate->evaluator)
01169     {
01170         snprintf (result, 32, "result-%u-%u", simulation, experiment);
01171         buffer2 = g_path_get_dirname (calibrate->evaluator);
01172         buffer3 = g_path_get_basename (calibrate->evaluator);
01173         buffer4 = g_build_filename (buffer2, buffer3, NULL);
01174         snprintf (buffer, 512, "\"%s\" %s %s %s",
01175                 buffer4, output, calibrate->experiment[experiment], result);
01176         g_free (buffer4);
01177         g_free (buffer3);
01178         g_free (buffer2);
01179 #if DEBUG
01180         fprintf (stderr, "calibrate_parse: %s\n", buffer);
01181 #endif
01182         system (buffer);
01183         file_result = g_fopen (result, "r");
01184         e = atof (fgets (buffer, 512, file_result));
01185         fclose (file_result);
01186     }
01187     else
01188     {
01189         strcpy (result, "");
01190         file_result = g_fopen (output, "r");
01191         e = atof (fgets (buffer, 512, file_result));
01192         fclose (file_result);
01193     }
01194
01195     // Removing files
01196 #if !DEBUG
01197     for (i = 0; i < calibrate->ninputs; ++i)
01198     {
01199         if (calibrate->file[i][0])
01200         {
01201             snprintf (buffer, 512, RM " %s", &input[i][0]);
01202             system (buffer);
01203         }
01204     }
01205     snprintf (buffer, 512, RM " %s %s", output, result);
01206     system (buffer);
01207 #endif
01208
01209 #if DEBUG
01210     fprintf (stderr, "calibrate_parse: end\n");
01211 #endif
01212

```

```

01213 // Returning the objective function
01214 return e * calibrate->weight[experiment];
01215 }

```

Here is the call graph for this function:



### 5.3.3.7 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 1257 of file [calibrator.c](#).

```

01258 {
01259     unsigned int i;
01260     char buffer[64];
01261     #if DEBUG
01262     fprintf (stderr, "calibrate_save_variables: start\n");
01263     #endif
01264     for (i = 0; i < calibrate->nvariables; ++i)
01265     {
01266         snprintf (buffer, 64, "%s ", format[calibrate->precision[i]]);
01267         fprintf (calibrate->file_variables, buffer,
01268             calibrate->value[simulation * calibrate->
01269                 nvariables + i]);
01269     }
01270     fprintf (calibrate->file_variables, "%.14le\n", error);
01271     #if DEBUG
01272     fprintf (stderr, "calibrate_save_variables: end\n");
01273     #endif
01274 }

```

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

Function to calibrate on a thread.

#### Parameters

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

#### Returns

NULL

Definition at line 1372 of file [calibrator.c](#).

```

01373 {
01374     unsigned int i, j, thread;
01375     double e;
01376     #if DEBUG

```

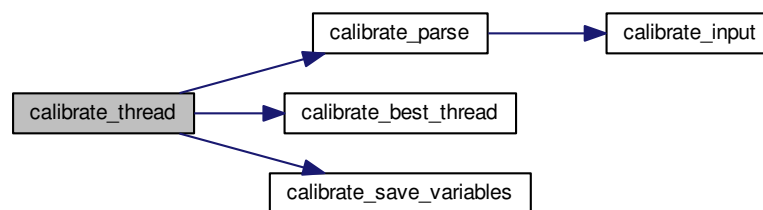


```

01377 fprintf (stderr, "calibrate_thread: start\n");
01378 #endif
01379 thread = data->thread;
01380 #if DEBUG
01381 fprintf (stderr, "calibrate_thread: thread=%u start=%u end=%u\n", thread,
01382         calibrate->thread[thread], calibrate->thread[thread + 1]);
01383 #endif
01384 for (i = calibrate->thread[thread]; i < calibrate->thread[thread + 1]; ++i)
01385 {
01386     e = 0.;
01387     for (j = 0; j < calibrate->nexperiments; ++j)
01388         e += calibrate_parse (i, j);
01389     calibrate_best_thread (i, e);
01390     g_mutex_lock (mutex);
01391     calibrate_save_variables (i, e);
01392     g_mutex_unlock (mutex);
01393 #if DEBUG
01394     fprintf (stderr, "calibrate_thread: i=%u e=%lg\n", i, e);
01395 #endif
01396 }
01397 #if DEBUG
01398 fprintf (stderr, "calibrate_thread: end\n");
01399 #endif
01400 g_thread_exit (NULL);
01401 return NULL;
01402 }

```

Here is the call graph for this function:



### 5.3.3.9 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 472 of file [calibrator.c](#).

```

00473 {
00474     char buffer2[64];
00475     xmlDoc *doc;
00476     xmlNode *node, *child;
00477     xmlChar *buffer;
00478     char *msg;
00479     int error_code;
00480     unsigned int i;
00481
00482 #if DEBUG
00483     fprintf (stderr, "input_open: start\n");
00484 #endif
00485

```

```
00486 // Resetting input data
00487 input_new ();
00488
00489 // Parsing the input file
00490 doc = xmlParseFile (filename);
00491 if (!doc)
00492 {
00493     msg = gettext ("Unable to parse the input file");
00494     goto exit_on_error;
00495 }
00496
00497 // Getting the root node
00498 node = xmlDocGetRootElement (doc);
00499 if (xmlStrcmp (node->name, XML_CALIBRATE))
00500 {
00501     msg = gettext ("Bad root XML node");
00502     goto exit_on_error;
00503 }
00504
00505 // Opening simulator program name
00506 input->simulator = (char *) xmlGetProp (node, XML_SIMULATOR);
00507 if (!input->simulator)
00508 {
00509     msg = gettext ("Bad simulator program");
00510     goto exit_on_error;
00511 }
00512
00513 // Opening evaluator program name
00514 input->evaluator = (char *) xmlGetProp (node, XML_EVALUATOR);
00515
00516 // Obtaining pseudo-random numbers generator seed
00517 if (!xmlHasProp (node, XML_SEED))
00518     input->seed = DEFAULT_RANDOM_SEED;
00519 else
00520 {
00521     input->seed = xml_node_get_uint (node, XML_SEED, &error_code);
00522     if (error_code)
00523     {
00524         msg = gettext ("Bad pseudo-random numbers generator seed");
00525         goto exit_on_error;
00526     }
00527 }
00528
00529 // Opening algorithm
00530 buffer = xmlGetProp (node, XML_ALGORITHM);
00531 if (!xmlStrcmp (buffer, XML_MONTE_CARLO))
00532 {
00533     input->algorithm = ALGORITHM_MONTE_CARLO;
00534
00535     // Obtaining simulations number
00536     input->nsimulations
00537     = xml_node_get_int (node, XML_NSIMULATIONS, &error_code);
00538     if (error_code)
00539     {
00540         msg = gettext ("Bad simulations number");
00541         goto exit_on_error;
00542     }
00543 }
00544 else if (!xmlStrcmp (buffer, XML_SWEEP))
00545     input->algorithm = ALGORITHM_SWEEP;
00546 else if (!xmlStrcmp (buffer, XML_GENETIC))
00547 {
00548     input->algorithm = ALGORITHM_GENETIC;
00549
00550     // Obtaining population
00551     if (xmlHasProp (node, XML_NPOPULATION))
00552     {
00553         input->nsimulations
00554         = xml_node_get_uint (node, XML_NPOPULATION, &error_code);
00555         if (error_code || input->nsimulations < 3)
00556         {
00557             msg = gettext ("Invalid population number");
00558             goto exit_on_error;
00559         }
00560     }
00561     else
00562     {
00563         msg = gettext ("No population number");
00564         goto exit_on_error;
00565     }
00566
00567     // Obtaining generations
00568     if (xmlHasProp (node, XML_NGENERATIONS))
00569     {
00570         input->niterations
00571         = xml_node_get_uint (node, XML_NGENERATIONS, &error_code);
00572         if (error_code || !input->niterations)
```

```

00573         {
00574             msg = gettext ("Invalid generations number");
00575             goto exit_on_error;
00576         }
00577     }
00578     else
00579     {
00580         msg = gettext ("No generations number");
00581         goto exit_on_error;
00582     }
00583
00584     // Obtaining mutation probability
00585     if (xmlHasProp (node, XML_MUTATION))
00586     {
00587         input->mutation_ratio
00588         = xml_node_get_float (node, XML_MUTATION, &error_code);
00589         if (error_code || input->mutation_ratio < 0.
00590             || input->mutation_ratio >= 1.)
00591         {
00592             msg = gettext ("Invalid mutation probability");
00593             goto exit_on_error;
00594         }
00595     }
00596     else
00597     {
00598         msg = gettext ("No mutation probability");
00599         goto exit_on_error;
00600     }
00601
00602     // Obtaining reproduction probability
00603     if (xmlHasProp (node, XML_REPRODUCTION))
00604     {
00605         input->reproduction_ratio
00606         = xml_node_get_float (node, XML_REPRODUCTION, &error_code);
00607         if (error_code || input->reproduction_ratio < 0.
00608             || input->reproduction_ratio >= 1.0)
00609         {
00610             msg = gettext ("Invalid reproduction probability");
00611             goto exit_on_error;
00612         }
00613     }
00614     else
00615     {
00616         msg = gettext ("No reproduction probability");
00617         goto exit_on_error;
00618     }
00619
00620     // Obtaining adaptation probability
00621     if (xmlHasProp (node, XML_ADAPTATION))
00622     {
00623         input->adaptation_ratio
00624         = xml_node_get_float (node, XML_ADAPTATION, &error_code);
00625         if (error_code || input->adaptation_ratio < 0.
00626             || input->adaptation_ratio >= 1.)
00627         {
00628             msg = gettext ("Invalid adaptation probability");
00629             goto exit_on_error;
00630         }
00631     }
00632     else
00633     {
00634         msg = gettext ("No adaptation probability");
00635         goto exit_on_error;
00636     }
00637
00638     // Checking survivals
00639     i = input->mutation_ratio * input->nsimulations;
00640     i += input->reproduction_ratio * input->
00641     nsimulations;
00642     if (i > input->nsimulations - 2)
00643     {
00644         msg = gettext
00645         ("No enough survival entities to reproduce the population");
00646         goto exit_on_error;
00647     }
00648     }
00649     else
00650     {
00651         msg = gettext ("Unknown algorithm");
00652         goto exit_on_error;
00653     }
00654
00655     if (input->algorithm == ALGORITHM_MONTE_CARLO
00656         || input->algorithm == ALGORITHM_SWEEP)
00657     {

```

```

00658
00659 // Obtaining iterations number
00660 input->niterations
00661 = xml_node_get_int (node, XML_NITERATIONS, &error_code);
00662 if (error_code == 1)
00663     input->niterations = 1;
00664 else if (error_code)
00665     {
00666         msg = gettext ("Bad iterations number");
00667         goto exit_on_error;
00668     }
00669
00670 // Obtaining best number
00671 if (xmlHasProp (node, XML_NBEST))
00672     {
00673         input->nbest = xml_node_get_uint (node,
XML_NBEST, &error_code);
00674         if (error_code || !input->nbest)
00675             {
00676                 msg = gettext ("Invalid best number");
00677                 goto exit_on_error;
00678             }
00679     }
00680 else
00681     input->nbest = 1;
00682
00683 // Obtaining tolerance
00684 if (xmlHasProp (node, XML_TOLERANCE))
00685     {
00686         input->tolerance
00687         = xml_node_get_float (node, XML_TOLERANCE, &error_code);
00688         if (error_code || input->tolerance < 0.)
00689             {
00690                 msg = gettext ("Invalid tolerance");
00691                 goto exit_on_error;
00692             }
00693     }
00694 else
00695     input->tolerance = 0.;
00696 }
00697
00698 // Reading the experimental data
00699 for (child = node->children; child; child = child->next)
00700     {
00701         if (xmlStrcmp (child->name, XML_EXPERIMENT))
00702             break;
00703 #if DEBUG
00704         fprintf (stderr, "input_open: nexperiments=%u\n", input->nexperiments);
00705 #endif
00706         if (xmlHasProp (child, XML_NAME))
00707             {
00708                 input->experiment
00709                 = g_realloc (input->experiment,
00710                     (1 + input->nexperiments) * sizeof (char *));
00711                 input->experiment[input->nexperiments]
00712                 = (char *) xmlGetProp (child, XML_NAME);
00713             }
00714         else
00715             {
00716                 snprintf (buffer2, 64, "%s %u: %s",
00717                     gettext ("Experiment"),
00718                     input->nexperiments + 1, gettext ("no data file name"));
00719                 msg = buffer2;
00720                 goto exit_on_error;
00721             }
00722 #if DEBUG
00723         fprintf (stderr, "input_open: experiment=%s\n",
00724             input->experiment[input->nexperiments]);
00725 #endif
00726         input->weight = g_realloc (input->weight,
00727             (1 + input->nexperiments) * sizeof (double));
00728         if (xmlHasProp (child, XML_WEIGHT))
00729             {
00730                 input->weight[input->nexperiments]
00731                 = xml_node_get_float (child, XML_WEIGHT, &error_code);
00732                 if (error_code)
00733                     {
00734                         snprintf (buffer2, 64, "%s %u: %s",
00735                             gettext ("Experiment"),
00736                             input->nexperiments + 1, gettext ("bad weight"));
00737                         msg = buffer2;
00738                         goto exit_on_error;
00739                     }
00740             }
00741         else
00742             input->weight[input->nexperiments] = 1.;
00743 #if DEBUG

```

```

00744     fprintf (stderr, "input_open: weight=%lg\n",
00745               input->weight[input->nexperiments]);
00746 #endif
00747     if (!input->nexperiments)
00748         input->ninputs = 0;
00749 #if DEBUG
00750     fprintf (stderr, "input_open: template[0]\n");
00751 #endif
00752     if (xmlHasProp (child, XML_TEMPLATE1))
00753     {
00754         input->template[0]
00755             = (char **) g_realloc (input->template[0],
00756                                   (1 + input->nexperiments) * sizeof (char *));
00757         input->template[0][input->nexperiments]
00758             = (char *) xmlGetProp (child, template[0]);
00759 #if DEBUG
00760         fprintf (stderr, "input_open: experiment=%u template1=%s\n",
00761                 input->nexperiments,
00762                 input->template[0][input->nexperiments]);
00763 #endif
00764         if (!input->nexperiments)
00765             ++input->ninputs;
00766 #if DEBUG
00767         fprintf (stderr, "input_open: ninputs=%u\n", input->ninputs);
00768 #endif
00769     }
00770     else
00771     {
00772         snprintf (buffer2, 64, "%s %u: %s",
00773                  gettext ("Experiment"),
00774                  input->nexperiments + 1, gettext ("no template"));
00775         msg = buffer2;
00776         goto exit_on_error;
00777     }
00778     for (i = 1; i < MAX_NINPUTS; ++i)
00779     {
00780 #if DEBUG
00781         fprintf (stderr, "input_open: template%u\n", i + 1);
00782 #endif
00783         if (xmlHasProp (child, template[i]))
00784         {
00785             if (input->nexperiments && input->ninputs <= i)
00786             {
00787                 snprintf (buffer2, 64, "%s %u: %s",
00788                          gettext ("Experiment"),
00789                          input->nexperiments + 1,
00790                          gettext ("bad templates number"));
00791                 msg = buffer2;
00792                 goto exit_on_error;
00793             }
00794             input->template[i] = (char **)
00795                 g_realloc (input->template[i],
00796                           (1 + input->nexperiments) * sizeof (char *));
00797             input->template[i][input->nexperiments]
00798                 = (char *) xmlGetProp (child, template[i]);
00799 #if DEBUG
00800             fprintf (stderr, "input_open: experiment=%u template%u=%s\n",
00801                     input->nexperiments, i + 1,
00802                     input->template[i][input->nexperiments]);
00803 #endif
00804             if (!input->nexperiments)
00805                 ++input->ninputs;
00806 #if DEBUG
00807             fprintf (stderr, "input_open: ninputs=%u\n", input->ninputs);
00808 #endif
00809         }
00810         else if (input->nexperiments && input->ninputs >= i)
00811         {
00812             snprintf (buffer2, 64, "%s %u: %s%u",
00813                      gettext ("Experiment"),
00814                      input->nexperiments + 1,
00815                      gettext ("no template"), i + 1);
00816             msg = buffer2;
00817             goto exit_on_error;
00818         }
00819         else
00820             break;
00821     }
00822     ++input->nexperiments;
00823 #if DEBUG
00824     fprintf (stderr, "input_open: nexperiments=%u\n", input->nexperiments);
00825 #endif
00826 }
00827 if (!input->nexperiments)
00828 {
00829     msg = gettext ("No calibration experiments");
00830     goto exit_on_error;

```

```

00831     }
00832
00833     // Reading the variables data
00834     for (; child; child = child->next)
00835     {
00836         if (xmlStrcmp (child->name, XML_VARIABLE))
00837         {
00838             snprintf (buffer2, 64, "%s %u: %s",
00839                     gettext ("Variable"),
00840                     input->nvariables + 1, gettext ("bad XML node"));
00841             msg = buffer2;
00842             goto exit_on_error;
00843         }
00844         if (xmlHasProp (child, XML_NAME))
00845         {
00846             input->label = g_realloc
00847                 (input->label, (1 + input->nvariables) * sizeof (char *));
00848             input->label[input->nvariables]
00849                 = (char *) xmlGetProp (child, XML_NAME);
00850         }
00851         else
00852         {
00853             snprintf (buffer2, 64, "%s %u: %s",
00854                     gettext ("Variable"),
00855                     input->nvariables + 1, gettext ("no name"));
00856             msg = buffer2;
00857             goto exit_on_error;
00858         }
00859         if (xmlHasProp (child, XML_MINIMUM))
00860         {
00861             input->rangemin = g_realloc
00862                 (input->rangemin, (1 + input->nvariables) * sizeof (double));
00863             input->rangeminabs = g_realloc
00864                 (input->rangeminabs, (1 + input->nvariables) * sizeof (double));
00865             input->rangemin[input->nvariables]
00866                 = xml_node_get_float (child, XML_MINIMUM, &error_code);
00867             if (xmlHasProp (child, XML_ABSOLUTE_MINIMUM))
00868             {
00869                 input->rangeminabs[input->nvariables]
00870                     = xml_node_get_float (child,
00871 XML_ABSOLUTE_MINIMUM, &error_code);
00872             }
00873             else
00874                 input->rangeminabs[input->nvariables] = -G_MAXDOUBLE;
00875             if (input->rangemin[input->nvariables]
00876                 < input->rangeminabs[input->nvariables])
00877             {
00878                 snprintf (buffer2, 64, "%s %u: %s",
00879                         gettext ("Variable"),
00880                         input->nvariables + 1,
00881                         gettext ("minimum range not allowed"));
00882                 msg = buffer2;
00883                 goto exit_on_error;
00884             }
00885             else
00886             {
00887                 snprintf (buffer2, 64, "%s %u: %s",
00888                         gettext ("Variable"),
00889                         input->nvariables + 1, gettext ("no minimum range"));
00890                 msg = buffer2;
00891                 goto exit_on_error;
00892             }
00893             if (xmlHasProp (child, XML_MAXIMUM))
00894             {
00895                 input->rangemax = g_realloc
00896                     (input->rangemax, (1 + input->nvariables) * sizeof (double));
00897                 input->rangemaxabs = g_realloc
00898                     (input->rangemaxabs, (1 + input->nvariables) * sizeof (double));
00899                 input->rangemax[input->nvariables]
00900                     = xml_node_get_float (child, XML_MAXIMUM, &error_code);
00901                 if (xmlHasProp (child, XML_ABSOLUTE_MAXIMUM))
00902                 {
00903                     input->rangemaxabs[input->nvariables]
00904                         = xml_node_get_float (child,
00905 XML_ABSOLUTE_MAXIMUM, &error_code);
00906                 }
00907                 else
00908                     input->rangemaxabs[input->nvariables] = G_MAXDOUBLE;
00909                 if (input->rangemax[input->nvariables]
00910                     > input->rangemaxabs[input->nvariables])
00911                 {
00912                     snprintf (buffer2, 64, "%s %u: %s",
00913                             gettext ("Variable"),
00914                             input->nvariables + 1,
00915                             gettext ("maximum range not allowed"));
00916                     msg = buffer2;
00917                     goto exit_on_error;
00918                 }
00919             }
00920         }
00921     }

```

```

00916     }
00917     else
00918     {
00919         snprintf (buffer2, 64, "%s %u: %s",
00920             gettext ("Variable"),
00921             input->nvariables + 1, gettext ("no maximum range"));
00922         msg = buffer2;
00923         goto exit_on_error;
00924     }
00925     if (input->rangemax[input->nvariables]
00926         < input->rangemin[input->nvariables])
00927     {
00928         snprintf (buffer2, 64, "%s %u: %s",
00929             gettext ("Variable"),
00930             input->nvariables + 1, gettext ("bad range"));
00931         msg = buffer2;
00932         goto exit_on_error;
00933     }
00934     input->precision = g_realloc
00935         (input->precision, (1 + input->nvariables) * sizeof (unsigned int));
00936     if (xmlHasProp (child, XML_PRECISION))
00937         input->precision[input->nvariables]
00938             = xml_node_get_uint (child, XML_PRECISION, &error_code);
00939     else
00940         input->precision[input->nvariables] =
00941             DEFAULT_PRECISION;
00942     if (input->algorithm == ALGORITHM_SWEEP)
00943     {
00944         if (xmlHasProp (child, XML_NSWEEPS))
00945         {
00946             input->nsweeps = (unsigned int *)
00947                 g_realloc (input->nsweeps,
00948                     (1 + input->nvariables) * sizeof (unsigned int));
00949             input->nsweeps[input->nvariables]
00950                 = xml_node_get_uint (child, XML_NSWEEPS, &error_code);
00951         }
00952         else
00953         {
00954             snprintf (buffer2, 64, "%s %u: %s",
00955                 gettext ("Variable"),
00956                 input->nvariables + 1, gettext ("no sweeps number"));
00957             msg = buffer2;
00958             goto exit_on_error;
00959         }
00960         #if DEBUG
00961         fprintf (stderr, "input_open: nsweeps=%u nsimulations=%u\n",
00962             input->nsweeps[input->nvariables],
00963             input->nsimulations);
00964         #endif
00965     }
00966     if (input->algorithm == ALGORITHM_GENETIC)
00967     {
00968         // Obtaining bits representing each variable
00969         if (xmlHasProp (child, XML_NBITS))
00970         {
00971             input->nbits = (unsigned int *)
00972                 g_realloc (input->nbits,
00973                     (1 + input->nvariables) * sizeof (unsigned int));
00974             i = xml_node_get_uint (child, XML_NBITS, &error_code);
00975             if (error_code || !i)
00976             {
00977                 snprintf (buffer2, 64, "%s %u: %s",
00978                     gettext ("Variable"),
00979                     input->nvariables + 1,
00980                     gettext ("invalid bits number"));
00981                 msg = buffer2;
00982                 goto exit_on_error;
00983             }
00984             input->nbits[input->nvariables] = i;
00985         }
00986         else
00987         {
00988             snprintf (buffer2, 64, "%s %u: %s",
00989                 gettext ("Variable"),
00990                 input->nvariables + 1, gettext ("no bits number"));
00991             msg = buffer2;
00992             goto exit_on_error;
00993         }
00994     }
00995     ++input->nvariables;
00996     if (!input->nvariables)
00997     {
00998         msg = gettext ("No calibration variables");
00999         goto exit_on_error;
01000     }

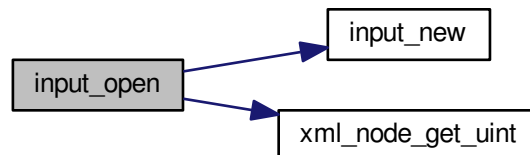
```

```

01001 // Getting the working directory
01002 input->directory = g_path_get_dirname (filename);
01003 input->name = g_path_get_basename (filename);
01004
01005 // Closing the XML document
01006 xmlFreeDoc (doc);
01007
01008 #if DEBUG
01009 fprintf (stderr, "input_open: end\n");
01010 #endif
01011 return 1;
01012
01013 exit_on_error:
01014 show_error (msg);
01015 input_free ();
01016 #if DEBUG
01017 fprintf (stderr, "input_open: end\n");
01018 #endif
01019 return 0;
01020 }

```

Here is the call graph for this function:



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

Function to show a dialog with an error message.

#### Parameters

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

Definition at line 246 of file [calibrator.c](#).

```

00247 {
00248     show_message (gettext ("ERROR!"), msg, ERROR_TYPE);
00249 }

```

Here is the call graph for this function:





5.3.3.11 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 216 of file [calibrator.c](#).

```

00217 {
00218     #if HAVE_GTK
00219         GtkMessageDialog *dlg;
00220
00221         // Creating the dialog
00222         dlg = (GtkMessageDialog *) gtk_message_dialog_new
00223             (window->window, GTK_DIALOG_MODAL, type, GTK_BUTTONS_OK, "%s", msg);
00224
00225         // Setting the dialog title
00226         gtk_window_set_title (GTK_WINDOW (dlg), title);
00227
00228         // Showing the dialog and waiting response
00229         gtk_dialog_run (GTK_DIALOG (dlg));
00230
00231         // Closing and freeing memory
00232         gtk_widget_destroy (GTK_WIDGET (dlg));
00233
00234     #else
00235         printf ("%s: %s\n", title, msg);
00236     #endif
00237 }
```

### 5.3.3.12 double xml\_node\_get\_float ( xmlDoc \* 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 325 of file [calibrator.c](#).

```

00326 {
00327     double x = 0.;
00328     xmlChar *buffer;
00329     buffer = xmlGetProp (node, prop);
00330     if (!buffer)
00331         *error_code = 1;
00332     else
00333     {
00334         if (sscanf ((char *) buffer, "%lf", &x) != 1)
00335             *error_code = 2;
00336         else
00337             *error_code = 0;
00338         xmlFree (buffer);
00339     }
00340     return x;
00341 }
```

### 5.3.3.13 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 263 of file [calibrator.c](#).

```
00264 {
00265     int i = 0;
00266     xmlChar *buffer;
00267     buffer = xmlGetProp (node, prop);
00268     if (!buffer)
00269         *error_code = 1;
00270     else
00271     {
00272         if (sscanf ((char *) buffer, "%d", &i) != 1)
00273             *error_code = 2;
00274         else
00275             *error_code = 0;
00276         xmlFree (buffer);
00277     }
00278     return i;
00279 }
```

#### 5.3.3.14 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 294 of file [calibrator.c](#).

```
00295 {
00296     unsigned int i = 0;
00297     xmlChar *buffer;
00298     buffer = xmlGetProp (node, prop);
00299     if (!buffer)
00300         *error_code = 1;
00301     else
00302     {
00303         if (sscanf ((char *) buffer, "%u", &i) != 1)
00304             *error_code = 2;
00305         else
00306             *error_code = 0;
00307         xmlFree (buffer);
00308     }
00309     return i;
00310 }
```

#### 5.3.3.15 void xml\_node\_set\_float ( xmlDoc \* 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 392 of file [calibrator.c](#).

```
00393 {
00394     xmlChar buffer[64];
00395     snprintf ((char *) buffer, 64, "%.14lg", value);
00396     xmlSetProp (node, prop, buffer);
00397 }
```

**5.3.3.16 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 354 of file [calibrator.c](#).

```
00355 {
00356     xmlChar buffer[64];
00357     snprintf ((char *) buffer, 64, "%d", value);
00358     xmlSetProp (node, prop, buffer);
00359 }
```

**5.3.3.17 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 373 of file [calibrator.c](#).

```
00374 {
00375     xmlChar buffer[64];
00376     snprintf ((char *) buffer, 64, "%u", value);
00377     xmlSetProp (node, prop, buffer);
00378 }
```

**5.4 calibrator.h**

```
00001 /*
00002 Calibrator: a software to make calibrations of empirical parameters.
00003
00004 AUTHORS: Javier Burguete and Borja Latorre.
00005
00006 Copyright 2012-2015, 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 CALIBRATOR__H
00037 #define CALIBRATOR__H 1
00038
00043 enum Algorithm
00044 {
00045     ALGORITHM_MONTE_CARLO = 0,
00046     ALGORITHM_SWEEP = 1,
00047     ALGORITHM_GENETIC = 2
00048 };
00049
00054 typedef struct
00055 {
00056     char *simulator;
00057     char *evaluator;
00059     char **experiment;
00060     char **template[MAX_NINPUTS];
00061     char **label;
00062     char *directory;
00063     char *name;
00064     double *rangemin;
00065     double *rangemax;
00066     double *rangeminabs;
00067     double *rangemaxabs;
00068     double *weight;
00069     double tolerance;
00070     double mutation_ratio;
00071     double reproduction_ratio;
00072     double adaptation_ratio;
00073     unsigned long int seed;
00075     unsigned int nvariables;
00076     unsigned int nexperiments;
00077     unsigned int ninputs;
00078     unsigned int nsimulations;
00079     unsigned int algorithm;
00080     unsigned int *precision;
00081     unsigned int *nsweeps;
00082     unsigned int *nbits;
00084     unsigned int niterations;
00085     unsigned int nbest;
00086 } Input;
00087
00092 typedef struct
00093 {
00094     char *simulator;
00095     char *evaluator;
00097     char **experiment;
00098     char **template[MAX_NINPUTS];
00099     char **label;
00100     unsigned int nvariables;
00101     unsigned int nexperiments;
00102     unsigned int ninputs;
00103     unsigned int nsimulations;
00104     unsigned int algorithm;
00105     unsigned int *precision;
00106     unsigned int *nsweeps;
00107     unsigned int nstart;
00108     unsigned int nend;
00109     unsigned int *thread;
00111     unsigned int niterations;
00112     unsigned int nbest;
00113     unsigned int nsaveds;
00114     unsigned int *simulation_best;
00115     unsigned long int seed;
00117     double *value;
00118     double *rangemin;
00119     double *rangemax;
00120     double *rangeminabs;
00121     double *rangemaxabs;
00122     double *error_best;
00123     double *weight;
00124     double *value_old;

```

```

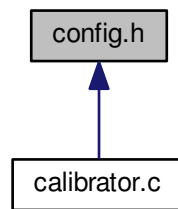
00126 double *error_old;
00128 double tolerance;
00129 double mutation_ratio;
00130 double reproduction_ratio;
00131 double adaptation_ratio;
00132 FILE *file_result;
00133 FILE *file_variables;
00134 gsl_rng *rng;
00135 GMappedFile **file[MAX_NINPUTS];
00136 GeneticVariable *genetic_variable;
00138 #if HAVE_MPI
00139 int mpi_rank;
00140 #endif
00141 } Calibrate;
00142
00147 typedef struct
00148 {
00149     unsigned int thread;
00150 } ParallelData;
00151
00152 // Public functions
00153 void show_message (char *title, char *msg, int type);
00154 void show_error (char *msg);
00155 int xml_node_get_int (xmlNode * node, const xmlChar * prop, int *error_code);
00156 unsigned int xml_node_get_uint (xmlNode * node, const xmlChar * prop,
00157                                 int *error_code);
00158 double xml_node_get_float (xmlNode * node, const xmlChar * prop,
00159                             int *error_code);
00160 void xml_node_set_int (xmlNode * node, const xmlChar * prop, int value);
00161 void xml_node_set_uint (xmlNode * node, const xmlChar * prop,
00162                         unsigned int value);
00163 void xml_node_set_float (xmlNode * node, const xmlChar * prop, double value);
00164 void input_new ();
00165 void input_free ();
00166 int input_open (char *filename);
00167 void calibrate_input (unsigned int simulation, char *input,
00168                      GMappedFile * template);
00169 double calibrate_parse (unsigned int simulation, unsigned int experiment);
00170 void calibrate_print ();
00171 void calibrate_save_variables (unsigned int simulation, double error);
00172 void calibrate_best_thread (unsigned int simulation, double value);
00173 void calibrate_best_sequential (unsigned int simulation, double value);
00174 void *calibrate_thread (ParallelData * data);
00175 void calibrate_sequential ();
00176 void calibrate_merge (unsigned int nsaveds, unsigned int *simulation_best,
00177                      double *error_best);
00178 #if HAVE_MPI
00179 void calibrate_synchronise ();
00180 #endif
00181 void calibrate_sweep ();
00182 void calibrate_MonteCarlo ();
00183 double calibrate_genetic_objective (Entity * entity);
00184 void calibrate_genetic ();
00185 void calibrate_save_old ();
00186 void calibrate_merge_old ();
00187 void calibrate_refine ();
00188 void calibrate_iterate ();
00189 void calibrate_new ();
00190
00191 #endif

```

## 5.5 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 algorithms.*
- `#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 LOCALE_DIR "locales"`  
*Locales directory.*
- `#define PROGRAM_INTERFACE "calibrator"`  
*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"`  
*algorithm XML label.*
- `#define XML_CALIBRATE (const xmlChar*)"calibrate"`  
*calibrate 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_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_NGENERATIONS` (const xmlChar\*)"ngenerations"

*ngenerations XML label.*
- #define `XML_NITERATIONS` (const xmlChar\*)"niterations"

*niterations XML label.*
- #define `XML_NPOPULATION` (const xmlChar\*)"npopulation"

*npopulation XML label.*
- #define `XML_NSIMULATIONS` (const xmlChar\*)"nsimulations"

*nsimulations XML label.*
- #define `XML_NSWEEPS` (const xmlChar\*)"nsweeps"

*nsweeps XML label.*
- #define `XML_PRECISION` (const xmlChar\*)"precision"

*precision XML label.*
- #define `XML_REPRODUCTION` (const xmlChar\*)"reproduction"

*reproduction XML label.*
- #define `XML_SIMULATOR` (const xmlChar\*)"simulator"

*simulator XML label.*
- #define `XML_SEED` (const xmlChar\*)"seed"

*seed XML label.*
- #define `XML_SWEEP` (const xmlChar\*)"sweep"

*sweep 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_WEIGHT` (const xmlChar\*)"weight"

*weight XML label.*



### 5.5.1 Detailed Description

Configuration header file.

#### Authors

Javier Burguete and Borja Latorre.

#### Copyright

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

## 5.6 config.h

```

00001 /* config.h. Generated from config.h.in by configure. */
00002 /*
00003 Calibrator: a software to make calibrations of empirical parameters.
00004
00005 AUTHORS: Javier Burguete and Borja Latorre.
00006
00007 Copyright 2012-2014, 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 NPRECISIONS 15
00046
00047 // Default choices
00048
00049 #define DEFAULT_PRECISION (NPRECISIONS - 1)
00050 #define DEFAULT_RANDOM_SEED 7007
00051
00052 // Interface labels
00053
00054 #define LOCALE_DIR "locales"
00055 #define PROGRAM_INTERFACE "calibrator"
00056
00057 // XML labels
00058
00059 #define XML_ABSOLUTE_MINIMUM (const xmlChar*)"absolute_minimum"
00060 #define XML_ABSOLUTE_MAXIMUM (const xmlChar*)"absolute_maximum"
00062 #define XML_ADAPTATION (const xmlChar*)"adaptation"
00064 #define XML_ALGORITHM (const xmlChar*)"algorithm"
00066 #define XML_CALIBRATE (const xmlChar*)"calibrate"
00068 #define XML_EVALUATOR (const xmlChar*)"evaluator"
00070 #define XML_EXPERIMENT (const xmlChar*)"experiment"
00072 #define XML_GENETIC (const xmlChar*)"genetic"
00074 #define XML_MINIMUM (const xmlChar*)"minimum"
00075 #define XML_MAXIMUM (const xmlChar*)"maximum"

```

```

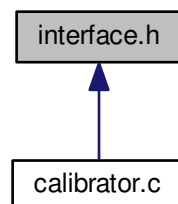
00076 #define XML_MONTE_CARLO (const xmlChar*)"Monte-Carlo"
00077 #define XML_MUTATION (const xmlChar*)"mutation"
00079 #define XML_NAME (const xmlChar*)"name"
00080 #define XML_NBEST (const xmlChar*)"nbest"
00081 #define XML_NBITS (const xmlChar*)"nbits"
00082 #define XML_NGENERATIONS (const xmlChar*)"ngenerations"
00083 #define XML_NITERATIONS (const xmlChar*)"niterations"
00085 #define XML_NPOPULATION (const xmlChar*)"npopulation"
00087 #define XML_NSIMULATIONS (const xmlChar*)"nsimulations"
00089 #define XML_NSWEEPS (const xmlChar*)"nsweeps"
00091 #define XML_PRECISION (const xmlChar*)"precision"
00092 #define XML_REPRODUCTION (const xmlChar*)"reproduction"
00094 #define XML_SIMULATOR (const xmlChar*)"simulator"
00096 #define XML_SEED (const xmlChar*)"seed"
00098 #define XML_SWEEP (const xmlChar*)"sweep"
00099 #define XML_TEMPLATE1 (const xmlChar*)"template1"
00100 #define XML_TEMPLATE2 (const xmlChar*)"template2"
00102 #define XML_TEMPLATE3 (const xmlChar*)"template3"
00104 #define XML_TEMPLATE4 (const xmlChar*)"template4"
00106 #define XML_TEMPLATE5 (const xmlChar*)"template5"
00108 #define XML_TEMPLATE6 (const xmlChar*)"template6"
00110 #define XML_TEMPLATE7 (const xmlChar*)"template7"
00112 #define XML_TEMPLATE8 (const xmlChar*)"template8"
00114 #define XML_TOLERANCE (const xmlChar*)"tolerance"
00116 #define XML_VARIABLE (const xmlChar*)"variable"
00118 #define XML_WEIGHT (const xmlChar*)"weight"
00119
00120 #endif

```

## 5.7 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

- 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.*
- 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.*
- int `window_get_algorithm` ()  
*Function to get the algorithm number.*
- 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.*

### 5.7.1 Detailed Description

Header file of the interface.

#### Authors

Javier Burguete.

#### Copyright

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

### 5.7.2 Function Documentation

#### 5.7.2.1 int cores\_number ( )

Function to obtain the cores number.

#### Returns

Cores number.

Definition at line [3904](#) of file [calibrator.c](#).

```
03905 {
03906     #ifdef G_OS_WIN32
03907         SYSTEM_INFO sysinfo;
03908         GetSystemInfo (&sysinfo);
03909         return sysinfo.dwNumberOfProcessors;
03910     #else
03911         return (int) sysconf (_SC_NPROCESSORS_ONLN);
03912     #endif
03913 }
```

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

Function to save the input file.

## Parameters

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

Definition at line 2142 of file `calibrator.c`.

```

02143 {
02144     unsigned int i, j;
02145     char *buffer;
02146     xmlDoc *doc;
02147     xmlNode *node, *child;
02148     GFile *file, *file2;
02149
02150     // Getting the input file directory
02151     input->name = g_path_get_basename (filename);
02152     input->directory = g_path_get_dirname (filename);
02153     file = g_file_new_for_path (input->directory);
02154
02155     // Opening the input file
02156     doc = xmlNewDoc ((const xmlChar *) "1.0");
02157
02158     // Setting root XML node
02159     node = xmlNewDocNode (doc, 0, XML_CALIBRATE, 0);
02160     xmlDocSetRootElement (doc, node);
02161
02162     // Adding properties to the root XML node
02163     file2 = g_file_new_for_path (input->simulator);
02164     buffer = g_file_get_relative_path (file, file2);
02165     g_object_unref (file2);
02166     xmlSetProp (node, XML_SIMULATOR, (xmlChar *) buffer);
02167     g_free (buffer);
02168     if (input->evaluator)
02169     {
02170         file2 = g_file_new_for_path (input->evaluator);
02171         buffer = g_file_get_relative_path (file, file2);
02172         g_object_unref (file2);
02173         if (xmlStrlen ((xmlChar *) buffer))
02174             xmlSetProp (node, XML_EVALUATOR, (xmlChar *) buffer);
02175         g_free (buffer);
02176     }
02177     if (input->seed != DEFAULT_RANDOM_SEED)
02178         xml_node_set_uint (node, XML_SEED, input->seed);
02179
02180     // Setting the algorithm
02181     buffer = (char *) g_malloc (64);
02182     switch (input->algorithm)
02183     {
02184     case ALGORITHM_MONTE_CARLO:
02185         xmlSetProp (node, XML_ALGORITHM, XML_MONTE_CARLO);
02186         snprintf (buffer, 64, "%u", input->nsimulations);
02187         xmlSetProp (node, XML_NSIMULATIONS, (xmlChar *) buffer);
02188         snprintf (buffer, 64, "%u", input->niterations);
02189         xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02190         snprintf (buffer, 64, "%.3lg", input->tolerance);
02191         xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02192         snprintf (buffer, 64, "%u", input->nbest);
02193         xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02194         break;
02195     case ALGORITHM_SWEEP:
02196         xmlSetProp (node, XML_ALGORITHM, XML_SWEEP);
02197         snprintf (buffer, 64, "%u", input->niterations);
02198         xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02199         snprintf (buffer, 64, "%.3lg", input->tolerance);
02200         xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02201         snprintf (buffer, 64, "%u", input->nbest);
02202         xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02203         break;
02204     default:
02205         xmlSetProp (node, XML_ALGORITHM, XML_GENETIC);
02206         snprintf (buffer, 64, "%u", input->nsimulations);
02207         xmlSetProp (node, XML_NPOPULATION, (xmlChar *) buffer);
02208         snprintf (buffer, 64, "%u", input->niterations);
02209         xmlSetProp (node, XML_NGENERATIONS, (xmlChar *) buffer);
02210         snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
02211         xmlSetProp (node, XML_MUTATION, (xmlChar *) buffer);
02212         snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
02213         xmlSetProp (node, XML_REPRODUCTION, (xmlChar *) buffer);
02214         snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
02215         xmlSetProp (node, XML_ADAPTATION, (xmlChar *) buffer);
02216         break;
02217     }
02218     g_free (buffer);
02219
02220     // Setting the experimental data
02221     for (i = 0; i < input->nexperiments; ++i)
02222     {

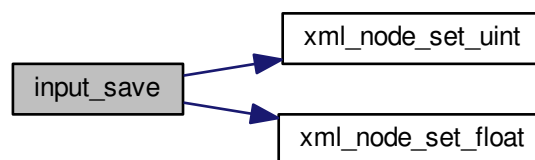
```

```

02223     child = xmlNewChild (node, 0, XML_EXPERIMENT, 0);
02224     xmlSetProp (child, XML_NAME, (xmlChar *) input->experiment[i]);
02225     if (input->weight[i] != 1.)
02226         xml_node_set_float (child, XML_WEIGHT, input->
weight[i]);
02227     for (j = 0; j < input->ninputs; ++j)
02228         xmlSetProp (child, template[j], (xmlChar *) input->template[j][i]);
02229 }
02230
02231 // Setting the variables data
02232 for (i = 0; i < input->nvariables; ++i)
02233 {
02234     child = xmlNewChild (node, 0, XML_VARIABLE, 0);
02235     xmlSetProp (child, XML_NAME, (xmlChar *) input->label[i]);
02236     xml_node_set_float (child, XML_MINIMUM, input->
rangemin[i]);
02237     if (input->rangeminabs[i] != -G_MAXDOUBLE)
02238         xml_node_set_float (child, XML_ABSOLUTE_MINIMUM,
input->rangeminabs[i]);
02239     xml_node_set_float (child, XML_MAXIMUM, input->
rangemax[i]);
02240     if (input->rangemaxabs[i] != G_MAXDOUBLE)
02241         xml_node_set_float (child, XML_ABSOLUTE_MAXIMUM,
input->rangemaxabs[i]);
02242     if (input->precision[i] != DEFAULT_PRECISION)
02243         xml_node_set_uint (child, XML_PRECISION,
input->precision[i]);
02244     if (input->algorithm == ALGORITHM_SWEEP)
02245         xml_node_set_uint (child, XML_NSWEEPS, input->
nsweeps[i]);
02246     else if (input->algorithm == ALGORITHM_GENETIC)
02247         xml_node_set_uint (child, XML_NBITS, input->
nbits[i]);
02248 }
02249
02250 // Saving the XML file
02251 xmlSaveFormatFile (filename, doc, 1);
02252
02253 // Freeing memory
02254 xmlFreeDoc (doc);
02255 }

```

Here is the call graph for this function:



### 5.7.2.3 int window\_get\_algorithm ( )

Function to get the algorithm number.

#### Returns

Algorithm number.

Definition at line 2515 of file [calibrator.c](#).

```

02516 {
02517     unsigned int i;
02518     for (i = 0; i < NALGORITHMS; ++i)

```

```

02519     if (gtk_toggle_button_get_active
02520         (GTK_TOGGLE_BUTTON (window->button_algorithm[i])))
02521         break;
02522     return i;
02523 }

```

#### 5.7.2.4 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 3266 of file [calibrator.c](#).

```

03267 {
03268     unsigned int i;
03269     char *buffer;
03270     #if DEBUG
03271     fprintf (stderr, "window_read: start\n");
03272     #endif
03273
03274     // Reading new input file
03275     input_free ();
03276     if (!input_open (filename))
03277         return 0;
03278
03279     // Setting GTK+ widgets data
03280     buffer = g_build_filename (input->directory, input->
simulator, NULL);
03281     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
(window->button_simulator), buffer);
03282     g_free (buffer);
03283     gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
(size_t) input->evaluator);
03284     if (input->evaluator)
03285     {
03286         buffer = g_build_filename (input->directory, input->
evaluator, NULL);
03287         gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
(window->button_evaluator), buffer);
03288         g_free (buffer);
03289     }
03290     gtk_toggle_button_set_active
(GTK_TOGGLE_BUTTON (window->button_algorithm[input->
algorithm]), TRUE);
03291     switch (input->algorithm)
03292     {
03293     case ALGORITHM_MONTE_CARLO:
03294         gtk_spin_button_set_value (window->spin_simulations,
(gdouble) input->nsimulations);
03295     case ALGORITHM_SWEEP:
03296         gtk_spin_button_set_value (window->spin_iterations,
(gdouble) input->niterations);
03297         gtk_spin_button_set_value (window->spin_bests, (gdouble)
input->nbest);
03298         gtk_spin_button_set_value (window->spin_tolerance,
input->tolerance);
03299         break;
03300     default:
03301         gtk_spin_button_set_value (window->spin_population,
(gdouble) input->nsimulations);
03302         gtk_spin_button_set_value (window->spin_generations,
(gdouble) input->niterations);
03303         gtk_spin_button_set_value (window->spin_mutation, input->
mutation_ratio);
03304         gtk_spin_button_set_value (window->spin_reproduction,
input->reproduction_ratio);
03305         gtk_spin_button_set_value (window->spin_adaptation,
input->adaptation_ratio);
03306     }
03307     g_signal_handler_block (window->combo_experiment, window->
id_experiment);

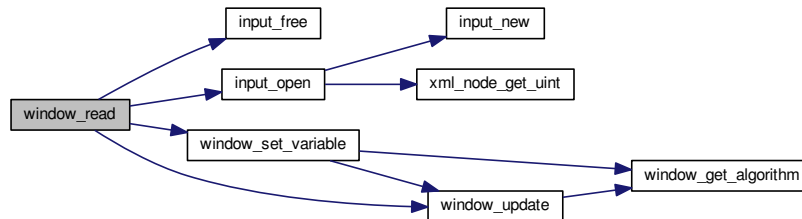
```

```

03318 g_signal_handler_block (window->button_experiment,
03319                          window->id_experiment_name);
03320 gtk_combo_box_text_remove_all (window->combo_experiment);
03321 for (i = 0; i < input->nexperiments; ++i)
03322     gtk_combo_box_text_append_text (window->combo_experiment,
03323                                     input->experiment[i]);
03324 g_signal_handler_unblock
03325     (window->button_experiment, window->
03326      id_experiment_name);
03327 g_signal_handler_unblock (window->combo_experiment,
03328                          window->id_experiment);
03329 gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
03330 g_signal_handler_block (window->combo_variable, window->
03331 id_variable);
03332 g_signal_handler_block (window->entry_variable, window->
03333 id_variable_label);
03334 gtk_combo_box_text_remove_all (window->combo_variable);
03335 for (i = 0; i < input->nvariables; ++i)
03336     gtk_combo_box_text_append_text (window->combo_variable,
03337                                     input->label[i]);
03338 g_signal_handler_unblock (window->entry_variable, window->
03339 id_variable_label);
03340 g_signal_handler_unblock (window->combo_variable, window->
03341 id_variable);
03342 gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
03343 window_set_variable ();
03344 window_update ();
03345 }

```

Here is the call graph for this function:



### 5.7.2.5 int window\_save ( )

Function to save the input file.

#### Returns

1 on OK, 0 on Cancel.

Definition at line 2330 of file [calibrator.c](#).

```

02331 {
02332     char *buffer;
02333     GtkFileChooserDialog *dlg;
02334
02335     #if DEBUG
02336     fprintf (stderr, "window_save: start\n");
02337     #endif
02338
02339     // Opening the saving dialog
02340     dlg = (GtkFileChooserDialog *)
02341         gtk_file_chooser_dialog_new (gettext ("Save file"),
02342                                     window->window,

```

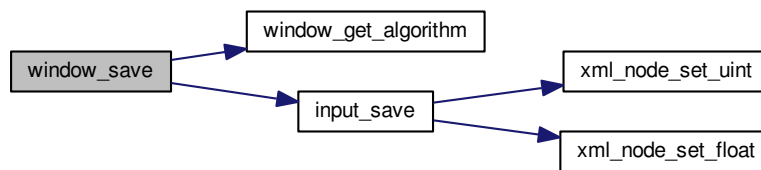


```

02343                                     GTK_FILE_CHOOSER_ACTION_SAVE,
02344                                     gettext ("Cancel"),
02345                                     GTK_RESPONSE_CANCEL,
02346                                     gettext ("OK"), GTK_RESPONSE_OK, NULL);
02347 gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
02348 buffer = g_build_filename (input->directory, input->name, NULL);
02349 gtk_file_chooser_set_filename (GTK_FILE_CHOOSER (dlg), buffer);
02350 g_free (buffer);
02351
02352 // If OK response then saving
02353 if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
02354 {
02355     // Adding properties to the root XML node
02356     input->simulator = gtk_file_chooser_get_filename
02357         (GTK_FILE_CHOOSER (window->button_simulator));
02358     if (gtk_toggle_button_get_active
02359         (GTK_TOGGLE_BUTTON (window->check_evaluator)))
02360         input->evaluator = gtk_file_chooser_get_filename
02361             (GTK_FILE_CHOOSER (window->button_evaluator));
02362     else
02363         input->evaluator = NULL;
02364
02365     // Setting the algorithm
02366     switch (window_get_algorithm ())
02367     {
02368     case ALGORITHM_MONTE_CARLO:
02369         input->algorithm = ALGORITHM_MONTE_CARLO;
02370         input->nsimulations
02371             = gtk_spin_button_get_value_as_int (window->spin_simulations);
02372         input->niterations
02373             = gtk_spin_button_get_value_as_int (window->spin_iterations);
02374         input->tolerance = gtk_spin_button_get_value (window->
02375 spin_tolerance);
02376         input->nbest = gtk_spin_button_get_value_as_int (window->
02377 spin_bests);
02378         break;
02379     case ALGORITHM_SWEEP:
02380         input->algorithm = ALGORITHM_SWEEP;
02381         input->niterations
02382             = gtk_spin_button_get_value_as_int (window->spin_iterations);
02383         input->tolerance = gtk_spin_button_get_value (window->
02384 spin_tolerance);
02385         input->nbest = gtk_spin_button_get_value_as_int (window->
02386 spin_bests);
02387         break;
02388     default:
02389         input->algorithm = ALGORITHM_GENETIC;
02390         input->nsimulations
02391             = gtk_spin_button_get_value_as_int (window->spin_population);
02392         input->niterations
02393             = gtk_spin_button_get_value_as_int (window->spin_generations);
02394         input->mutation_ratio
02395             = gtk_spin_button_get_value (window->spin_mutation);
02396         input->reproduction_ratio
02397             = gtk_spin_button_get_value (window->spin_reproduction);
02398         input->adaptation_ratio
02399             = gtk_spin_button_get_value (window->spin_adaptation);
02400         break;
02401     }
02402
02403     // Saving the XML file
02404     buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
02405     input_save (buffer);
02406
02407     // Closing and freeing memory
02408     g_free (buffer);
02409     gtk_widget_destroy (GTK_WIDGET (dlg));
02410 #if DEBUG
02411     fprintf (stderr, "window_save: end\n");
02412 #endif
02413     return 1;
02414 }
02415
02416 // Closing and freeing memory
02417 gtk_widget_destroy (GTK_WIDGET (dlg));
02418 #if DEBUG
02419     fprintf (stderr, "window_save: end\n");
02420 #endif
02421     return 0;
02422 }

```

Here is the call graph for this function:



### 5.7.2.6 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 2902 of file [calibrator.c](#).

```

02903 {
02904     unsigned int i, j;
02905     char *buffer;
02906     GFile *file1, *file2;
02907     #if DEBUG
02908         fprintf (stderr, "window_template_experiment: start\n");
02909     #endif
02910     i = (size_t) data;
02911     j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02912     file1
02913     = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
02914     file2 = g_file_new_for_path (input->directory);
02915     buffer = g_file_get_relative_path (file2, file1);
02916     input->template[i][j] = (char *) xmlStrdup ((xmlChar *) buffer);
02917     g_free (buffer);
02918     g_object_unref (file2);
02919     g_object_unref (file1);
02920     #if DEBUG
02921         fprintf (stderr, "window_template_experiment: end\n");
02922     #endif
02923 }

```

## 5.8 interface.h

```

00001 /*
00002 Calibrator: a software to make calibrations of empirical parameters.
00003
00004 AUTHORS: Javier Burguete and Borja Latorre.
00005
00006 Copyright 2012-2015, AUTHORS.
00007
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```

```

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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     unsigned int precision;
00066     unsigned int nsweeps;
00067     unsigned int nbits;
00068 } Variable;
00069
00074 typedef struct
00075 {
00076     GtkDialog *dialog;
00077     GtkGrid *grid;
00078     GtkLabel *label_processors;
00079     GtkSpinButton *spin_processors;
00080     GtkLabel *label_seed;
00082     GtkSpinButton *spin_seed;
00084 } Options;
00085
00090 typedef struct
00091 {
00092     GtkDialog *dialog;
00093     GtkLabel *label;
00094 } Running;
00095
00100 typedef struct
00101 {
00102     GtkWidget *window;
00103     GtkGrid *grid;
00104     GtkToolbar *bar_buttons;
00105     GtkToolButton *button_open;
00106     GtkToolButton *button_save;
00107     GtkToolButton *button_run;
00108     GtkToolButton *button_options;
00109     GtkToolButton *button_help;
00110     GtkToolButton *button_about;
00111     GtkToolButton *button_exit;
00112     GtkLabel *label_simulator;
00113     GtkFileChooserButton *button_simulator;
00115     GtkCheckButton *check_evaluator;
00116     GtkFileChooserButton *button_evaluator;
00118     GtkFrame *frame_algorithm;
00119     GtkGrid *grid_algorithm;
00120     GtkRadioButton *button_algorithm[NALGORITHMS];
00122     GtkLabel *label_simulations;
00123     GtkSpinButton *spin_simulations;
00125     GtkLabel *label_iterations;
00126     GtkSpinButton *spin_iterations;
00128     GtkLabel *label_tolerance;
00129     GtkSpinButton *spin_tolerance;
00130     GtkLabel *label_bests;
00131     GtkSpinButton *spin_bests;
00132     GtkLabel *label_population;
00133     GtkSpinButton *spin_population;
00135     GtkLabel *label_generations;
00136     GtkSpinButton *spin_generations;
00138     GtkLabel *label_mutation;
00139     GtkSpinButton *spin_mutation;
00140     GtkLabel *label_reproduction;
00141     GtkSpinButton *spin_reproduction;
00143     GtkLabel *label_adaptation;
00144     GtkSpinButton *spin_adaptation;
00146     GtkFrame *frame_variable;
00147     GtkGrid *grid_variable;
00148     GtkComboBoxText *combo_variable;

```

```

00150   GtkWidget *button_add_variable;
00151   GtkWidget *button_remove_variable;
00152   GtkWidget *label_variable;
00153   GtkWidget *entry_variable;
00154   GtkWidget *label_min;
00155   GtkWidget *spin_min;
00156   GtkWidget *scrolled_min;
00157   GtkWidget *label_max;
00158   GtkWidget *spin_max;
00159   GtkWidget *scrolled_max;
00160   GtkWidget *check_minabs;
00161   GtkWidget *spin_minabs;
00162   GtkWidget *scrolled_minabs;
00163   GtkWidget *check_maxabs;
00164   GtkWidget *spin_maxabs;
00165   GtkWidget *scrolled_maxabs;
00166   GtkWidget *label_precision;
00167   GtkWidget *spin_precision;
00168   GtkWidget *label_sweeps;
00169   GtkWidget *spin_sweeps;
00170   GtkWidget *label_bits;
00171   GtkWidget *spin_bits;
00172   GtkWidget *frame_experiment;
00173   GtkWidget *grid_experiment;
00174   GtkWidget *combo_experiment;
00175   GtkWidget *button_add_experiment;
00176   GtkWidget *button_remove_experiment;
00177   GtkWidget *label_experiment;
00178   GtkWidget *FileChooserButton *button_experiment;
00180   GtkWidget *label_weight;
00181   GtkWidget *spin_weight;
00182   GtkWidget *check_template[MAX_NINPUTS];
00184   GtkWidget *FileChooserButton *button_template[MAX_NINPUTS];
00186   GdkPixbuf *logo;
00187   Experiment *experiment;
00188   Variable *variable;
00189   char *application_directory;
00190   gulong id_experiment;
00191   gulong id_experiment_name;
00192   gulong id_variable;
00193   gulong id_variable_label;
00194   gulong id_template[MAX_NINPUTS];
00196   gulong id_input[MAX_NINPUTS];
00198   unsigned int nexperiments;
00199   unsigned int nvariables;
00200 } Window;
00201
00202 // Public functions
00203 void input_save (char *filename);
00204 void options_new ();
00205 void running_new ();
00206 int window_save ();
00207 void window_run ();
00208 void window_help ();
00209 int window_get_algorithm ();
00210 void window_update ();
00211 void window_set_algorithm ();
00212 void window_set_experiment ();
00213 void window_remove_experiment ();
00214 void window_add_experiment ();
00215 void window_name_experiment ();
00216 void window_weight_experiment ();
00217 void window_inputs_experiment ();
00218 void window_template_experiment (void *data);
00219 void window_set_variable ();
00220 void window_remove_variable ();
00221 void window_add_variable ();
00222 void window_label_variable ();
00223 void window_precision_variable ();
00224 void window_rangemin_variable ();
00225 void window_rangemax_variable ();
00226 void window_rangeminabs_variable ();
00227 void window_rangemaxabs_variable ();
00228 void window_update_variable ();
00229 int window_read (char *filename);
00230 void window_open ();
00231 void window_new ();
00232 int cores_number ();
00233
00234 #endif

```

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