

Calibrator

1.1.26

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# Chapter 1

## CALIBRATOR (1.1.26 version)

A software to perform calibrations or optimizations of empirical parameters.

### AUTHORS

- Javier Burguete Tolosa ([jburguete@eead.csic.es](mailto:jburguete@eead.csic.es))
- Borja Latorre Garcés ([borja.latorre@csic.es](mailto:borja.latorre@csic.es))

### TOOLS AND LIBRARIES REQUIRED TO BUILD THE EXECUTABLE

- mpicc, 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)
- gthreads (to use multicores in shared memory machines)
- glib (extended utilities of C to work with data, lists, mapped files, regular expressions, ...)
- [genetic](#) (genetic algorithm)

### OPTIONAL TOOLS AND LIBRARIES

- gtk+ (to create the interactive GUI tool)
- openmpi or mpich (to run in parallelized tasks)
- doxygen (standard comments format to generate documentation)
- latex (to build the PDF manuals)

## 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.

## 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

FreeBSD 10.2

NetBSD 7.0

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/1.1.26
$ 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.

## MAKING REFERENCE MANUAL INSTRUCTIONS (file latex/refman.pdf)

On UNIX type systems you need **texlive** installed. On Windows systems you need **MiKTeX**.

## USER INSTRUCTIONS

- Command line in sequential mode:

```
$ ./calibrator [-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] ./calibrator [-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
```

## INPUT FILE FORMAT

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

- **"weight"**: associated to every experiment multiplies the objective value obtained for every experiment in the final objective function value.

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:  $4 \times 5 \times 5 \times 5 = 2500$ .

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

### 4.2.1 Detailed Description

Struct to define experiment data.

Definition at line 49 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 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](#)
- 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 60 of file [calibrator.h](#).

#### 4.3.2 Field Documentation

##### 4.3.2.1 Input::nbits

## Parameters

<i>Array</i>	of bits numbers of the genetic algorithm.
--------------	---

Definition at line 120 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

- GtkLabel \* [label\\_processors](#)  
*Processors number GtkLabel.*
- GtkSpinButton \* [spin\\_processors](#)  
*Processors number GtkSpinButton.*
- GtkGrid \* [grid](#)  
*main GtkGrid.*
- GtkDialog \* [dialog](#)  
*main GtkDialog.*

### 4.4.1 Detailed Description

Struct to define the options dialog.

Definition at line 96 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 228 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

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

### 4.6.1 Detailed Description

Struct to define the running dialog.

Definition at line 118 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 67 of file [interface.h](#).

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

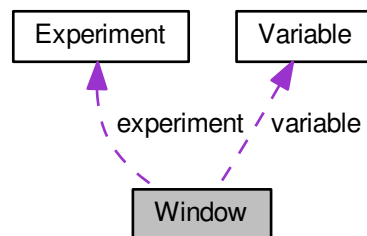
- [interface.h](#)

## 4.8 Window Struct Reference

Struct to define the main window.

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

Collaboration diagram for Window:



### Data Fields

- GtkWidget \* [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 GtkWidget.*
- GtkWidget \* [button\\_add\\_variable](#)  
*GtkWidget to add a variable.*
- GtkWidget \* [button\\_remove\\_variable](#)  
*GtkWidget to remove a variable.*
- GtkWidget \* [button\\_add\\_experiment](#)

- GtkButton to add a experiment.*

  - GtkButton \* [button\\_remove\\_experiment](#)
- GtkButton to remove a experiment.*

  - GtkRadioButton \* [button\\_algorithm](#) [NALGORITHMS]
- Array of GtkButtons to set the algorithm.*

  - GtkCheckButton \* [check\\_evaluator](#)
- Evaluator program GtkCheckButton.*

  - GtkCheckButton \* [check\\_minabs](#)
- Absolute minimum GtkCheckButton.*

  - GtkCheckButton \* [check\\_maxabs](#)
- Absolute maximum GtkCheckButton.*

  - GtkCheckButton \* [check\\_template](#) [MAX\_NINPUTS]
- Array of GtkCheckButtons to set the input templates.*

  - GtkLabel \* [label\\_simulator](#)
- Simulator program GtkLabel.*

  - GtkLabel \* [label\\_simulations](#)
- GtkLabel to set the simulations number.*

  - GtkLabel \* [label\\_iterations](#)
- GtkLabel to set the iterations number.*

  - GtkLabel \* [label\\_tolerance](#)
- GtkLabel to set the tolerance.*

  - GtkLabel \* [label\\_bests](#)
- GtkLabel to set the best number.*

  - GtkLabel \* [label\\_population](#)
- GtkLabel to set the population number.*

  - GtkLabel \* [label\\_generations](#)
- GtkLabel to set the generations number.*

  - GtkLabel \* [label\\_mutation](#)
- GtkLabel to set the mutation ratio.*

  - GtkLabel \* [label\\_reproduction](#)
- GtkLabel to set the reproduction ratio.*

  - GtkLabel \* [label\\_adaptation](#)
- GtkLabel to set the adaptation ratio.*

  - GtkLabel \* [label\\_variable](#)
- Variable GtkLabel.*

  - GtkLabel \* [label\\_min](#)
- Minimum GtkLabel.*

  - GtkLabel \* [label\\_max](#)
- Maximum GtkLabel.*

  - GtkLabel \* [label\\_precision](#)
- Precision GtkLabel.*

  - GtkLabel \* [label\\_sweeps](#)
- Sweeps number GtkLabel.*

  - GtkLabel \* [label\\_bits](#)
- Bits number GtkLabel.*

  - GtkLabel \* [label\\_experiment](#)
- Experiment GtkLabel.*

  - GtkLabel \* [label\\_weight](#)
- Weight GtkLabel.*

  - GtkEntry \* [entry\\_variable](#)
- GtkEntry to set the variable name.*



- GtkComboBoxText \* [combo\\_variable](#)  
*Variable GtkComboBoxEntry.*
- GtkComboBoxText \* [combo\\_experiment](#)  
*Experiment GtkComboBoxEntry.*
- GtkFileChooserButton \* [button\\_simulator](#)  
*Simulator program GtkFileChooserButton.*
- GtkFileChooserButton \* [button\\_evaluator](#)  
*Evaluator program GtkFileChooserButton.*
- GtkFileChooserButton \* [button\\_experiment](#)  
*GtkFileChooserButton to set the experimental data file.*
- GtkFileChooserButton \* [button\\_template](#) [MAX\_NINPUTS]  
*Array of GtkFileChooserButtons to set the input templates.*
- GtkSpinButton \* [spin\\_min](#)  
*Minimum GtkSpinButton.*
- GtkSpinButton \* [spin\\_max](#)  
*Maximum GtkSpinButton.*
- GtkSpinButton \* [spin\\_minabs](#)  
*Absolute minimum GtkSpinButton.*
- GtkSpinButton \* [spin\\_maxabs](#)  
*Absolute maximum GtkSpinButton.*
- GtkSpinButton \* [spin\\_simulations](#)  
*GtkSpinButton to set the simulations number.*
- GtkSpinButton \* [spin\\_iterations](#)  
*GtkSpinButton to set the iterations number.*
- GtkSpinButton \* [spin\\_tolerance](#)  
*GtkSpinButton to set the tolerance.*
- GtkSpinButton \* [spin\\_bests](#)  
*GtkSpinButton to set the best number.*
- GtkSpinButton \* [spin\\_population](#)  
*GtkSpinButton to set the population number.*
- GtkSpinButton \* [spin\\_generations](#)  
*GtkSpinButton to set the generations number.*
- GtkSpinButton \* [spin\\_mutation](#)  
*GtkSpinButton to set the mutation ratio.*
- GtkSpinButton \* [spin\\_reproduction](#)  
*GtkSpinButton to set the reproduction ratio.*
- GtkSpinButton \* [spin\\_adaptation](#)  
*GtkSpinButton to set the adaptation ratio.*
- GtkSpinButton \* [spin\\_precision](#)  
*Precision digits GtkSpinButton.*
- GtkSpinButton \* [spin\\_sweeps](#)  
*Sweeps number GtkSpinButton.*
- GtkSpinButton \* [spin\\_bits](#)  
*Bits number GtkSpinButton.*
- GtkSpinButton \* [spin\\_weight](#)  
*Weight GtkSpinButton.*
- GtkToolbar \* [bar\\_buttons](#)  
*GtkToolbar to store the main buttons.*
- GtkGrid \* [grid](#)  
*Main GtkGrid.*
- GtkGrid \* [grid\\_algorithm](#)

- *GtkGrid to set the algorithm.*
- GtkGrid \* [grid\\_variable](#)  
*Variable GtkGrid.*
- GtkGrid \* [grid\\_experiment](#)  
*Experiment GtkGrid.*
- GtkFrame \* [frame\\_algorithm](#)  
*GtkFrame to set the algorithm.*
- GtkFrame \* [frame\\_variable](#)  
*Variable GtkFrame.*
- GtkFrame \* [frame\\_experiment](#)  
*Experiment GtkFrame.*
- GdkPixbuf \* [logo](#)  
*Logo GdkPixbuf.*
- GtkScrolledWindow \* [scrolled\\_min](#)  
*Minimum GtkScrolledWindow.*
- GtkScrolledWindow \* [scrolled\\_max](#)  
*Maximum GtkScrolledWindow.*
- GtkScrolledWindow \* [scrolled\\_minabs](#)  
*Absolute minimum GtkScrolledWindow.*
- GtkScrolledWindow \* [scrolled\\_maxabs](#)  
*Absolute maximum GtkScrolledWindow.*
- GtkWindow \* [window](#)  
*Main GtkWindow.*
- GtkApplication \* [application](#)  
*Main GtkApplication.*
- [Experiment](#) \* [experiment](#)  
*Array of experiments data.*
- [Variable](#) \* [variable](#)  
*Array of variables data.*
- gulong [id\\_experiment](#)  
*Identifier (gulong) of the combo\_experiment signal.*
- gulong [id\\_experiment\\_name](#)  
*Identifier (gulong) of the button\_experiment signal.*
- gulong [id\\_variable](#)  
*Identifier (gulong) of the combo\_variable signal.*
- gulong [id\\_variable\\_label](#)  
*Identifier (gulong) of the entry\_variable signal.*
- gulong [id\\_template](#) [MAX\_NINPUTS]  
*Array of identifiers (gulong) of the check\_template signal.*
- gulong [id\\_input](#) [MAX\_NINPUTS]  
*Array of identifiers (gulong) 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 134 of file [interface.h](#).

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

- [interface.h](#)

## Chapter 5

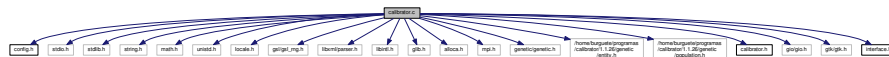
# File Documentation

### 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 <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.
- int `input_open` (char \*filename)  
Function to open the input file.
- void `input_free` ()  
Function to free the memory of the input file data.
- 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.*
- char \* `current_directory`  
*Application directory.*
- 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 [1267](#) of file [calibrator.c](#).

```

01268 {
01269     unsigned int i, j;
01270     double e;
01271     #if DEBUG
01272     fprintf(stderr, "calibrate_best_sequential: start\n");
01273     #endif
01274     if (calibrate->nsaveds < calibrate->nbest
01275         || value < calibrate->error_best[calibrate->nsaveds - 1])
01276     {
01277         if (calibrate->nsaveds < calibrate->nbest)
01278             ++calibrate->nsaveds;
01279         calibrate->error_best[calibrate->nsaveds - 1] = value;
01280         calibrate->simulation_best[calibrate->
01281 nsaveds - 1] = simulation;
01282         for (i = calibrate->nsaveds; --i;)
01283         {
01284             if (calibrate->error_best[i] < calibrate->
01285 error_best[i - 1])
01286             {
01287                 j = calibrate->simulation_best[i];
01288                 e = calibrate->error_best[i];
01289                 calibrate->simulation_best[i] = calibrate->
01290 simulation_best[i - 1];
01291                 calibrate->error_best[i] = calibrate->
01292 error_best[i - 1];

```

```

01289         calibrate->simulation_best[i - 1] = j;
01290         calibrate->error_best[i - 1] = e;
01291     }
01292     else
01293         break;
01294 }
01295 }
01296 #if DEBUG
01297 fprintf (stderr, "calibrate_best_sequential: end\n");
01298 #endif
01299 }

```

#### 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 1222 of file [calibrator.c](#).

```

01223 {
01224     unsigned int i, j;
01225     double e;
01226     #if DEBUG
01227     fprintf (stderr, "calibrate_best_thread: start\n");
01228     #endif
01229     if (calibrate->nsaveds < calibrate->nbest
01230         || value < calibrate->error_best[calibrate->nsaveds - 1])
01231     {
01232         g_mutex_lock (mutex);
01233         if (calibrate->nsaveds < calibrate->nbest)
01234             ++calibrate->nsaveds;
01235         calibrate->error_best[calibrate->nsaveds - 1] = value;
01236         calibrate->simulation_best[calibrate->
01237             nsaveds - 1] = simulation;
01237         for (i = calibrate->nsaveds; --i;)
01238         {
01239             if (calibrate->error_best[i] < calibrate->
01240                 error_best[i - 1])
01241             {
01242                 j = calibrate->simulation_best[i];
01243                 e = calibrate->error_best[i];
01244                 calibrate->simulation_best[i] = calibrate->
01245                     simulation_best[i - 1];
01246                 calibrate->error_best[i] = calibrate->
01247                     error_best[i - 1];
01248                 calibrate->simulation_best[i - 1] = j;
01249                 calibrate->error_best[i - 1] = e;
01250             }
01251             else
01252                 break;
01253         }
01254         g_mutex_unlock (mutex);
01255     }
01256     #if DEBUG
01257     fprintf (stderr, "calibrate_best_thread: end\n");
01258     #endif
01259 }

```

#### 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

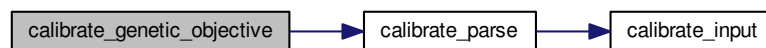
objective function value.

Definition at line 1576 of file [calibrator.c](#).

```

01577 {
01578     unsigned int j;
01579     double objective;
01580     char buffer[64];
01581     #if DEBUG
01582     fprintf (stderr, "calibrate_genetic_objective: start\n");
01583     #endif
01584     for (j = 0; j < calibrate->nvariables; ++j)
01585     {
01586         calibrate->value[entity->id * calibrate->nvariables + j]
01587         = genetic_get_variable (entity, calibrate->genetic_variable + j);
01588     }
01589     for (j = 0, objective = 0.; j < calibrate->nexperiments; ++j)
01590         objective += calibrate_parse (entity->id, j);
01591     g_mutex_lock (mutex);
01592     for (j = 0; j < calibrate->nvariables; ++j)
01593     {
01594         snprintf (buffer, 64, "%s ", format[calibrate->precision[j]]);
01595         fprintf (calibrate->file_variables, buffer,
01596             genetic_get_variable (entity, calibrate->
01597                 genetic_variable + j));
01598     }
01599     fprintf (calibrate->file_variables, "%.14le\n", objective);
01600     g_mutex_unlock (mutex);
01601     #if DEBUG
01602     fprintf (stderr, "calibrate_genetic_objective: end\n");
01603     #endif
01604     return objective;
01605 }
```

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

Definition at line 971 of file [calibrator.c](#).

```

00972 {
00973     unsigned int i;
00974     char buffer[32], value[32], *buffer2, *buffer3, *content;
00975     FILE *file;
00976     gsize length;
00977     GRegex *regex;
00978
00979     #if DEBUG
00980     fprintf (stderr, "calibrate_input: start\n");
00981     #endif
00982
00983     // Checking the file
00984     if (!template)
```

```

00985     goto calibrate_input_end;
00986
00987     // Opening template
00988     content = g_mapped_file_get_contents (template);
00989     length = g_mapped_file_get_length (template);
00990     #if DEBUG
00991     fprintf (stderr, "calibrate_input: length=%lu\ncontent:\n%s", length,
00992             content);
00993     #endif
00994     file = fopen (input, "w");
00995
00996     // Parsing template
00997     for (i = 0; i < calibrate->nvariables; ++i)
00998     {
00999     #if DEBUG
01000     fprintf (stderr, "calibrate_input: variable=%u\n", i);
01001     #endif
01002     snprintf (buffer, 32, "@variable%u@", i + 1);
01003     regex = g_regex_new (buffer, 0, 0, NULL);
01004     if (i == 0)
01005     {
01006     buffer2 = g_regex_replace_literal (regex, content, length, 0,
01007                                     calibrate->label[i], 0, NULL);
01008     #if DEBUG
01009     fprintf (stderr, "calibrate_input: buffer2\n%s", buffer2);
01010     #endif
01011     }
01012     else
01013     {
01014     length = strlen (buffer3);
01015     buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
01016                                     calibrate->label[i], 0, NULL);
01017     g_free (buffer3);
01018     }
01019     g_regex_unref (regex);
01020     length = strlen (buffer2);
01021     snprintf (buffer, 32, "@value%u@", i + 1);
01022     regex = g_regex_new (buffer, 0, 0, NULL);
01023     snprintf (value, 32, format[calibrate->precision[i]],
01024             calibrate->value[simulation * calibrate->
nvariables + i]);
01025
01026     #if DEBUG
01027     fprintf (stderr, "calibrate_input: value=%s\n", value);
01028     #endif
01029     buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
01030                                     0, NULL);
01031     g_free (buffer2);
01032     g_regex_unref (regex);
01033     }
01034
01035     // Saving input file
01036     fwrite (buffer3, strlen (buffer3), sizeof (char), file);
01037     g_free (buffer3);
01038     fclose (file);
01039
01040 calibrate_input_end:
01041 #if DEBUG
01042 fprintf (stderr, "calibrate_input: end\n");
01043 #endif
01044 return;
01045 }

```

#### 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 1383 of file [calibrator.c](#).

```

01385 {
01386     unsigned int i, j, k, s[calibrate->nbest];
01387     double e[calibrate->nbest];
01388     #if DEBUG
01389     fprintf (stderr, "calibrate_merge: start\n");

```

```

01390 #endif
01391     i = j = k = 0;
01392     do
01393     {
01394         if (i == calibrate->nsaveds)
01395         {
01396             s[k] = simulation_best[j];
01397             e[k] = error_best[j];
01398             ++j;
01399             ++k;
01400             if (j == nsaveds)
01401                 break;
01402         }
01403         else if (j == nsaveds)
01404         {
01405             s[k] = calibrate->simulation_best[i];
01406             e[k] = calibrate->error_best[i];
01407             ++i;
01408             ++k;
01409             if (i == calibrate->nsaveds)
01410                 break;
01411         }
01412         else if (calibrate->error_best[i] > error_best[j])
01413         {
01414             s[k] = simulation_best[j];
01415             e[k] = error_best[j];
01416             ++j;
01417             ++k;
01418         }
01419         else
01420         {
01421             s[k] = calibrate->simulation_best[i];
01422             e[k] = calibrate->error_best[i];
01423             ++i;
01424             ++k;
01425         }
01426     }
01427     while (k < calibrate->nbest);
01428     calibrate->nsaveds = k;
01429     memcpy (calibrate->simulation_best, s, k * sizeof (unsigned int));
01430     memcpy (calibrate->error_best, e, k * sizeof (double));
01431     #if DEBUG
01432     fprintf (stderr, "calibrate_merge: end\n");
01433     #endif
01434 }

```

#### 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 1058 of file calibrator.c.

```

01059 {
01060     unsigned int i;
01061     double e;
01062     char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
01063         *buffer3, *buffer4;
01064     FILE *file_result;
01065
01066     #if DEBUG
01067     fprintf (stderr, "calibrate_parse: start\n");
01068     fprintf (stderr, "calibrate_parse: simulation=%u experiment=%u\n", simulation,
01069             experiment);
01070     #endif
01071
01072     // Opening input files
01073     for (i = 0; i < calibrate->ninputs; ++i)
01074     {
01075         snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);

```

```

01076 #if DEBUG
01077     fprintf (stderr, "calibrate_parse: i=%u input=%s\n", i, &input[i][0]);
01078 #endif
01079     calibrate_input (simulation, &input[i][0],
01080                     calibrate->file[i][experiment]);
01081 }
01082 for (; i < MAX_NINPUTS; ++i)
01083     strcpy (&input[i][0], "");
01084 #if DEBUG
01085     fprintf (stderr, "calibrate_parse: parsing end\n");
01086 #endif
01087
01088 // Performing the simulation
01089 snprintf (output, 32, "output-%u-%u", simulation, experiment);
01090 buffer2 = g_path_get_dirname (calibrate->simulator);
01091 buffer3 = g_path_get_basename (calibrate->simulator);
01092 buffer4 = g_build_filename (buffer2, buffer3, NULL);
01093 snprintf (buffer, 512, "%s\\%s\\%s %s %s %s %s %s %s %s",
01094          buffer4, input[0], input[1], input[2], input[3], input[4], input[5],
01095          input[6], input[7], output);
01096 g_free (buffer4);
01097 g_free (buffer3);
01098 g_free (buffer2);
01099 #if DEBUG
01100     fprintf (stderr, "calibrate_parse: %s\n", buffer);
01101 #endif
01102     system (buffer);
01103
01104 // Checking the objective value function
01105 if (calibrate->evaluator)
01106 {
01107     snprintf (result, 32, "result-%u-%u", simulation, experiment);
01108     buffer2 = g_path_get_dirname (calibrate->evaluator);
01109     buffer3 = g_path_get_basename (calibrate->evaluator);
01110     buffer4 = g_build_filename (buffer2, buffer3, NULL);
01111     snprintf (buffer, 512, "%s\\%s\\%s %s %s %s",
01112             buffer4, output, calibrate->experiment[experiment], result);
01113     g_free (buffer4);
01114     g_free (buffer3);
01115     g_free (buffer2);
01116 #if DEBUG
01117     fprintf (stderr, "calibrate_parse: %s\n", buffer);
01118 #endif
01119     system (buffer);
01120     file_result = fopen (result, "r");
01121     e = atof (fgets (buffer, 512, file_result));
01122     fclose (file_result);
01123 }
01124 else
01125 {
01126     strcpy (result, "");
01127     file_result = fopen (output, "r");
01128     e = atof (fgets (buffer, 512, file_result));
01129     fclose (file_result);
01130 }
01131
01132 // Removing files
01133 #if !DEBUG
01134     for (i = 0; i < calibrate->ninputs; ++i)
01135     {
01136         if (calibrate->file[i][0])
01137         {
01138             snprintf (buffer, 512, RM " %s", &input[i][0]);
01139             system (buffer);
01140         }
01141     }
01142     snprintf (buffer, 512, RM " %s %s", output, result);
01143     system (buffer);
01144 #endif
01145
01146 #if DEBUG
01147     fprintf (stderr, "calibrate_parse: end\n");
01148 #endif
01149
01150 // Returning the objective function
01151 return e * calibrate->weight[experiment];
01152 }

```

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 1194 of file [calibrator.c](#).

```

01195 {
01196     unsigned int i;
01197     char buffer[64];
01198     #if DEBUG
01199     fprintf (stderr, "calibrate_save_variables: start\n");
01200     #endif
01201     for (i = 0; i < calibrate->nvariables; ++i)
01202     {
01203         snprintf (buffer, 64, "%s ", format[calibrate->precision[i]]);
01204         fprintf (calibrate->file_variables, buffer,
01205                 calibrate->value[simulation * calibrate->
01206                 nvariables + i]);
01207     }
01207     fprintf (calibrate->file_variables, "%.14le\n", error);
01208     #if DEBUG
01209     fprintf (stderr, "calibrate_save_variables: end\n");
01210     #endif
01211 }
  
```

#### 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 1309 of file [calibrator.c](#).

```

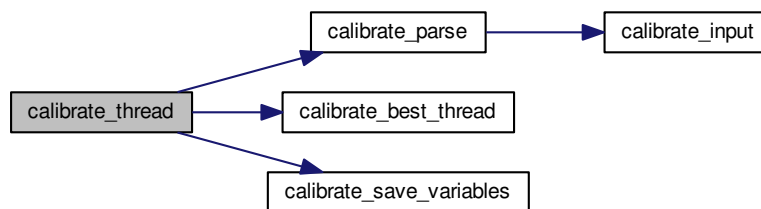
01310 {
01311     unsigned int i, j, thread;
01312     double e;
01313     #if DEBUG
01314     fprintf (stderr, "calibrate_thread: start\n");
01315     #endif
01316     thread = data->thread;
01317     #if DEBUG
01318     fprintf (stderr, "calibrate_thread: thread=%u start=%u end=%u\n", thread,
01319             calibrate->thread[thread], calibrate->thread[thread + 1]);
  
```

```

01320 #endif
01321     for (i = calibrate->thread[thread]; i < calibrate->thread[thread + 1]; ++i)
01322     {
01323         e = 0.;
01324         for (j = 0; j < calibrate->nexperiments; ++j)
01325             e += calibrate_parse (i, j);
01326         calibrate_best_thread (i, e);
01327         g_mutex_lock (mutex);
01328         calibrate_save_variables (i, e);
01329         g_mutex_unlock (mutex);
01330 #if DEBUG
01331         fprintf (stderr, "calibrate_thread: i=%u e=%lg\n", i, e);
01332 #endif
01333     }
01334 #if DEBUG
01335     fprintf (stderr, "calibrate_thread: end\n");
01336 #endif
01337     g_thread_exit (NULL);
01338     return NULL;
01339 }

```

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 3731 of file [calibrator.c](#).

```

03732 {
03733 #ifdef G_OS_WIN32
03734     SYSTEM_INFO sysinfo;
03735     GetSystemInfo (&sysinfo);
03736     return sysinfo.dwNumberOfProcessors;
03737 #else
03738     return (int) sysconf (_SC_NPROCESSORS_ONLN);
03739 #endif
03740 }

```

#### 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 458 of file `calibrator.c`.

```

00459 {
00460     int error_code;
00461     unsigned int i;
00462     char buffer2[64];
00463     xmlChar *buffer;
00464     xmlDoc *doc;
00465     xmlNode *node, *child;
00466
00467     #if DEBUG
00468         fprintf (stderr, "input_new: start\n");
00469     #endif
00470
00471     // Resetting input data
00472     input_new ();
00473
00474     // Parsing the input file
00475     doc = xmlParseFile (filename);
00476     if (!doc)
00477     {
00478         show_error (gettext ("Unable to parse the input file"));
00479         return 0;
00480     }
00481
00482     // Getting the root node
00483     node = xmlDocGetRootElement (doc);
00484     if (xmlStrcmp (node->name, XML_CALIBRATE))
00485     {
00486         show_error (gettext ("Bad root XML node"));
00487         return 0;
00488     }
00489
00490     // Opening simulator program name
00491     input->simulator = (char *) xmlGetProp (node, XML_SIMULATOR);
00492     if (!input->simulator)
00493     {
00494         show_error (gettext ("Bad simulator program"));
00495         return 0;
00496     }
00497
00498     // Opening evaluator program name
00499     input->evaluator = (char *) xmlGetProp (node, XML_EVALUATOR);
00500
00501     // Opening algorithm
00502     buffer = xmlGetProp (node, XML_ALGORITHM);
00503     if (!xmlStrcmp (buffer, XML_MONTE_CARLO))
00504     {
00505         input->algorithm = ALGORITHM_MONTE_CARLO;
00506
00507         // Obtaining simulations number
00508         input->nsimulations
00509             = xml_node_get_int (node, XML_NSIMULATIONS, &error_code);
00510         if (error_code)
00511         {
00512             show_error (gettext ("Bad simulations number"));
00513             return 0;
00514         }
00515     }
00516     else if (!xmlStrcmp (buffer, XML_SWEEP))
00517         input->algorithm = ALGORITHM_SWEEP;
00518     else if (!xmlStrcmp (buffer, XML_GENETIC))
00519     {
00520         input->algorithm = ALGORITHM_GENETIC;
00521
00522         // Obtaining population
00523         if (xmlHasProp (node, XML_NPOPULATION))
00524         {
00525             input->nsimulations
00526                 = xml_node_get_uint (node, XML_NPOPULATION, &error_code);
00527             if (error_code || input->nsimulations < 3)
00528             {
00529                 show_error (gettext ("Invalid population number"));
00530                 return 0;
00531             }

```

```

00532     }
00533     else
00534     {
00535         show_error (gettext ("No population number"));
00536         return 0;
00537     }
00538
00539     // Obtaining generations
00540     if (xmlHasProp (node, XML_NGENERATIONS))
00541     {
00542         input->niterations
00543         = xml_node_get_uint (node, XML_NGENERATIONS, &error_code);
00544         if (error_code || !input->niterations)
00545         {
00546             show_error (gettext ("Invalid generation number"));
00547             return 0;
00548         }
00549     }
00550     else
00551     {
00552         show_error (gettext ("No generation number"));
00553         return 0;
00554     }
00555
00556     // Obtaining mutation probability
00557     if (xmlHasProp (node, XML_MUTATION))
00558     {
00559         input->mutation_ratio
00560         = xml_node_get_float (node, XML_MUTATION, &error_code);
00561         if (error_code || input->mutation_ratio < 0.
00562             || input->mutation_ratio >= 1.)
00563         {
00564             show_error (gettext ("Invalid mutation probability"));
00565             return 0;
00566         }
00567     }
00568     else
00569     {
00570         show_error (gettext ("No mutation probability"));
00571         return 0;
00572     }
00573
00574     // Obtaining reproduction probability
00575     if (xmlHasProp (node, XML_REPRODUCTION))
00576     {
00577         input->reproduction_ratio
00578         = xml_node_get_float (node, XML_REPRODUCTION, &error_code);
00579         if (error_code || input->reproduction_ratio < 0.
00580             || input->reproduction_ratio >= 1.0)
00581         {
00582             show_error (gettext ("Invalid reproduction probability"));
00583             return 0;
00584         }
00585     }
00586     else
00587     {
00588         show_error (gettext ("No reproduction probability"));
00589         return 0;
00590     }
00591
00592     // Obtaining adaptation probability
00593     if (xmlHasProp (node, XML_ADAPTATION))
00594     {
00595         input->adaptation_ratio
00596         = xml_node_get_float (node, XML_ADAPTATION, &error_code);
00597         if (error_code || input->adaptation_ratio < 0.
00598             || input->adaptation_ratio >= 1.)
00599         {
00600             show_error (gettext ("Invalid adaptation probability"));
00601             return 0;
00602         }
00603     }
00604     else
00605     {
00606         show_error (gettext ("No adaptation probability"));
00607         return 0;
00608     }
00609
00610     // Checking survivals
00611     i = input->mutation_ratio * input->nsimulations;
00612     i += input->reproduction_ratio * input->
00613     nsimulations;
00614     i += input->adaptation_ratio * input->
00615     nsimulations;
00616     if (i > input->nsimulations - 2)
00617     {
00618         show_error

```



```

00617         (gettext
00618         ("No enough survival entities to reproduce the population"));
00619         return 0;
00620     }
00621 }
00622 else
00623 {
00624     show_error (gettext ("Unknown algorithm"));
00625     return 0;
00626 }
00627
00628 if (input->algorithm == ALGORITHM_MONTE_CARLO
00629 || input->algorithm == ALGORITHM_SWEEP)
00630 {
00631
00632     // Obtaining iterations number
00633     input->niterations
00634     = xml_node_get_int (node, XML_NITERATIONS, &error_code);
00635     if (error_code == 1)
00636         input->niterations = 1;
00637     else if (error_code)
00638     {
00639         show_error (gettext ("Bad iterations number"));
00640         return 0;
00641     }
00642
00643     // Obtaining best number
00644     if (xmlHasProp (node, XML_NBEST))
00645     {
00646         input->nbest = xml_node_get_uint (node,
XML_NBEST, &error_code);
00647         if (error_code || !input->nbest)
00648         {
00649             show_error (gettext ("Invalid best number"));
00650             return 0;
00651         }
00652     }
00653     else
00654         input->nbest = 1;
00655
00656     // Obtaining tolerance
00657     if (xmlHasProp (node, XML_TOLERANCE))
00658     {
00659         input->tolerance
00660         = xml_node_get_float (node, XML_TOLERANCE, &error_code);
00661         if (error_code || input->tolerance < 0.)
00662         {
00663             show_error (gettext ("Invalid tolerance"));
00664             return 0;
00665         }
00666     }
00667     else
00668         input->tolerance = 0.;
00669 }
00670
00671 // Reading the experimental data
00672 for (child = node->children; child; child = child->next)
00673 {
00674     if (xmlStrcmp (child->name, XML_EXPERIMENT))
00675         break;
00676 #if DEBUG
00677     fprintf (stderr, "input_new: nexperiments=%u\n", input->nexperiments);
00678 #endif
00679     if (xmlHasProp (child, XML_NAME))
00680     {
00681         input->experiment
00682         = g_realloc (input->experiment,
00683                     (1 + input->nexperiments) * sizeof (char *));
00684         input->experiment[input->nexperiments]
00685         = (char *) xmlGetProp (child, XML_NAME);
00686     }
00687     else
00688     {
00689         show_error (gettext ("No experiment file name"));
00690         return 0;
00691     }
00692 #if DEBUG
00693     fprintf (stderr, "input_new: experiment=%s\n",
00694             input->experiment[input->nexperiments]);
00695 #endif
00696     input->weight = g_realloc (input->weight,
00697                               (1 + input->nexperiments) * sizeof (double));
00698     if (xmlHasProp (child, XML_WEIGHT))
00699         input->weight[input->nexperiments]
00700         = xml_node_get_float (child, XML_WEIGHT, &error_code);
00701     else
00702         input->weight[input->nexperiments] = 1.;

```

```

00703 #if DEBUG
00704     fprintf (stderr, "input_new: weight=%lg\n",
00705             input->weight[input->nexperiments]);
00706 #endif
00707     if (!input->nexperiments)
00708         input->ninputs = 0;
00709 #if DEBUG
00710     fprintf (stderr, "input_new: template[0]\n");
00711 #endif
00712     if (xmlHasProp (child, XML_TEMPLATE1))
00713     {
00714         input->template[0]
00715             = (char **) g_realloc (input->template[0],
00716                                   (1 + input->nexperiments) * sizeof (char *));
00717         input->template[0][input->nexperiments]
00718             = (char *) xmlGetProp (child, template[0]);
00719 #if DEBUG
00720         fprintf (stderr, "input_new: experiment=%u templatel=%s\n",
00721                 input->nexperiments,
00722                 input->template[0][input->nexperiments]);
00723 #endif
00724         if (!input->nexperiments)
00725             ++input->ninputs;
00726 #if DEBUG
00727         fprintf (stderr, "input_new: ninputs=%u\n", input->ninputs);
00728 #endif
00729     }
00730     else
00731     {
00732         show_error (gettext ("No experiment template"));
00733         return 0;
00734     }
00735     for (i = 1; i < MAX_NINPUTS; ++i)
00736     {
00737 #if DEBUG
00738         fprintf (stderr, "input_new: template%u\n", i + 1);
00739 #endif
00740         if (xmlHasProp (child, template[i]))
00741         {
00742             if (input->nexperiments && input->ninputs < 2)
00743             {
00744                 snprintf (buffer2, 64,
00745                         gettext ("Experiment %u: bad templates number"),
00746                         input->nexperiments + 1);
00747                 show_error (buffer2);
00748                 return 0;
00749             }
00750             input->template[i] = (char **)
00751                 g_realloc (input->template[i],
00752                           (1 + input->nexperiments) * sizeof (char *));
00753             input->template[i][input->nexperiments]
00754                 = (char *) xmlGetProp (child, template[i]);
00755 #if DEBUG
00756             fprintf (stderr, "input_new: experiment=%u template%u=%s\n",
00757                     input->nexperiments, i + 1,
00758                     input->template[i][input->nexperiments]);
00759 #endif
00760             if (!input->nexperiments)
00761                 ++input->ninputs;
00762 #if DEBUG
00763             fprintf (stderr, "input_new: ninputs=%u\n", input->ninputs);
00764 #endif
00765         }
00766         else if (input->nexperiments && input->ninputs > 1)
00767         {
00768             snprintf (buffer2, 64, gettext ("No experiment %u template%u"),
00769                     input->nexperiments + 1, i + 1);
00770             show_error (buffer2);
00771             return 0;
00772         }
00773         else
00774             break;
00775     }
00776     ++input->nexperiments;
00777 #if DEBUG
00778     fprintf (stderr, "input_new: nexperiments=%u\n", input->nexperiments);
00779 #endif
00780 }
00781 if (!input->nexperiments)
00782 {
00783     show_error (gettext ("No calibration experiments"));
00784     return 0;
00785 }
00786 // Reading the variables data
00787 for (; child; child = child->next)
00788 {

```

```

00790     if (xmlStrcmp (child->name, XML_VARIABLE))
00791     {
00792         show_error (gettext ("Bad XML node"));
00793         return 0;
00794     }
00795     if (xmlHasProp (child, XML_NAME))
00796     {
00797         input->label = g_realloc
00798             (input->label, (1 + input->nvariables) * sizeof (char *));
00799         input->label[input->nvariables]
00800             = (char *) xmlGetProp (child, XML_NAME);
00801     }
00802     else
00803     {
00804         show_error (gettext ("No variable name"));
00805         return 0;
00806     }
00807     if (xmlHasProp (child, XML_MINIMUM))
00808     {
00809         input->rangemin = g_realloc
00810             (input->rangemin, (1 + input->nvariables) * sizeof (double));
00811         input->rangeminabs = g_realloc
00812             (input->rangeminabs, (1 + input->nvariables) * sizeof (double));
00813         input->rangemin[input->nvariables]
00814             = xml_node_get_float (child, XML_MINIMUM, &error_code);
00815         if (xmlHasProp (child, XML_ABSOLUTE_MINIMUM))
00816         {
00817             input->rangeminabs[input->nvariables]
00818                 = xml_node_get_float (child,
XML_ABSOLUTE_MINIMUM, &error_code);
00819         }
00820         else
00821             input->rangeminabs[input->nvariables] = -G_MAXDOUBLE;
00822     }
00823     else
00824     {
00825         show_error (gettext ("No minimum range"));
00826         return 0;
00827     }
00828     if (xmlHasProp (child, XML_MAXIMUM))
00829     {
00830         input->rangemax = g_realloc
00831             (input->rangemax, (1 + input->nvariables) * sizeof (double));
00832         input->rangemaxabs = g_realloc
00833             (input->rangemaxabs, (1 + input->nvariables) * sizeof (double));
00834         input->rangemax[input->nvariables]
00835             = xml_node_get_float (child, XML_MAXIMUM, &error_code);
00836         if (xmlHasProp (child, XML_ABSOLUTE_MAXIMUM))
00837             input->rangemaxabs[input->nvariables]
00838                 = xml_node_get_float (child,
XML_ABSOLUTE_MAXIMUM, &error_code);
00839         else
00840             input->rangemaxabs[input->nvariables] = G_MAXDOUBLE;
00841     }
00842     else
00843     {
00844         show_error (gettext ("No maximum range"));
00845         return 0;
00846     }
00847     input->precision = g_realloc
00848         (input->precision, (1 + input->nvariables) * sizeof (unsigned int));
00849     if (xmlHasProp (child, XML_PRECISION))
00850         input->precision[input->nvariables]
00851             = xml_node_get_uint (child, XML_PRECISION, &error_code);
00852     else
00853         input->precision[input->nvariables] =
DEFAULT_PRECISION;
00854     if (input->algorithm == ALGORITHM_SWEEP)
00855     {
00856         if (xmlHasProp (child, XML_NSWEEPS))
00857         {
00858             input->nsweeps = (unsigned int *)
g_realloc (input->nsweeps,
(1 + input->nvariables) * sizeof (unsigned int));
00859             input->nsweeps[input->nvariables]
00860                 = xml_node_get_uint (child, XML_NSWEEPS, &error_code);
00861         }
00862         else
00863         {
00864             show_error (gettext ("No sweeps number"));
00865             return 0;
00866         }
00867     }
00868     #if DEBUG
00869     fprintf (stderr, "input_new: nsweeps=%u nsimulations=%u\n",
input->nsweeps[input->nvariables],
input->nsimulations);
00870     #endif

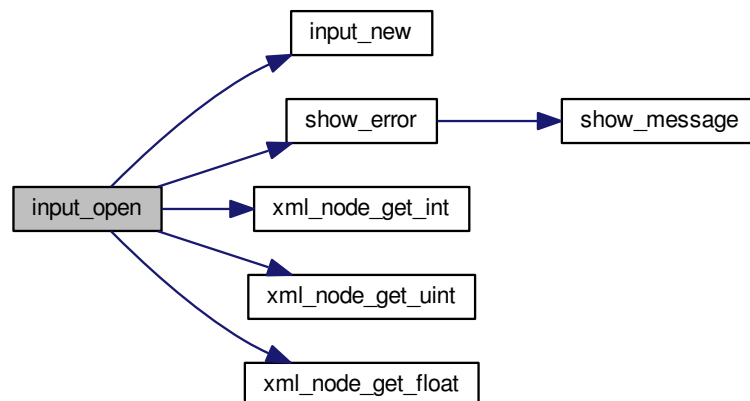
```

```

00873     }
00874     if (input->algorithm == ALGORITHM_GENETIC)
00875     {
00876         // Obtaining bits representing each variable
00877         if (xmlHasProp (child, XML_NBITS))
00878         {
00879             input->nbits = (unsigned int *)
00880                 g_realloc (input->nbits,
00881                     (1 + input->nvariables) * sizeof (unsigned int));
00882             i = xml_node_get_uint (child, XML_NBITS, &error_code);
00883             if (error_code || !i)
00884             {
00885                 show_error (gettext ("Invalid bit number"));
00886                 return 0;
00887             }
00888             input->nbits[input->nvariables] = i;
00889         }
00890         else
00891         {
00892             show_error (gettext ("No bits number"));
00893             return 0;
00894         }
00895     }
00896     ++input->nvariables;
00897 }
00898 if (!input->nvariables)
00899 {
00900     show_error (gettext ("No calibration variables"));
00901     return 0;
00902 }
00903
00904 // Getting the working directory
00905 input->directory = g_path_get_dirname (filename);
00906 input->name = g_path_get_basename (filename);
00907
00908 // Closing the XML document
00909 xmlFreeDoc (doc);
00910
00911 #if DEBUG
00912 fprintf (stderr, "input_new: end\n");
00913 #endif
00914
00915 return 1;
00916 }

```

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 2070 of file `calibrator.c`.

```

02071 {
02072     unsigned int i, j;
02073     char *buffer;
02074     xmlDoc *doc;
02075     xmlNode *node, *child;
02076     GFile *file, *file2;
02077
02078     // Getting the input file directory
02079     input->name = g_path_get_basename (filename);
02080     input->directory = g_path_get_dirname (filename);
02081     file = g_file_new_for_path (input->directory);
02082
02083     // Opening the input file
02084     doc = xmlNewDoc ((const xmlChar *) "1.0");
02085
02086     // Setting root XML node
02087     node = xmlNewDocNode (doc, 0, XML_CALIBRATE, 0);
02088     xmlDocSetRootElement (doc, node);
02089
02090     // Adding properties to the root XML node
02091     file2 = g_file_new_for_path (input->simulator);
02092     buffer = g_file_get_relative_path (file, file2);
02093     g_object_unref (file2);
02094     xmlSetProp (node, XML_SIMULATOR, (xmlChar *) buffer);
02095     g_free (buffer);
02096     if (input->evaluator)
02097     {
02098         file2 = g_file_new_for_path (input->evaluator);
02099         buffer = g_file_get_relative_path (file, file2);
02100         g_object_unref (file2);
02101         if (xmlStrlen ((xmlChar *) buffer))
02102             xmlSetProp (node, XML_EVALUATOR, (xmlChar *) buffer);
02103         g_free (buffer);
02104     }
02105
02106     // Setting the algorithm
02107     buffer = (char *) g_malloc (64);
02108     switch (input->algorithm)
02109     {
02110         case ALGORITHM_MONTE_CARLO:
02111             xmlSetProp (node, XML_ALGORITHM, XML_MONTE_CARLO);
02112             snprintf (buffer, 64, "%u", input->nsimulations);
02113             xmlSetProp (node, XML_NSIMULATIONS, (xmlChar *) buffer);
02114             snprintf (buffer, 64, "%u", input->niterations);
02115             xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02116             snprintf (buffer, 64, "%.3lg", input->tolerance);
02117             xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02118             snprintf (buffer, 64, "%u", input->nbest);
02119             xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02120             break;
02121         case ALGORITHM_SWEEP:
02122             xmlSetProp (node, XML_ALGORITHM, XML_SWEEP);
02123             snprintf (buffer, 64, "%u", input->niterations);
02124             xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02125             snprintf (buffer, 64, "%.3lg", input->tolerance);
02126             xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02127             snprintf (buffer, 64, "%u", input->nbest);
02128             xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02129             break;
02130         default:
02131             xmlSetProp (node, XML_ALGORITHM, XML_GENETIC);
02132             snprintf (buffer, 64, "%u", input->nsimulations);
02133             xmlSetProp (node, XML_NPOPULATION, (xmlChar *) buffer);
02134             snprintf (buffer, 64, "%u", input->niterations);
02135             xmlSetProp (node, XML_NGENERATIONS, (xmlChar *) buffer);
02136             snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
02137             xmlSetProp (node, XML_MUTATION, (xmlChar *) buffer);
02138             snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
02139             xmlSetProp (node, XML_REPRODUCTION, (xmlChar *) buffer);
02140             snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
02141             xmlSetProp (node, XML_ADAPTATION, (xmlChar *) buffer);
02142             break;
02143     }
02144     g_free (buffer);
02145
02146     // Setting the experimental data
02147     for (i = 0; i < input->nexperiments; ++i)
02148     {
02149         child = xmlNewChild (node, 0, XML_EXPERIMENT, 0);
02150         xmlSetProp (child, XML_NAME, (xmlChar *) input->experiment[i]);

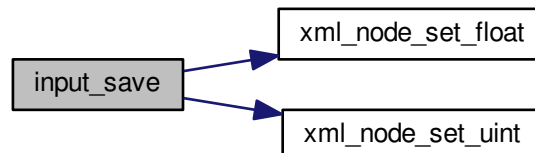
```

```

02151         if (input->weight[i] != 1.)
02152             xml_node_set_float (child, XML_WEIGHT, input->
weight[i]);
02153         for (j = 0; j < input->ninputs; ++j)
02154             xmlSetProp (child, template[j], (xmlChar *) input->template[j][i]);
02155     }
02156
02157     // Setting the variables data
02158     for (i = 0; i < input->nvariables; ++i)
02159     {
02160         child = xmlNewChild (node, 0, XML_VARIABLE, 0);
02161         xmlSetProp (child, XML_NAME, (xmlChar *) input->label[i]);
02162         xml_node_set_float (child, XML_MINIMUM, input->
rangemin[i]);
02163         if (input->rangeminabs[i] != -G_MAXDOUBLE)
02164             xml_node_set_float (child, XML_ABSOLUTE_MINIMUM,
input->rangeminabs[i]);
02165         xml_node_set_float (child, XML_MAXIMUM, input->
rangemax[i]);
02166         if (input->rangemaxabs[i] != G_MAXDOUBLE)
02167             xml_node_set_float (child, XML_ABSOLUTE_MAXIMUM,
input->rangemaxabs[i]);
02168         if (input->precision[i] != DEFAULT_PRECISION)
02169             xml_node_set_uint (child, XML_PRECISION,
input->precision[i]);
02170         if (input->algorithm == ALGORITHM_SWEEP)
02171             xml_node_set_uint (child, XML_NSWEEPS, input->
nsweeps[i]);
02172         else if (input->algorithm == ALGORITHM_GENETIC)
02173             xml_node_set_uint (child, XML_NBITS, input->
nbits[i]);
02174     }
02175
02176     // Saving the XML file
02177     xmlSaveFormatFile (filename, doc, 1);
02178
02179     // Freeing memory
02180     xmlFreeDoc (doc);
02181 }

```

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.

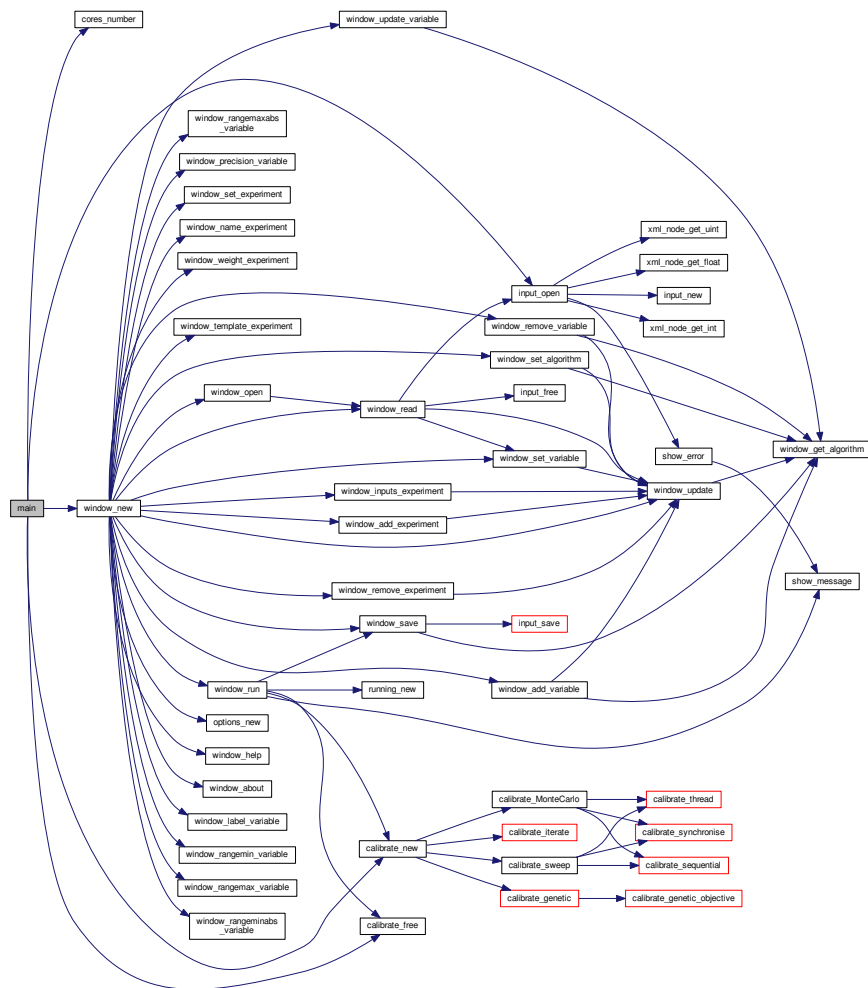
Definition at line 3752 of file [calibrator.c](#).

```

03753 {
03754     #if HAVE_GTK
03755         int status;
03756     #endif
03757     #if HAVE_MPI
03758         // Starting MPI
03759         MPI_Init (&argn, &argc);
03760         MPI_Comm_size (MPI_COMM_WORLD, &ntasks);
03761         MPI_Comm_rank (MPI_COMM_WORLD, &calibrate->mpi_rank);
03762         printf ("rank=%d tasks=%d\n", calibrate->mpi_rank, ntasks);
03763     #else
03764         ntasks = 1;
03765     #endif
03766     // Starting pseudo-random numbers generator
03767     calibrate->rng = gsl_rng_alloc (gsl_rng_taus2);
03768     gsl_rng_set (calibrate->rng, DEFAULT_RANDOM_SEED);
03769     // Allowing spaces in the XML data file
03770     xmlKeepBlanksDefault (0);
03771
03772     #if HAVE_GTK
03773
03774         nthreads = cores_number ();
03775         setlocale (LC_ALL, "");
03776         setlocale (LC_NUMERIC, "C");
03777         current_directory = g_get_current_dir ();
03778         bindtextdomain
03779             (PROGRAM_INTERFACE, g_build_filename (current_directory,
03780             LOCALE_DIR, NULL));
03781         bind_textdomain_codeset (PROGRAM_INTERFACE, "UTF-8");
03782         textdomain (PROGRAM_INTERFACE);
03783         gtk_disable_setlocale ();
03784         window->application = gtk_application_new ("git.jburguete.calibrator",
03785             G_APPLICATION_FLAGS_NONE);
03786         g_signal_connect (window->application, "activate", window_new, NULL);
03787         status = g_application_run (G_APPLICATION (window->application), argn, argc);
03788         g_object_unref (window->application);
03789     #else
03790
03791         // Checking syntax
03792         if (!(argn == 2 || (argn == 4 && !strcmp (argc[1], "-nthreads"))))
03793         {
03794             printf ("The syntax is:\ncalibrator [-nthreads x] data_file\n");
03795         }
03796         #if HAVE_MPI
03797             // Closing MPI
03798             MPI_Finalize ();
03799         #endif
03800         return 1;
03801     }
03802     // Getting threads number
03803     if (argn == 2)
03804         nthreads = cores_number ();
03805     else
03806         nthreads = atoi (argc[2]);
03807     printf ("nthreads=%u\n", nthreads);
03808     // Making calibration
03809     if (input_open (argc[argn - 1]))
03810         calibrate_new ();
03811     // Freeing memory
03812     calibrate_free ();
03813 #endif
03814
03815     // Freeing memory
03816     gsl_rng_free (calibrate->rng);
03817     #if HAVE_MPI
03818         // Closing MPI
03819         MPI_Finalize ();
03820     #endif
03821
03822     #if HAVE_GTK
03823         g_free (current_directory);
03824         return status;
03825     #else
03826         return 0;
03827     #endif
03828 }

```

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 273 of file [calibrator.c](#).

```
00274 {
00275     show_message (gettext ("ERROR!"), msg, ERROR_TYPE);
00276 }
```



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 243 of file [calibrator.c](#).

```

00244 {
00245     #if HAVE_GTK
00246         GtkMessageDialog *dlg;
00247
00248         // Creating the dialog
00249         dlg = (GtkMessageDialog *) gtk_message_dialog_new
00250             (window->window, GTK_DIALOG_MODAL, type, GTK_BUTTONS_OK, "%s", msg);
00251
00252         // Setting the dialog title
00253         gtk_window_set_title (GTK_WINDOW (dlg), title);
00254
00255         // Showing the dialog and waiting response
00256         gtk_dialog_run (GTK_DIALOG (dlg));
00257
00258         // Closing and freeing memory
00259         gtk_widget_destroy (GTK_WIDGET (dlg));
00260
00261     #else
00262         printf ("%s: %s\n", title, msg);
00263     #endif
00264 }
  
```

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

Function to get the algorithm number.

##### Returns

Algorithm number.

Definition at line 2421 of file [calibrator.c](#).

```

02422 {
02423     unsigned int i;
02424     for (i = 0; i < NALGORITHMS; ++i)
02425         if (gtk_toggle_button_get_active
02426             (GTK_TOGGLE_BUTTON (window->button_algorithm[i])))
02427             break;
02428     return i;
02429 }
  
```

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 3137 of file `calibrator.c`.

```

03138 {
03139     unsigned int i;
03140     char *buffer;
03141     #if DEBUG
03142     fprintf (stderr, "window_read: start\n");
03143     #endif
03144     input_free ();
03145     if (!input_open (filename))
03146     {
03147         #if DEBUG
03148         fprintf (stderr, "window_read: end\n");
03149         #endif
03150         return 0;
03151     }
03152     buffer = g_build_filename (input->directory, input->
simulator, NULL);
03153     puts (buffer);
03154     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
(window->button_simulator), buffer);
03155     g_free (buffer);
03156     gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
(size_t) input->evaluator);
03157     if (input->evaluator)
03158     {
03159         buffer = g_build_filename (input->directory, input->
evaluator, NULL);
03160         gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
(window->button_evaluator), buffer);
03161         g_free (buffer);
03162     }
03163     gtk_toggle_button_set_active
(GTK_TOGGLE_BUTTON (window->button_algorithm[input->
algorithm]), TRUE);
03164     switch (input->algorithm)
03165     {
03166     case ALGORITHM_MONTE_CARLO:
03167         gtk_spin_button_set_value (window->spin_simulations,
(gdouble) input->nsimulations);
03168     case ALGORITHM_SWEEP:
03169         gtk_spin_button_set_value (window->spin_iterations,
(gdouble) input->niterations);
03170         gtk_spin_button_set_value (window->spin_bests, (gdouble)
input->nbest);
03171         gtk_spin_button_set_value (window->spin_tolerance,
input->tolerance);
03172         break;
03173     default:
03174         gtk_spin_button_set_value (window->spin_population,
(gdouble) input->nsimulations);
03175         gtk_spin_button_set_value (window->spin_generations,
(gdouble) input->niterations);
03176         gtk_spin_button_set_value (window->spin_mutation, input->
mutation_ratio);
03177         gtk_spin_button_set_value (window->spin_reproduction,
input->reproduction_ratio);
03178         gtk_spin_button_set_value (window->spin_adaptation,
input->adaptation_ratio);
03179     }
03180     g_signal_handler_block (window->combo_experiment, window->
id_experiment);
03181     g_signal_handler_block (window->button_experiment,
window->id_experiment_name);
03182     gtk_combo_box_text_remove_all (window->combo_experiment);
03183     for (i = 0; i < input->nexperiments; ++i)
03184         gtk_combo_box_text_append_text (window->combo_experiment,
input->experiment[i]);
03185     g_signal_handler_unblock
(window->button_experiment, window->
id_experiment_name);
03186     g_signal_handler_unblock (window->combo_experiment,
window->id_experiment);
03187     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
03188     g_signal_handler_block (window->combo_variable, window->

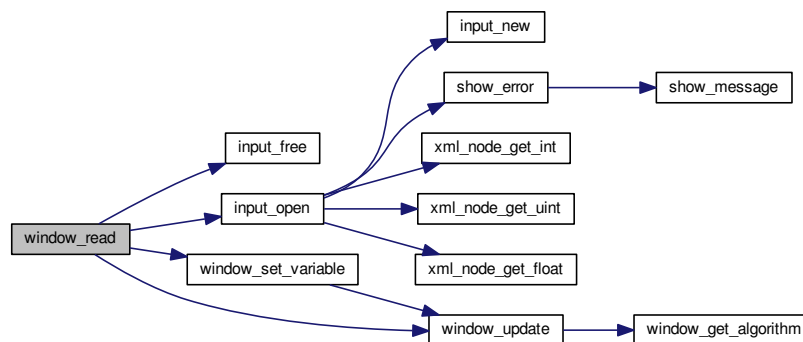
```

```

    id_variable);
03202   g_signal_handler_block (window->entry_variable, window->
    id_variable_label);
03203   gtk_combo_box_text_remove_all (window->combo_variable);
03204   for (i = 0; i < input->nvariables; ++i)
03205       gtk_combo_box_text_append_text (window->combo_variable,
    input->label[i]);
03206   g_signal_handler_unblock (window->entry_variable, window->
    id_variable_label);
03207   g_signal_handler_unblock (window->combo_variable, window->
    id_variable);
03208   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
03209   window_set_variable ();
03210   window_update ();
03211   #if DEBUG
03212       fprintf (stderr, "window_read: end\n");
03213   #endif
03214   return 1;
03215 }

```

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 2240 of file [calibrator.c](#).

```

02241 {
02242   char *buffer;
02243   GtkFileChooserDialog *dlg;
02244
02245   #if DEBUG
02246       fprintf (stderr, "window_save: start\n");
02247   #endif
02248
02249   // Opening the saving dialog
02250   dlg = (GtkFileChooserDialog *)
02251       gtk_file_chooser_dialog_new (gettext ("Save file"),
02252                                   window->window,
02253                                   GTK_FILE_CHOOSER_ACTION_SAVE,
02254                                   gettext ("Cancel"),
02255                                   GTK_RESPONSE_CANCEL,
02256                                   gettext ("OK"), GTK_RESPONSE_OK, NULL);
02257   gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
02258
02259   // If OK response then saving
02260   if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
02261       {

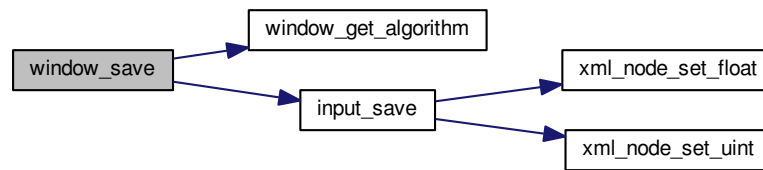
```

```

02262
02263 // Adding properties to the root XML node
02264 input->simulator = gtk_file_chooser_get_filename
02265 (GTK_FILE_CHOOSER (window->button_simulator));
02266 if (gtk_toggle_button_get_active
02267     (GTK_TOGGLE_BUTTON (window->check_evaluator)))
02268     input->evaluator = gtk_file_chooser_get_filename
02269     (GTK_FILE_CHOOSER (window->button_evaluator));
02270 else
02271     input->evaluator = NULL;
02272
02273 // Setting the algorithm
02274 switch (window_get_algorithm ())
02275 {
02276     case ALGORITHM_MONTE_CARLO:
02277         input->algorithm = ALGORITHM_MONTE_CARLO;
02278         input->nsimulations
02279             = gtk_spin_button_get_value_as_int (window->spin_simulations);
02280         input->niterations
02281             = gtk_spin_button_get_value_as_int (window->spin_iterations);
02282         input->tolerance = gtk_spin_button_get_value (window->
spin_tolerance);
02283         input->nbest = gtk_spin_button_get_value_as_int (window->
spin_best);
02284         break;
02285     case ALGORITHM_SWEEP:
02286         input->algorithm = ALGORITHM_SWEEP;
02287         input->niterations
02288             = gtk_spin_button_get_value_as_int (window->spin_iterations);
02289         input->tolerance = gtk_spin_button_get_value (window->
spin_tolerance);
02290         input->nbest = gtk_spin_button_get_value_as_int (window->
spin_best);
02291         break;
02292     default:
02293         input->algorithm = ALGORITHM_GENETIC;
02294         input->nsimulations
02295             = gtk_spin_button_get_value_as_int (window->spin_population);
02296         input->niterations
02297             = gtk_spin_button_get_value_as_int (window->spin_generations);
02298         input->mutation_ratio
02299             = gtk_spin_button_get_value (window->spin_mutation);
02300         input->reproduction_ratio
02301             = gtk_spin_button_get_value (window->spin_reproduction);
02302         input->adaptation_ratio
02303             = gtk_spin_button_get_value (window->spin_adaptation);
02304         break;
02305 }
02306
02307 // Saving the XML file
02308 buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
02309 input_save (buffer);
02310
02311 // Closing and freeing memory
02312 g_free (buffer);
02313 gtk_widget_destroy (GTK_WIDGET (dlg));
02314 #if DEBUG
02315     fprintf (stderr, "window_save: end\n");
02316 #endif
02317     return 1;
02318 }
02319
02320 // Closing and freeing memory
02321 gtk_widget_destroy (GTK_WIDGET (dlg));
02322 #if DEBUG
02323     fprintf (stderr, "window_save: end\n");
02324 #endif
02325     return 0;
02326 }

```

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 2795 of file [calibrator.c](#).

```

02796 {
02797     unsigned int i, j;
02798     char *buffer;
02799     GFile *file1, *file2;
02800     #if DEBUG
02801     fprintf (stderr, "window_template_experiment: start\n");
02802     #endif
02803     i = (size_t) data;
02804     j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02805     file1
02806     = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
02807     file2 = g_file_new_for_path (input->directory);
02808     buffer = g_file_get_relative_path (file2, file1);
02809     input->template[i][j] = (char *) xmlStrdup ((xmlChar *) buffer);
02810     g_free (buffer);
02811     g_object_unref (file2);
02812     g_object_unref (file1);
02813     #if DEBUG
02814     fprintf (stderr, "window_template_experiment: end\n");
02815     #endif
02816 }
  
```

#### 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 352 of file [calibrator.c](#).

```

00353 {
  
```

```

00354     double x = 0.;
00355     xmlChar *buffer;
00356     buffer = xmlGetProp (node, prop);
00357     if (!buffer)
00358         *error_code = 1;
00359     else
00360     {
00361         if (sscanf ((char *) buffer, "%lf", &x) != 1)
00362             *error_code = 2;
00363         else
00364             *error_code = 0;
00365         xmlFree (buffer);
00366     }
00367     return x;
00368 }

```

#### 5.1.2.20 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 290 of file [calibrator.c](#).

```

00291 {
00292     int i = 0;
00293     xmlChar *buffer;
00294     buffer = xmlGetProp (node, prop);
00295     if (!buffer)
00296         *error_code = 1;
00297     else
00298     {
00299         if (sscanf ((char *) buffer, "%d", &i) != 1)
00300             *error_code = 2;
00301         else
00302             *error_code = 0;
00303         xmlFree (buffer);
00304     }
00305     return i;
00306 }

```

#### 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 321 of file [calibrator.c](#).

```

00322 {
00323     unsigned int i = 0;
00324     xmlChar *buffer;
00325     buffer = xmlGetProp (node, prop);
00326     if (!buffer)
00327         *error_code = 1;
00328     else
00329     {
00330         if (sscanf ((char *) buffer, "%u", &i) != 1)
00331             *error_code = 2;
00332         else
00333             *error_code = 0;
00334         xmlFree (buffer);
00335     }
00336     return i;
00337 }

```

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

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

##### Parameters

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

Definition at line 419 of file [calibrator.c](#).

```

00420 {
00421     xmlChar buffer[64];
00422     snprintf ((char *) buffer, 64, "%.14lg", value);
00423     xmlSetProp (node, prop, buffer);
00424 }

```

#### 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 381 of file [calibrator.c](#).

```

00382 {
00383     xmlChar buffer[64];
00384     snprintf ((char *) buffer, 64, "%d", value);
00385     xmlSetProp (node, prop, buffer);
00386 }

```

#### 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 400 of file [calibrator.c](#).

```
00401 {
00402     xmlChar buffer[64];
00403     snprintf ((char *) buffer, 64, "%u", value);
00404     xmlSetProp (node, prop, buffer);
00405 }
```

### 5.1.3 Variable Documentation

#### 5.1.3.1 format

**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 129 of file [calibrator.c](#).

#### 5.1.3.2 precision

**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 134 of file [calibrator.c](#).

#### 5.1.3.3 template

**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 124 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
```

```

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00009 are permitted provided that the following conditions are met:
00010
00011     1. Redistributions of source code must retain the above copyright notice,
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00018 THIS SOFTWARE IS PROVIDED BY AUTHORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
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00020 MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
00021 SHALL AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
00022 SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
00023 PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
00024 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
00025 CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
00026 IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
00027 OF SUCH DAMAGE.
00028 */
00029
00036 #define _GNU_SOURCE
00037 #include "config.h"
00038 #include <stdio.h>
00039 #include <stdlib.h>
00040 #include <string.h>
00041 #include <math.h>
00042 #include <unistd.h>
00043 #include <locale.h>
00044 #include <gsl/gsl_rng.h>
00045 #include <libxml/parser.h>
00046 #include <libintl.h>
00047 #include <glib.h>
00048 #ifdef G_OS_WIN32
00049 #include <windows.h>
00050 #elif (!__BSD_VISIBLE)
00051 #include <alloca.h>
00052 #endif
00053 #if HAVE_MPI
00054 #include <mpi.h>
00055 #endif
00056 #include "genetic/genetic.h"
00057 #include "calibrator.h"
00058 #if HAVE_GTK
00059 #include <gio/gio.h>
00060 #include <gtk/gtk.h>
00061 #include "interface.h"
00062 #endif
00063
00076 #define DEBUG 0
00077 #if HAVE_GTK
00078 #define ERROR_TYPE GTK_MESSAGE_ERROR
00079 #define INFO_TYPE GTK_MESSAGE_INFO
00080 #else
00081 #define ERROR_TYPE 0
00082 #define INFO_TYPE 0
00083 #endif
00084 #ifdef G_OS_WIN32
00085 #define INPUT_FILE "test-ga-win.xml"
00086 #define RM "del"
00087 #else
00088 #define INPUT_FILE "test-ga.xml"
00089 #define RM "rm"
00090 #endif
00091
00116 int ntasks;
00117 unsigned int nthreads;
00118 char *current_directory;
00119 GMutex mutex[1];
00120 void (*calibrate_step) ();
00121 Input input[1];
00122 Calibrate calibrate[1];
00123
00124 const xmlChar *template[MAX_NINPUTS] = {
00125     XML_TEMPLATE1, XML_TEMPLATE2, XML_TEMPLATE3,
00126     XML_TEMPLATE4,
00127     XML_TEMPLATE5, XML_TEMPLATE6, XML_TEMPLATE7,
00128     XML_TEMPLATE8
00129 };
00128
00129 const char *format[NPRECISIONS] = {
00130     "%.11g", "%.21g", "%.31g", "%.41g", "%.51g", "%.61g", "%.71g", "%.81g",
00131     "%.91g", "%.101g", "%.111g", "%.121g", "%.131g", "%.141g", "%.151g"
00132 };
00133
00134 const double precision[NPRECISIONS] = {

```

```

00135 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,
00136 1e-13, 1e-14
00137 };
00138
00139 const char *logo[] = {
00140 "32 32 3 1",
00141 "    c None",
00142 ".    c #0000FF",
00143 "+    c #FF0000",
00144 "                                     ",
00145 "                                     ",
00146 "                                     ",
00147 "    .    .    .    .    .    .    ",
00148 "    .    .    .    .    .    .    ",
00149 "    .    .    .    .    .    .    ",
00150 "    .    .    .    .    .    .    ",
00151 "    .    .    .    .    .    .    ",
00152 "    .    .    .    .    .    .    ",
00153 "    .    .    .    .    .    .    ",
00154 "    .    .    .    .    .    .    ",
00155 "    .    .    .    .    .    .    ",
00156 "    .    .    .    .    .    .    ",
00157 "    .    .    .    .    .    .    ",
00158 "    .    .    .    .    .    .    ",
00159 "    .    .    .    .    .    .    ",
00160 "    .    .    .    .    .    .    ",
00161 "    .    .    .    .    .    .    ",
00162 "    .    .    .    .    .    .    ",
00163 "    .    .    .    .    .    .    ",
00164 "    .    .    .    .    .    .    ",
00165 "    .    .    .    .    .    .    ",
00166 "    .    .    .    .    .    .    ",
00167 "    .    .    .    .    .    .    ",
00168 "    .    .    .    .    .    .    ",
00169 "    .    .    .    .    .    .    ",
00170 "    .    .    .    .    .    .    ",
00171 "    .    .    .    .    .    .    ",
00172 "    .    .    .    .    .    .    ",
00173 "    .    .    .    .    .    .    ",
00174 "    .    .    .    .    .    .    ",
00175 "    .    .    .    .    .    .    ",
00176 };
00177
00178 /*
00179 const char * logo[] = {
00180 "32 32 3 1",
00181 "    c #FFFFFFFF",
00182 ".    c #00000000FFFF",
00183 "X    c #FFFF00000000",
00184 "                                     ",
00185 "                                     ",
00186 "                                     ",
00187 "    .    .    .    .    .    .    ",
00188 "    .    .    .    .    .    .    ",
00189 "    .    .    .    .    .    .    ",
00190 "    .    .    .    .    .    .    ",
00191 "    .    .    .    .    .    .    ",
00192 "    .    .    .    .    .    .    ",
00193 "    .    .    .    .    .    .    ",
00194 "    .    .    .    .    .    .    ",
00195 "    .    .    .    .    .    .    ",
00196 "    .    .    .    .    .    .    ",
00197 "    .    .    .    .    .    .    ",
00198 "    .    .    .    .    .    .    ",
00199 "    .    .    .    .    .    .    ",
00200 "    .    .    .    .    .    .    ",
00201 "    .    .    .    .    .    .    ",
00202 "    .    .    .    .    .    .    ",
00203 "    .    .    .    .    .    .    ",
00204 "    .    .    .    .    .    .    ",
00205 "    .    .    .    .    .    .    ",
00206 "    .    .    .    .    .    .    ",
00207 "    .    .    .    .    .    .    ",
00208 "    .    .    .    .    .    .    ",
00209 "    .    .    .    .    .    .    ",
00210 "    .    .    .    .    .    .    ",
00211 "    .    .    .    .    .    .    ",
00212 "    .    .    .    .    .    .    ",
00213 "    .    .    .    .    .    .    ",
00214 "    .    .    .    .    .    .    ",
00215 "    .    .    .    .    .    .    ",
00216 */
00217
00218 #if HAVE_GTK
00219
00227 Options options[1];
00228 Running running[1];

```

```

00229 Window window[1];
00230 #endif
00231
00242 void
00243 show_message (char *title, char *msg, int type)
00244 {
00245     #if HAVE_GTK
00246         GtkMessageDialog *dlg;
00247
00248         // Creating the dialog
00249         dlg = (GtkMessageDialog *) gtk_message_dialog_new
00250             (window->window, GTK_DIALOG_MODAL, type, GTK_BUTTONS_OK, "%s", msg);
00251
00252         // Setting the dialog title
00253         gtk_window_set_title (GTK_WINDOW (dlg), title);
00254
00255         // Showing the dialog and waiting response
00256         gtk_dialog_run (GTK_DIALOG (dlg));
00257
00258         // Closing and freeing memory
00259         gtk_widget_destroy (GTK_WIDGET (dlg));
00260
00261     #else
00262         printf ("%s: %s\n", title, msg);
00263     #endif
00264 }
00265
00272 void
00273 show_error (char *msg)
00274 {
00275     show_message (gettext ("ERROR!"), msg, ERROR_TYPE);
00276 }
00277
00289 int
00290 xml_node_get_int (xmlNode * node, const xmlChar * prop, int *error_code)
00291 {
00292     int i = 0;
00293     xmlChar *buffer;
00294     buffer = xmlGetProp (node, prop);
00295     if (!buffer)
00296         *error_code = 1;
00297     else
00298     {
00299         if (sscanf ((char *) buffer, "%d", &i) != 1)
00300             *error_code = 2;
00301         else
00302             *error_code = 0;
00303         xmlFree (buffer);
00304     }
00305     return i;
00306 }
00307
00320 unsigned int
00321 xml_node_get_uint (xmlNode * node, const xmlChar * prop, int *error_code)
00322 {
00323     unsigned int i = 0;
00324     xmlChar *buffer;
00325     buffer = xmlGetProp (node, prop);
00326     if (!buffer)
00327         *error_code = 1;
00328     else
00329     {
00330         if (sscanf ((char *) buffer, "%u", &i) != 1)
00331             *error_code = 2;
00332         else
00333             *error_code = 0;
00334         xmlFree (buffer);
00335     }
00336     return i;
00337 }
00338
00351 double
00352 xml_node_get_float (xmlNode * node, const xmlChar * prop, int *error_code)
00353 {
00354     double x = 0.;
00355     xmlChar *buffer;
00356     buffer = xmlGetProp (node, prop);
00357     if (!buffer)
00358         *error_code = 1;
00359     else
00360     {
00361         if (sscanf ((char *) buffer, "%lf", &x) != 1)
00362             *error_code = 2;
00363         else
00364             *error_code = 0;
00365         xmlFree (buffer);
00366     }

```

```

00367     return x;
00368 }
00369
00380 void
00381 xml_node_set_int (xmlNode * node, const xmlChar * prop, int value)
00382 {
00383     xmlChar buffer[64];
00384     snprintf ((char *) buffer, 64, "%d", value);
00385     xmlSetProp (node, prop, buffer);
00386 }
00387
00399 void
00400 xml_node_set_uint (xmlNode * node, const xmlChar * prop, unsigned int value)
00401 {
00402     xmlChar buffer[64];
00403     snprintf ((char *) buffer, 64, "%u", value);
00404     xmlSetProp (node, prop, buffer);
00405 }
00406
00418 void
00419 xml_node_set_float (xmlNode * node, const xmlChar * prop, double value)
00420 {
00421     xmlChar buffer[64];
00422     snprintf ((char *) buffer, 64, "%.14lg", value);
00423     xmlSetProp (node, prop, buffer);
00424 }
00425
00430 void
00431 input_new ()
00432 {
00433     unsigned int i;
00434     #if DEBUG
00435     fprintf (stderr, "input_init: start\n");
00436     #endif
00437     input->nvariables = input->nexperiments = input->ninputs = 0;
00438     input->simulator = input->evaluator = input->directory = input->
name = NULL;
00439     input->experiment = input->label = NULL;
00440     input->precision = input->nsweeps = input->nbits = NULL;
00441     input->rangemin = input->rangemax = input->rangeminabs = input->
rangemaxabs
= input->weight = NULL;
00443     for (i = 0; i < MAX_NINPUTS; ++i)
00444         input->template[i] = NULL;
00445     #if DEBUG
00446     fprintf (stderr, "input_init: end\n");
00447     #endif
00448 }
00449
00457 int
00458 input_open (char *filename)
00459 {
00460     int error_code;
00461     unsigned int i;
00462     char buffer2[64];
00463     xmlChar *buffer;
00464     xmlDoc *doc;
00465     xmlNode *node, *child;
00466
00467     #if DEBUG
00468     fprintf (stderr, "input_new: start\n");
00469     #endif
00470
00471     // Resetting input data
00472     input_new ();
00473
00474     // Parsing the input file
00475     doc = xmlParseFile (filename);
00476     if (!doc)
00477     {
00478         show_error (gettext ("Unable to parse the input file"));
00479         return 0;
00480     }
00481
00482     // Getting the root node
00483     node = xmlDocGetRootElement (doc);
00484     if (xmlStrcmp (node->name, XML_CALIBRATE))
00485     {
00486         show_error (gettext ("Bad root XML node"));
00487         return 0;
00488     }
00489
00490     // Opening simulator program name
00491     input->simulator = (char *) xmlGetProp (node, XML_SIMULATOR);
00492     if (!input->simulator)
00493     {
00494         show_error (gettext ("Bad simulator program"));

```

```

00495     return 0;
00496 }
00497
00498 // Opening evaluator program name
00499 input->evaluator = (char *) xmlGetProp (node, XML_EVALUATOR);
00500
00501 // Opening algorithm
00502 buffer = xmlGetProp (node, XML_ALGORITHM);
00503 if (!xmlStrcmp (buffer, XML_MONTE_CARLO))
00504 {
00505     input->algorithm = ALGORITHM_MONTE_CARLO;
00506
00507     // Obtaining simulations number
00508     input->nsimulations
00509     = xml_node_get_int (node, XML_NSIMULATIONS, &error_code);
00510     if (error_code)
00511     {
00512         show_error (gettext ("Bad simulations number"));
00513         return 0;
00514     }
00515 }
00516 else if (!xmlStrcmp (buffer, XML_SWEEP))
00517     input->algorithm = ALGORITHM_SWEEP;
00518 else if (!xmlStrcmp (buffer, XML_GENETIC))
00519 {
00520     input->algorithm = ALGORITHM_GENETIC;
00521
00522     // Obtaining population
00523     if (xmlHasProp (node, XML_NPOPULATION))
00524     {
00525         input->nsimulations
00526         = xml_node_get_uint (node, XML_NPOPULATION, &error_code);
00527         if (error_code || input->nsimulations < 3)
00528         {
00529             show_error (gettext ("Invalid population number"));
00530             return 0;
00531         }
00532     }
00533     else
00534     {
00535         show_error (gettext ("No population number"));
00536         return 0;
00537     }
00538
00539     // Obtaining generations
00540     if (xmlHasProp (node, XML_NGENERATIONS))
00541     {
00542         input->niterations
00543         = xml_node_get_uint (node, XML_NGENERATIONS, &error_code);
00544         if (error_code || !input->niterations)
00545         {
00546             show_error (gettext ("Invalid generation number"));
00547             return 0;
00548         }
00549     }
00550     else
00551     {
00552         show_error (gettext ("No generation number"));
00553         return 0;
00554     }
00555
00556     // Obtaining mutation probability
00557     if (xmlHasProp (node, XML_MUTATION))
00558     {
00559         input->mutation_ratio
00560         = xml_node_get_float (node, XML_MUTATION, &error_code);
00561         if (error_code || input->mutation_ratio < 0.
00562             || input->mutation_ratio >= 1.)
00563         {
00564             show_error (gettext ("Invalid mutation probability"));
00565             return 0;
00566         }
00567     }
00568     else
00569     {
00570         show_error (gettext ("No mutation probability"));
00571         return 0;
00572     }
00573
00574     // Obtaining reproduction probability
00575     if (xmlHasProp (node, XML_REPRODUCTION))
00576     {
00577         input->reproduction_ratio
00578         = xml_node_get_float (node, XML_REPRODUCTION, &error_code);
00579         if (error_code || input->reproduction_ratio < 0.
00580             || input->reproduction_ratio >= 1.0)
00581         {

```

```

00582         show_error (gettext ("Invalid reproduction probability"));
00583         return 0;
00584     }
00585 }
00586 else
00587 {
00588     show_error (gettext ("No reproduction probability"));
00589     return 0;
00590 }
00591
00592 // Obtaining adaptation probability
00593 if (xmlHasProp (node, XML_ADAPTATION))
00594 {
00595     input->adaptation_ratio
00596     = xml_node_get_float (node, XML_ADAPTATION, &error_code);
00597     if (error_code || input->adaptation_ratio < 0.
00598         || input->adaptation_ratio >= 1.)
00599     {
00600         show_error (gettext ("Invalid adaptation probability"));
00601         return 0;
00602     }
00603 }
00604 else
00605 {
00606     show_error (gettext ("No adaptation probability"));
00607     return 0;
00608 }
00609
00610 // Checking survivals
00611 i = input->mutation_ratio * input->nsimulations;
00612 i += input->reproduction_ratio * input->nsimulations;
00613 i += input->adaptation_ratio * input->nsimulations;
00614 if (i > input->nsimulations - 2)
00615 {
00616     show_error
00617     (gettext
00618      ("No enough survival entities to reproduce the population"));
00619     return 0;
00620 }
00621 }
00622 else
00623 {
00624     show_error (gettext ("Unknown algorithm"));
00625     return 0;
00626 }
00627
00628 if (input->algorithm == ALGORITHM_MONTE_CARLO
00629     || input->algorithm == ALGORITHM_SWEEP)
00630 {
00631
00632     // Obtaining iterations number
00633     input->niterations
00634     = xml_node_get_int (node, XML_NITERATIONS, &error_code);
00635     if (error_code == 1)
00636         input->niterations = 1;
00637     else if (error_code)
00638     {
00639         show_error (gettext ("Bad iterations number"));
00640         return 0;
00641     }
00642
00643     // Obtaining best number
00644     if (xmlHasProp (node, XML_NBEST))
00645     {
00646         input->nbest = xml_node_get_uint (node,
XML_NBEST, &error_code);
00647         if (error_code || !input->nbest)
00648         {
00649             show_error (gettext ("Invalid best number"));
00650             return 0;
00651         }
00652     }
00653     else
00654         input->nbest = 1;
00655
00656     // Obtaining tolerance
00657     if (xmlHasProp (node, XML_TOLERANCE))
00658     {
00659         input->tolerance
00660         = xml_node_get_float (node, XML_TOLERANCE, &error_code);
00661         if (error_code || input->tolerance < 0.)
00662         {
00663             show_error (gettext ("Invalid tolerance"));
00664             return 0;
00665         }
00666     }
00667     else

```

```

00668     input->tolerance = 0.;
00669 }
00670
00671 // Reading the experimental data
00672 for (child = node->children; child; child = child->next)
00673 {
00674     if (xmlStrcmp (child->name, XML_EXPERIMENT))
00675         break;
00676 #if DEBUG
00677     fprintf (stderr, "input_new: nexperiments=%u\n", input->nexperiments);
00678 #endif
00679     if (xmlHasProp (child, XML_NAME))
00680     {
00681         input->experiment
00682             = g_realloc (input->experiment,
00683                 (1 + input->nexperiments) * sizeof (char *));
00684         input->experiment[input->nexperiments]
00685             = (char *) xmlGetProp (child, XML_NAME);
00686     }
00687     else
00688     {
00689         show_error (gettext ("No experiment file name"));
00690         return 0;
00691     }
00692 #if DEBUG
00693     fprintf (stderr, "input_new: experiment=%s\n",
00694         input->experiment[input->nexperiments]);
00695 #endif
00696     input->weight = g_realloc (input->weight,
00697         (1 + input->nexperiments) * sizeof (double));
00698     if (xmlHasProp (child, XML_WEIGHT))
00699         input->weight[input->nexperiments]
00700             = xml_node_get_float (child, XML_WEIGHT, &error_code);
00701     else
00702         input->weight[input->nexperiments] = 1.;
00703 #if DEBUG
00704     fprintf (stderr, "input_new: weight=%lg\n",
00705         input->weight[input->nexperiments]);
00706 #endif
00707     if (!input->nexperiments)
00708         input->ninputs = 0;
00709 #if DEBUG
00710     fprintf (stderr, "input_new: template[0]\n");
00711 #endif
00712     if (xmlHasProp (child, XML_TEMPLATE1))
00713     {
00714         input->template[0]
00715             = (char **) g_realloc (input->template[0],
00716                 (1 + input->nexperiments) * sizeof (char *));
00717         input->template[0][input->nexperiments]
00718             = (char *) xmlGetProp (child, template[0]);
00719 #if DEBUG
00720         fprintf (stderr, "input_new: experiment=%u templatel=%s\n",
00721             input->nexperiments,
00722             input->template[0][input->nexperiments]);
00723 #endif
00724         if (!input->nexperiments)
00725             ++input->ninputs;
00726 #if DEBUG
00727         fprintf (stderr, "input_new: ninputs=%u\n", input->ninputs);
00728 #endif
00729     }
00730     else
00731     {
00732         show_error (gettext ("No experiment template"));
00733         return 0;
00734     }
00735     for (i = 1; i < MAX_NINPUTS; ++i)
00736     {
00737 #if DEBUG
00738         fprintf (stderr, "input_new: template%u\n", i + 1);
00739 #endif
00740         if (xmlHasProp (child, template[i]))
00741         {
00742             if (input->nexperiments && input->ninputs < 2)
00743             {
00744                 snprintf (buffer2, 64,
00745                     gettext ("Experiment %u: bad templates number"),
00746                     input->nexperiments + 1);
00747                 show_error (buffer2);
00748                 return 0;
00749             }
00750             input->template[i] = (char **)
00751                 g_realloc (input->template[i],
00752                     (1 + input->nexperiments) * sizeof (char *));
00753             input->template[i][input->nexperiments]
00754                 = (char *) xmlGetProp (child, template[i]);

```



```

00755 #if DEBUG
00756         fprintf (stderr, "input_new: experiment=%u template%u=%s\n",
00757                 input->nexperiments, i + 1,
00758                 input->template[i][input->nexperiments]);
00759 #endif
00760         if (!input->nexperiments)
00761             ++input->ninputs;
00762 #if DEBUG
00763         fprintf (stderr, "input_new: ninputs=%u\n", input->ninputs);
00764 #endif
00765     }
00766     else if (input->nexperiments && input->ninputs > 1)
00767     {
00768         snprintf (buffer2, 64, gettext ("No experiment %u template%u"),
00769                 input->nexperiments + 1, i + 1);
00770         show_error (buffer2);
00771         return 0;
00772     }
00773     else
00774         break;
00775 }
00776 ++input->nexperiments;
00777 #if DEBUG
00778     fprintf (stderr, "input_new: nexperiments=%u\n", input->nexperiments);
00779 #endif
00780 }
00781 if (!input->nexperiments)
00782 {
00783     show_error (gettext ("No calibration experiments"));
00784     return 0;
00785 }
00786
00787 // Reading the variables data
00788 for (; child; child = child->next)
00789 {
00790     if (xmlStrcmp (child->name, XML_VARIABLE))
00791     {
00792         show_error (gettext ("Bad XML node"));
00793         return 0;
00794     }
00795     if (xmlHasProp (child, XML_NAME))
00796     {
00797         input->label = g_realloc
00798             (input->label, (1 + input->nvariables) * sizeof (char *));
00799         input->label[input->nvariables]
00800             = (char *) xmlGetProp (child, XML_NAME);
00801     }
00802     else
00803     {
00804         show_error (gettext ("No variable name"));
00805         return 0;
00806     }
00807     if (xmlHasProp (child, XML_MINIMUM))
00808     {
00809         input->rangemin = g_realloc
00810             (input->rangemin, (1 + input->nvariables) * sizeof (double));
00811         input->rangeminabs = g_realloc
00812             (input->rangeminabs, (1 + input->nvariables) * sizeof (double));
00813         input->rangemin[input->nvariables]
00814             = xml_node_get_float (child, XML_MINIMUM, &error_code);
00815         if (xmlHasProp (child, XML_ABSOLUTE_MINIMUM))
00816         {
00817             input->rangeminabs[input->nvariables]
00818                 = xml_node_get_float (child,
00819                                     XML_ABSOLUTE_MINIMUM, &error_code);
00819         }
00820     }
00821     else
00822         input->rangeminabs[input->nvariables] = -G_MAXDOUBLE;
00823 }
00824 else
00825 {
00826     show_error (gettext ("No minimum range"));
00827     return 0;
00828 }
00829 if (xmlHasProp (child, XML_MAXIMUM))
00830 {
00831     input->rangemax = g_realloc
00832         (input->rangemax, (1 + input->nvariables) * sizeof (double));
00833     input->rangemaxabs = g_realloc
00834         (input->rangemaxabs, (1 + input->nvariables) * sizeof (double));
00835     input->rangemax[input->nvariables]
00836         = xml_node_get_float (child, XML_MAXIMUM, &error_code);
00837     if (xmlHasProp (child, XML_ABSOLUTE_MAXIMUM))
00838     {
00839         input->rangemaxabs[input->nvariables]
00840             = xml_node_get_float (child,
00841                                 XML_ABSOLUTE_MAXIMUM, &error_code);
00839     }
00840     else

```

```

00840         input->rangemaxabs[input->nvariables] = G_MAXDOUBLE;
00841     }
00842     else
00843     {
00844         show_error (gettext ("No maximum range"));
00845         return 0;
00846     }
00847     input->precision = g_realloc
00848     (input->precision, (1 + input->nvariables) * sizeof (unsigned int));
00849     if (xmlHasProp (child, XML_PRECISION))
00850         input->precision[input->nvariables]
00851         = xml_node_get_uint (child, XML_PRECISION, &error_code);
00852     else
00853         input->precision[input->nvariables] =
00854         DEFAULT_PRECISION;
00855     if (input->algorithm == ALGORITHM_SWEEP)
00856     {
00857         if (xmlHasProp (child, XML_NSWEEPS))
00858         {
00859             input->nsweeps = (unsigned int *)
00860             g_realloc (input->nsweeps,
00861             (1 + input->nvariables) * sizeof (unsigned int));
00862             input->nsweeps[input->nvariables]
00863             = xml_node_get_uint (child, XML_NSWEEPS, &error_code);
00864         }
00865         else
00866         {
00867             show_error (gettext ("No sweeps number"));
00868             return 0;
00869         }
00870     }
00871     #if DEBUG
00872     fprintf (stderr, "input_new: nsweeps=%u nsimulations=%u\n",
00873             input->nsweeps[input->nvariables], input->
00874             nsimulations);
00875     #endif
00876     if (input->algorithm == ALGORITHM_GENETIC)
00877     {
00878         // Obtaining bits representing each variable
00879         if (xmlHasProp (child, XML_NBITS))
00880         {
00881             input->nbits = (unsigned int *)
00882             g_realloc (input->nbits,
00883             (1 + input->nvariables) * sizeof (unsigned int));
00884             i = xml_node_get_uint (child, XML_NBITS, &error_code);
00885             if (error_code || !i)
00886             {
00887                 show_error (gettext ("Invalid bit number"));
00888                 return 0;
00889             }
00890             input->nbits[input->nvariables] = i;
00891         }
00892         else
00893         {
00894             show_error (gettext ("No bits number"));
00895             return 0;
00896         }
00897     }
00898     ++input->nvariables;
00899     if (!input->nvariables)
00900     {
00901         show_error (gettext ("No calibration variables"));
00902         return 0;
00903     }
00904     // Getting the working directory
00905     input->directory = g_path_get_dirname (filename);
00906     input->name = g_path_get_basename (filename);
00907     // Closing the XML document
00908     xmlFreeDoc (doc);
00909     #if DEBUG
00910     fprintf (stderr, "input_new: end\n");
00911     #endif
00912     return 1;
00913 }
00914
00915 void
00916 input_free ()
00917 {
00918     unsigned int i, j;
00919     #if DEBUG
00920     fprintf (stderr, "input_free: start\n");
00921     #endif

```

```

00929     g_free (input->name);
00930     g_free (input->directory);
00931     for (i = 0; i < input->nexperiments; ++i)
00932     {
00933         xmlFree (input->experiment[i]);
00934         for (j = 0; j < input->ninputs; ++j)
00935             xmlFree (input->template[j][i]);
00936     }
00937     g_free (input->experiment);
00938     for (i = 0; i < input->ninputs; ++i)
00939         g_free (input->template[i]);
00940     for (i = 0; i < input->nvariables; ++i)
00941         xmlFree (input->label[i]);
00942     g_free (input->label);
00943     g_free (input->precision);
00944     g_free (input->rangemin);
00945     g_free (input->rangemax);
00946     g_free (input->rangeminabs);
00947     g_free (input->rangemaxabs);
00948     g_free (input->weight);
00949     g_free (input->nsweeps);
00950     g_free (input->nbits);
00951     xmlFree (input->evaluator);
00952     xmlFree (input->simulator);
00953     input->nexperiments = input->ninputs = input->nvariables = 0;
00954     #if DEBUG
00955         fprintf (stderr, "input_free: end\n");
00956     #endif
00957 }
00958
00970 void
00971 calibrate_input (unsigned int simulation, char *input, GMappedFile * template)
00972 {
00973     unsigned int i;
00974     char buffer[32], value[32], *buffer2, *buffer3, *content;
00975     FILE *file;
00976     gsize length;
00977     GRegex *regex;
00978
00979     #if DEBUG
00980         fprintf (stderr, "calibrate_input: start\n");
00981     #endif
00982
00983     // Checking the file
00984     if (!template)
00985         goto calibrate_input_end;
00986
00987     // Opening template
00988     content = g_mapped_file_get_contents (template);
00989     length = g_mapped_file_get_length (template);
00990     #if DEBUG
00991         fprintf (stderr, "calibrate_input: length=%lu\ncontent:\n%s", length,
00992             content);
00993     #endif
00994     file = fopen (input, "w");
00995
00996     // Parsing template
00997     for (i = 0; i < calibrate->nvariables; ++i)
00998     {
00999         #if DEBUG
01000             fprintf (stderr, "calibrate_input: variable=%u\n", i);
01001         #endif
01002         snprintf (buffer, 32, "@variable%u@", i + 1);
01003         regex = g_regex_new (buffer, 0, 0, NULL);
01004         if (i == 0)
01005         {
01006             buffer2 = g_regex_replace_literal (regex, content, length, 0,
01007                 calibrate->label[i], 0, NULL);
01008             #if DEBUG
01009                 fprintf (stderr, "calibrate_input: buffer2\n%s", buffer2);
01010             #endif
01011         }
01012         else
01013         {
01014             length = strlen (buffer3);
01015             buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
01016                 calibrate->label[i], 0, NULL);
01017             g_free (buffer3);
01018         }
01019         g_regex_unref (regex);
01020         length = strlen (buffer2);
01021         snprintf (buffer, 32, "@value%u@", i + 1);
01022         regex = g_regex_new (buffer, 0, 0, NULL);
01023         snprintf (value, 32, format[calibrate->precision[i]],
01024             calibrate->value[simulation * calibrate->nvariables + i]);
01025     }
01026     #if DEBUG

```

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01027     fprintf (stderr, "calibrate_input: value=%s\n", value);
01028 #endif
01029     buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
01030                                     0, NULL);
01031     g_free (buffer2);
01032     g_regex_unref (regex);
01033 }
01034
01035 // Saving input file
01036 fwrite (buffer3, strlen (buffer3), sizeof (char), file);
01037 g_free (buffer3);
01038 fclose (file);
01039
01040 calibrate_input_end:
01041 #if DEBUG
01042     fprintf (stderr, "calibrate_input: end\n");
01043 #endif
01044     return;
01045 }
01046
01057 double
01058 calibrate_parse (unsigned int simulation, unsigned int experiment)
01059 {
01060     unsigned int i;
01061     double e;
01062     char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
01063          *buffer3, *buffer4;
01064     FILE *file_result;
01065
01066 #if DEBUG
01067     fprintf (stderr, "calibrate_parse: start\n");
01068     fprintf (stderr, "calibrate_parse: simulation=%u experiment=%u\n", simulation,
01069             experiment);
01070 #endif
01071
01072     // Opening input files
01073     for (i = 0; i < calibrate->ninputs; ++i)
01074     {
01075         snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
01076 #if DEBUG
01077         fprintf (stderr, "calibrate_parse: i=%u input=%s\n", i, &input[i][0]);
01078 #endif
01079         calibrate_input (simulation, &input[i][0],
01080                         calibrate->file[i][experiment]);
01081     }
01082     for (; i < MAX_NINPUTS; ++i)
01083         strcpy (&input[i][0], "");
01084 #if DEBUG
01085     fprintf (stderr, "calibrate_parse: parsing end\n");
01086 #endif
01087
01088     // Performing the simulation
01089     snprintf (output, 32, "output-%u-%u", simulation, experiment);
01090     buffer2 = g_path_get_dirname (calibrate->simulator);
01091     buffer3 = g_path_get_basename (calibrate->simulator);
01092     buffer4 = g_build_filename (buffer2, buffer3, NULL);
01093     snprintf (buffer, 512, "\\\"%s\\\" %s %s %s %s %s %s %s %s",
01094             buffer4, input[0], input[1], input[2], input[3], input[4], input[5],
01095             input[6], input[7], output);
01096     g_free (buffer4);
01097     g_free (buffer3);
01098     g_free (buffer2);
01099 #if DEBUG
01100     fprintf (stderr, "calibrate_parse: %s\n", buffer);
01101 #endif
01102     system (buffer);
01103
01104     // Checking the objective value function
01105     if (calibrate->evaluator)
01106     {
01107         snprintf (result, 32, "result-%u-%u", simulation, experiment);
01108         buffer2 = g_path_get_dirname (calibrate->evaluator);
01109         buffer3 = g_path_get_basename (calibrate->evaluator);
01110         buffer4 = g_build_filename (buffer2, buffer3, NULL);
01111         snprintf (buffer, 512, "\\\"%s\\\" %s %s %s",
01112                 buffer4, output, calibrate->experiment[experiment], result);
01113         g_free (buffer4);
01114         g_free (buffer3);
01115         g_free (buffer2);
01116 #if DEBUG
01117         fprintf (stderr, "calibrate_parse: %s\n", buffer);
01118 #endif
01119         system (buffer);
01120         file_result = fopen (result, "r");
01121         e = atof (fgets (buffer, 512, file_result));
01122         fclose (file_result);
01123     }

```

```

01124     else
01125     {
01126         strcpy (result, "");
01127         file_result = fopen (output, "r");
01128         e = atof (fgets (buffer, 512, file_result));
01129         fclose (file_result);
01130     }
01131
01132     // Removing files
01133 #if !DEBUG
01134     for (i = 0; i < calibrate->ninputs; ++i)
01135     {
01136         if (calibrate->file[i][0])
01137         {
01138             snprintf (buffer, 512, RM " %s", &input[i][0]);
01139             system (buffer);
01140         }
01141     }
01142     snprintf (buffer, 512, RM " %s %s", output, result);
01143     system (buffer);
01144 #endif
01145
01146 #if DEBUG
01147     fprintf (stderr, "calibrate_parse: end\n");
01148 #endif
01149
01150     // Returning the objective function
01151     return e * calibrate->weight[experiment];
01152 }
01153
01154 void
01155 calibrate_print ()
01156 {
01157     unsigned int i;
01158     char buffer[512];
01159 #if HAVE_MPI
01160     if (!calibrate->mpi_rank)
01161     {
01162         printf ("THE BEST IS\n");
01163         fprintf (calibrate->file_result, "THE BEST IS\n");
01164         printf ("error=%.15le\n", calibrate->error_old[0]);
01165         fprintf (calibrate->file_result, "error=%.15le\n",
01166                 calibrate->error_old[0]);
01167         for (i = 0; i < calibrate->nvariables; ++i)
01168         {
01169             snprintf (buffer, 512, "%s=%s\n",
01170                     calibrate->label[i], format[calibrate->precision[i]]);
01171             printf (buffer, calibrate->value_old[i]);
01172             fprintf (calibrate->file_result, buffer, calibrate->
01173                     value_old[i]);
01174         }
01175         fflush (calibrate->file_result);
01176 #if HAVE_MPI
01177     }
01178 #endif
01179 }
01180
01181 void
01182 calibrate_save_variables (unsigned int simulation, double error)
01183 {
01184     unsigned int i;
01185     char buffer[64];
01186 #if DEBUG
01187     fprintf (stderr, "calibrate_save_variables: start\n");
01188 #endif
01189     for (i = 0; i < calibrate->nvariables; ++i)
01190     {
01191         snprintf (buffer, 64, "%s ", format[calibrate->precision[i]]);
01192         fprintf (calibrate->file_variables, buffer,
01193                 calibrate->value[simulation * calibrate->nvariables + i]);
01194     }
01195     fprintf (calibrate->file_variables, "%.14le\n", error);
01196 #if DEBUG
01197     fprintf (stderr, "calibrate_save_variables: end\n");
01198 #endif
01199 }
01200
01201 void
01202 calibrate_best_thread (unsigned int simulation, double value)
01203 {
01204     unsigned int i, j;
01205     double e;
01206 #if DEBUG
01207     fprintf (stderr, "calibrate_best_thread: start\n");
01208 #endif
01209     if (calibrate->nsaveds < calibrate->nbest

```

```

01230     || value < calibrate->error_best[calibrate->nsaveds - 1])
01231 {
01232     g_mutex_lock (mutex);
01233     if (calibrate->nsaveds < calibrate->nbest)
01234         ++calibrate->nsaveds;
01235     calibrate->error_best[calibrate->nsaveds - 1] = value;
01236     calibrate->simulation_best[calibrate->nsaveds - 1] = simulation;
01237     for (i = calibrate->nsaveds; --i;)
01238     {
01239         if (calibrate->error_best[i] < calibrate->error_best[i - 1])
01240         {
01241             j = calibrate->simulation_best[i];
01242             e = calibrate->error_best[i];
01243             calibrate->simulation_best[i] = calibrate->
simulation_best[i - 1];
01244             calibrate->error_best[i] = calibrate->error_best[i - 1];
01245             calibrate->simulation_best[i - 1] = j;
01246             calibrate->error_best[i - 1] = e;
01247         }
01248         else
01249             break;
01250     }
01251     g_mutex_unlock (mutex);
01252 }
01253 #if DEBUG
01254 fprintf (stderr, "calibrate_best_thread: end\n");
01255 #endif
01256 }
01257
01266 void
01267 calibrate_best_sequential (unsigned int simulation, double value)
01268 {
01269     unsigned int i, j;
01270     double e;
01271     #if DEBUG
01272     fprintf (stderr, "calibrate_best_sequential: start\n");
01273     #endif
01274     if (calibrate->nsaveds < calibrate->nbest
01275         || value < calibrate->error_best[calibrate->nsaveds - 1])
01276     {
01277         if (calibrate->nsaveds < calibrate->nbest)
01278             ++calibrate->nsaveds;
01279         calibrate->error_best[calibrate->nsaveds - 1] = value;
01280         calibrate->simulation_best[calibrate->nsaveds - 1] = simulation;
01281         for (i = calibrate->nsaveds; --i;)
01282         {
01283             if (calibrate->error_best[i] < calibrate->error_best[i - 1])
01284             {
01285                 j = calibrate->simulation_best[i];
01286                 e = calibrate->error_best[i];
01287                 calibrate->simulation_best[i] = calibrate->
simulation_best[i - 1];
01288                 calibrate->error_best[i] = calibrate->error_best[i - 1];
01289                 calibrate->simulation_best[i - 1] = j;
01290                 calibrate->error_best[i - 1] = e;
01291             }
01292             else
01293                 break;
01294         }
01295     }
01296     #if DEBUG
01297     fprintf (stderr, "calibrate_best_sequential: end\n");
01298     #endif
01299 }
01300
01308 void *
01309 calibrate_thread (ParallelData * data)
01310 {
01311     unsigned int i, j, thread;
01312     double e;
01313     #if DEBUG
01314     fprintf (stderr, "calibrate_thread: start\n");
01315     #endif
01316     thread = data->thread;
01317     #if DEBUG
01318     fprintf (stderr, "calibrate_thread: thread=%u start=%u end=%u\n", thread,
01319             calibrate->thread[thread], calibrate->thread[thread + 1]);
01320     #endif
01321     for (i = calibrate->thread[thread]; i < calibrate->thread[thread + 1]; ++i)
01322     {
01323         e = 0.;
01324         for (j = 0; j < calibrate->nexperiments; ++j)
01325             e += calibrate_parse (i, j);
01326         calibrate_best_thread (i, e);
01327         g_mutex_lock (mutex);
01328         calibrate_save_variables (i, e);
01329         g_mutex_unlock (mutex);

```

```

01330 #if DEBUG
01331     fprintf (stderr, "calibrate_thread: i=%u e=%lg\n", i, e);
01332 #endif
01333 }
01334 #if DEBUG
01335     fprintf (stderr, "calibrate_thread: end\n");
01336 #endif
01337     g_thread_exit (NULL);
01338     return NULL;
01339 }
01340
01341 void
01342 calibrate_sequential ()
01343 {
01344     unsigned int i, j;
01345     double e;
01346     #if DEBUG
01347         fprintf (stderr, "calibrate_sequential: start\n");
01348         fprintf (stderr, "calibrate_sequential: nstart=%u nend=%u\n",
01349                 calibrate->nstart, calibrate->nend);
01350     #endif
01351     for (i = calibrate->nstart; i < calibrate->nend; ++i)
01352     {
01353         e = 0.;
01354         for (j = 0; j < calibrate->nexperiments; ++j)
01355             e += calibrate_parse (i, j);
01356         calibrate_best_sequential (i, e);
01357         calibrate_save_variables (i, e);
01358     #if DEBUG
01359         fprintf (stderr, "calibrate_sequential: i=%u e=%lg\n", i, e);
01360     #endif
01361     }
01362     #if DEBUG
01363         fprintf (stderr, "calibrate_sequential: end\n");
01364     #endif
01365 }
01366
01367 void
01368 calibrate_merge (unsigned int nsaveds, unsigned int *simulation_best,
01369                 double *error_best)
01370 {
01371     unsigned int i, j, k, s[calibrate->nbest];
01372     double e[calibrate->nbest];
01373     #if DEBUG
01374         fprintf (stderr, "calibrate_merge: start\n");
01375     #endif
01376     i = j = k = 0;
01377     do
01378     {
01379         if (i == calibrate->nsaveds)
01380         {
01381             s[k] = simulation_best[j];
01382             e[k] = error_best[j];
01383             ++j;
01384             ++k;
01385             if (j == nsaveds)
01386                 break;
01387         }
01388         else if (j == nsaveds)
01389         {
01390             s[k] = calibrate->simulation_best[i];
01391             e[k] = calibrate->error_best[i];
01392             ++i;
01393             ++k;
01394             if (i == calibrate->nsaveds)
01395                 break;
01396         }
01397         else if (calibrate->error_best[i] > error_best[j])
01398         {
01399             s[k] = simulation_best[j];
01400             e[k] = error_best[j];
01401             ++j;
01402             ++k;
01403         }
01404         else
01405         {
01406             s[k] = calibrate->simulation_best[i];
01407             e[k] = calibrate->error_best[i];
01408             ++i;
01409             ++k;
01410         }
01411     } while (k < calibrate->nbest);
01412     calibrate->nsaveds = k;
01413     memcpy (calibrate->simulation_best, s, k * sizeof (unsigned int));
01414     memcpy (calibrate->error_best, e, k * sizeof (double));
01415     #if DEBUG
01416         fprintf (stderr, "calibrate_merge: end\n");
01417     #endif
01418 }

```

```

01432     fprintf (stderr, "calibrate_merge: end\n");
01433 #endif
01434 }
01435
01440 #if HAVE_MPI
01441 void
01442 calibrate_synchronise ()
01443 {
01444     unsigned int i, nsaveds, simulation_best[calibrate->nbest];
01445     double error_best[calibrate->nbest];
01446     MPI_Status mpi_stat;
01447     #if DEBUG
01448     fprintf (stderr, "calibrate_synchronise: start\n");
01449 #endif
01450     if (calibrate->mpi_rank == 0)
01451     {
01452         for (i = 1; i < ntasks; ++i)
01453         {
01454             MPI_Recv (&nsaveds, 1, MPI_INT, i, 1, MPI_COMM_WORLD, &mpi_stat);
01455             MPI_Recv (simulation_best, nsaveds, MPI_INT, i, 1,
01456                     MPI_COMM_WORLD, &mpi_stat);
01457             MPI_Recv (error_best, nsaveds, MPI_DOUBLE, i, 1,
01458                     MPI_COMM_WORLD, &mpi_stat);
01459             calibrate_merge (nsaveds, simulation_best, error_best);
01460         }
01461     }
01462     else
01463     {
01464         MPI_Send (&calibrate->nsaveds, 1, MPI_INT, 0, 1, MPI_COMM_WORLD);
01465         MPI_Send (calibrate->simulation_best, calibrate->nsaveds, MPI_INT, 0, 1,
01466                 MPI_COMM_WORLD);
01467         MPI_Send (calibrate->error_best, calibrate->nsaveds, MPI_DOUBLE, 0, 1,
01468                 MPI_COMM_WORLD);
01469     }
01470     #if DEBUG
01471     fprintf (stderr, "calibrate_synchronise: end\n");
01472 #endif
01473 }
01474 #endif
01475
01480 void
01481 calibrate_sweep ()
01482 {
01483     unsigned int i, j, k, l;
01484     double e;
01485     GThread *thread[nthreads];
01486     ParallelData data[nthreads];
01487     #if DEBUG
01488     fprintf (stderr, "calibrate_sweep: start\n");
01489 #endif
01490     for (i = 0; i < calibrate->nsimulations; ++i)
01491     {
01492         k = i;
01493         for (j = 0; j < calibrate->nvariables; ++j)
01494         {
01495             l = k % calibrate->nsweeps[j];
01496             k /= calibrate->nsweeps[j];
01497             e = calibrate->rangemin[j];
01498             if (calibrate->nsweeps[j] > 1)
01499                 e += 1 * (calibrate->rangemax[j] - calibrate->rangemin[j])
01500                     / (calibrate->nsweeps[j] - 1);
01501             calibrate->value[i * calibrate->nvariables + j] = e;
01502         }
01503     }
01504     calibrate->nsaveds = 0;
01505     if (nthreads <= 1)
01506         calibrate_sequential ();
01507     else
01508     {
01509         for (i = 0; i < nthreads; ++i)
01510         {
01511             data[i].thread = i;
01512             thread[i]
01513                 = g_thread_new (NULL, (void (*) ) calibrate_thread, &data[i]);
01514         }
01515         for (i = 0; i < nthreads; ++i)
01516             g_thread_join (thread[i]);
01517     }
01518     #if HAVE_MPI
01519     // Communicating tasks results
01520     calibrate_synchronise ();
01521 #endif
01522     #if DEBUG
01523     fprintf (stderr, "calibrate_sweep: end\n");
01524 #endif
01525 }
01526

```



```

01531 void
01532 calibrate_MonteCarlo ()
01533 {
01534     unsigned int i, j;
01535     GThread *thread[nthreads];
01536     ParallelData data[nthreads];
01537     #if DEBUG
01538     fprintf (stderr, "calibrate_MonteCarlo: start\n");
01539     #endif
01540     for (i = 0; i < calibrate->nsimulations; ++i)
01541         for (j = 0; j < calibrate->nvariables; ++j)
01542             calibrate->value[i * calibrate->nvariables + j]
01543                 = calibrate->rangemin[j] + gsl_rng_uniform (calibrate->rng)
01544                   * (calibrate->rangemax[j] - calibrate->rangemin[j]);
01545     calibrate->nsaveds = 0;
01546     if (nthreads <= 1)
01547         calibrate_sequential ();
01548     else
01549     {
01550         for (i = 0; i < nthreads; ++i)
01551         {
01552             data[i].thread = i;
01553             thread[i]
01554                 = g_thread_new (NULL, (void (*)(void*)) calibrate_thread, &data[i]);
01555         }
01556         for (i = 0; i < nthreads; ++i)
01557             g_thread_join (thread[i]);
01558     }
01559     #if HAVE_MPI
01560     // Communicating tasks results
01561     calibrate_synchronise ();
01562     #endif
01563     #if DEBUG
01564     fprintf (stderr, "calibrate_MonteCarlo: end\n");
01565     #endif
01566 }
01567
01575 double
01576 calibrate_genetic_objective (Entity * entity)
01577 {
01578     unsigned int j;
01579     double objective;
01580     char buffer[64];
01581     #if DEBUG
01582     fprintf (stderr, "calibrate_genetic_objective: start\n");
01583     #endif
01584     for (j = 0; j < calibrate->nvariables; ++j)
01585     {
01586         calibrate->value[entity->id * calibrate->nvariables + j]
01587             = genetic_get_variable (entity, calibrate->genetic_variable + j);
01588     }
01589     for (j = 0, objective = 0.; j < calibrate->nexperiments; ++j)
01590         objective += calibrate_parse (entity->id, j);
01591     g_mutex_lock (mutex);
01592     for (j = 0; j < calibrate->nvariables; ++j)
01593     {
01594         snprintf (buffer, 64, "%s ", format[calibrate->precision[j]]);
01595         fprintf (calibrate->file_variables, buffer,
01596                 genetic_get_variable (entity, calibrate->genetic_variable + j));
01597     }
01598     fprintf (calibrate->file_variables, "%.14le\n", objective);
01599     g_mutex_unlock (mutex);
01600     #if DEBUG
01601     fprintf (stderr, "calibrate_genetic_objective: end\n");
01602     #endif
01603     return objective;
01604 }
01605
01610 void
01611 calibrate_genetic ()
01612 {
01613     char *best_genome;
01614     double best_objective, *best_variable;
01615     #if DEBUG
01616     fprintf (stderr, "calibrate_genetic: start\n");
01617     fprintf (stderr, "calibrate_genetic: ntasks=%u nthreads=%u\n", ntasks,
01618             nthreads);
01619     fprintf (stderr,
01620             "calibrate_genetic: nvariables=%u population=%u generations=%u\n",
01621             calibrate->nvariables, calibrate->nsimulations,
01622             calibrate->niterations);
01623     fprintf (stderr,
01624             "calibrate_genetic: mutation=%lg reproduction=%lg adaptation=%lg\n",
01625             calibrate->mutation_ratio, calibrate->
01626             reproduction_ratio,
01627             calibrate->adaptation_ratio);
01627     #endif

```

```

01628     genetic_algorithm_default (calibrate->nvariables,
01629                               calibrate->genetic_variable,
01630                               calibrate->nsimulations,
01631                               calibrate->niterations,
01632                               calibrate->mutation_ratio,
01633                               calibrate->reproduction_ratio,
01634                               calibrate->adaptation_ratio,
01635                               &calibrate_genetic_objective,
01636                               &best_genome, &best_variable, &best_objective);
01637 #if DEBUG
01638     fprintf (stderr, "calibrate_genetic: the best\n");
01639 #endif
01640     calibrate->error_old = (double *) g_malloc (sizeof (double));
01641     calibrate->value_old
01642         = (double *) g_malloc (calibrate->nvariables * sizeof (double));
01643     calibrate->error_old[0] = best_objective;
01644     memcpy (calibrate->value_old, best_variable,
01645             calibrate->nvariables * sizeof (double));
01646     g_free (best_genome);
01647     g_free (best_variable);
01648     calibrate_print ();
01649 #if DEBUG
01650     fprintf (stderr, "calibrate_genetic: end\n");
01651 #endif
01652 }
01653
01654 void
01655 calibrate_save_old ()
01656 {
01657     unsigned int i, j;
01658 #if DEBUG
01659     fprintf (stderr, "calibrate_save_old: start\n");
01660 #endif
01661     memcpy (calibrate->error_old, calibrate->error_best,
01662             calibrate->nbest * sizeof (double));
01663     for (i = 0; i < calibrate->nbest; ++i)
01664     {
01665         j = calibrate->simulation_best[i];
01666         memcpy (calibrate->value_old + i * calibrate->nvariables,
01667                 calibrate->value + j * calibrate->nvariables,
01668                 calibrate->nvariables * sizeof (double));
01669     }
01670 #if DEBUG
01671     for (i = 0; i < calibrate->nvariables; ++i)
01672         fprintf (stderr, "calibrate_save_old: best variable %u=%lg\n",
01673                 i, calibrate->value_old[i]);
01674     fprintf (stderr, "calibrate_save_old: end\n");
01675 #endif
01676 }
01677
01678 void
01679 calibrate_merge_old ()
01680 {
01681     unsigned int i, j, k;
01682     double v[calibrate->nbest * calibrate->nvariables], e[calibrate->
01683 nbest],
01684          *enew, *eold;
01685 #if DEBUG
01686     fprintf (stderr, "calibrate_merge_old: start\n");
01687 #endif
01688     anew = calibrate->error_best;
01689     eold = calibrate->error_old;
01690     i = j = k = 0;
01691     do
01692     {
01693         if (*enew < *eold)
01694         {
01695             memcpy (v + k * calibrate->nvariables,
01696                     calibrate->value
01697                     + calibrate->simulation_best[i] * calibrate->
01698 nvariables,
01699                     calibrate->nvariables * sizeof (double));
01700             e[k] = *enew;
01701             ++k;
01702             ++enew;
01703             ++i;
01704         }
01705         else
01706         {
01707             memcpy (v + k * calibrate->nvariables,
01708                     calibrate->value_old + j * calibrate->nvariables,
01709                     calibrate->nvariables * sizeof (double));
01710             e[k] = *eold;
01711             ++k;
01712             ++eold;
01713             ++j;
01714         }
01715     }
01716 }

```

```

01722     }
01723     while (k < calibrate->nbest);
01724     memcpy (calibrate->value_old, v, k * calibrate->nvariables * sizeof (double));
01725     memcpy (calibrate->error_old, e, k * sizeof (double));
01726     #if DEBUG
01727     fprintf (stderr, "calibrate_merge_old: end\n");
01728     #endif
01729 }
01730
01731 void
01732 calibrate_refine ()
01733 {
01734     unsigned int i, j;
01735     double d;
01736     #if HAVE_MPI
01737     MPI_Status mpi_stat;
01738     #endif
01739     #if DEBUG
01740     fprintf (stderr, "calibrate_refine: start\n");
01741     #endif
01742     #if HAVE_MPI
01743     if (!calibrate->mpi_rank)
01744     {
01745         #endif
01746         for (j = 0; j < calibrate->nvariables; ++j)
01747         {
01748             calibrate->rangemin[j] = calibrate->rangemax[j]
01749             = calibrate->value_old[j];
01750         }
01751         for (i = 0; ++i < calibrate->nbest;)
01752         {
01753             for (j = 0; j < calibrate->nvariables; ++j)
01754             {
01755                 calibrate->rangemin[j]
01756                 = fmin (calibrate->rangemin[j],
01757                 calibrate->value_old[i * calibrate->nvariables + j]);
01758                 calibrate->rangemax[j]
01759                 = fmax (calibrate->rangemax[j],
01760                 calibrate->value_old[i * calibrate->nvariables + j]);
01761             }
01762             for (j = 0; j < calibrate->nvariables; ++j)
01763             {
01764                 d = 0.5 * calibrate->tolerance
01765                 * (calibrate->rangemax[j] - calibrate->rangemin[j]);
01766                 calibrate->rangemin[j] -= d;
01767                 calibrate->rangemin[j]
01768                 = fmax (calibrate->rangemin[j], calibrate->rangeminabs[j]);
01769                 calibrate->rangemax[j] += d;
01770                 calibrate->rangemax[j]
01771                 = fmin (calibrate->rangemax[j], calibrate->rangemaxabs[j]);
01772                 printf ("%s min=%lg max=%lg\n", calibrate->label[j],
01773                 calibrate->rangemin[j], calibrate->rangemax[j]);
01774                 fprintf (calibrate->file_result, "%s min=%lg max=%lg\n",
01775                 calibrate->label[j], calibrate->rangemin[j],
01776                 calibrate->rangemax[j]);
01777             }
01778             #if HAVE_MPI
01779             for (i = 1; i < ntasks; ++i)
01780             {
01781                 MPI_Send (calibrate->rangemin, calibrate->nvariables, MPI_DOUBLE, i,
01782                 1, MPI_COMM_WORLD);
01783                 MPI_Send (calibrate->rangemax, calibrate->nvariables, MPI_DOUBLE, i,
01784                 1, MPI_COMM_WORLD);
01785             }
01786             #else
01787             MPI_Recv (calibrate->rangemin, calibrate->nvariables, MPI_DOUBLE, 0, 1,
01788             MPI_COMM_WORLD, &mpi_stat);
01789             MPI_Recv (calibrate->rangemax, calibrate->nvariables, MPI_DOUBLE, 0, 1,
01790             MPI_COMM_WORLD, &mpi_stat);
01791             #endif
01792         }
01793         #if DEBUG
01794         fprintf (stderr, "calibrate_refine: end\n");
01795         #endif
01796     }
01797     void
01798     calibrate_iterate ()
01799     {
01800         unsigned int i;
01801         #if DEBUG
01802         fprintf (stderr, "calibrate_iterate: start\n");
01803         #endif
01804         calibrate->error_old

```

```

01818     = (double *) g_malloc (calibrate->nbest * sizeof (double));
01819     calibrate->value_old = (double *)
01820     g_malloc (calibrate->nbest * calibrate->nvariables * sizeof (double));
01821     calibrate_step ();
01822     calibrate_save_old ();
01823     calibrate_refine ();
01824     calibrate_print ();
01825     for (i = 1; i < calibrate->niterations; ++i)
01826     {
01827         calibrate_step ();
01828         calibrate_merge_old ();
01829         calibrate_refine ();
01830         calibrate_print ();
01831     }
01832 #if DEBUG
01833     fprintf (stderr, "calibrate_iterate: end\n");
01834 #endif
01835 }
01836
01841 void
01842 calibrate_free ()
01843 {
01844     unsigned int i, j;
01845     #if DEBUG
01846         fprintf (stderr, "calibrate_free: start\n");
01847     #endif
01848     for (i = 0; i < calibrate->nexperiments; ++i)
01849     {
01850         for (j = 0; j < calibrate->ninputs; ++j)
01851             g_mapped_file_unref (calibrate->file[j][i]);
01852     }
01853     for (i = 0; i < calibrate->ninputs; ++i)
01854         g_free (calibrate->file[i]);
01855     g_free (calibrate->error_old);
01856     g_free (calibrate->value_old);
01857     g_free (calibrate->value);
01858     g_free (calibrate->genetic_variable);
01859     #if DEBUG
01860         fprintf (stderr, "calibrate_free: end\n");
01861     #endif
01862 }
01863
01868 void
01869 calibrate_new ()
01870 {
01871     unsigned int i, j, *nbits;
01872     #if DEBUG
01873         fprintf (stderr, "calibrate_new: start\n");
01874     #endif
01875     // Replacing the working dir
01876     chdir (input->directory);
01877     // Obtaining the simulator file
01878     calibrate->simulator = input->simulator;
01879     // Obtaining the evaluator file
01880     calibrate->evaluator = input->evaluator;
01881     // Reading the algorithm
01882     calibrate->algorithm = input->algorithm;
01883     switch (calibrate->algorithm)
01884     {
01885         case ALGORITHM_MONTE_CARLO:
01886             calibrate_step = calibrate_MonteCarlo;
01887             break;
01888         case ALGORITHM_SWEEP:
01889             calibrate_step = calibrate_sweep;
01890             break;
01891         default:
01892             calibrate_step = calibrate_genetic;
01893             calibrate->mutation_ratio = input->mutation_ratio;
01894             calibrate->reproduction_ratio = input->
01895             reproduction_ratio;
01896             calibrate->adaptation_ratio = input->adaptation_ratio;
01897     }
01898     calibrate->nsimulations = input->nsimulations;
01899     calibrate->niterations = input->niterations;
01900     calibrate->nbest = input->nbest;
01901     calibrate->tolerance = input->tolerance;
01902     calibrate->simulation_best
01903     = (unsigned int *) alloca (calibrate->nbest * sizeof (unsigned int));
01904     calibrate->error_best
01905     = (double *) alloca (calibrate->nbest * sizeof (double));
01906 }

```

```

01912 // Reading the experimental data
01913 #if DEBUG
01914 fprintf (stderr, "calibrate_new: current directory=%s\n",
01915         g_get_current_dir ());
01916 #endif
01917 calibrate->nexperiments = input->nexperiments;
01918 calibrate->ninputs = input->ninputs;
01919 calibrate->experiment = input->experiment;
01920 calibrate->weight = input->weight;
01921 for (i = 0; i < input->ninputs; ++i)
01922 {
01923     calibrate->template[i] = input->template[i];
01924     calibrate->file[i]
01925         = g_malloc (input->nexperiments * sizeof (GMappedFile *));
01926 }
01927 for (i = 0; i < input->nexperiments; ++i)
01928 {
01929 #if DEBUG
01930     fprintf (stderr, "calibrate_new: i=%u\n", i);
01931     fprintf (stderr, "calibrate_new: experiment=%s\n",
01932             calibrate->experiment[i]);
01933     fprintf (stderr, "calibrate_new: weight=%lg\n", calibrate->weight[i]);
01934 #endif
01935     for (j = 0; j < input->ninputs; ++j)
01936     {
01937 #if DEBUG
01938         fprintf (stderr, "calibrate_new: template%u\n", j + 1);
01939         fprintf (stderr, "calibrate_new: experiment=%u template%u=%s\n",
01940                 i, j + 1, calibrate->template[j][i]);
01941 #endif
01942         calibrate->file[j][i]
01943             = g_mapped_file_new (input->template[j][i], 0, NULL);
01944     }
01945 }
01946 // Reading the variables data
01947 #if DEBUG
01948 fprintf (stderr, "calibrate_new: reading variables\n");
01949 #endif
01950 calibrate->nvariables = input->nvariables;
01951 calibrate->label = input->label;
01952 calibrate->rangemin = input->rangemin;
01953 calibrate->rangeminabs = input->rangeminabs;
01954 calibrate->rangemax = input->rangemax;
01955 calibrate->rangemaxabs = input->rangemaxabs;
01956 calibrate->precision = input->precision;
01957 calibrate->nsweeps = input->nsweeps;
01958 nbits = input->nbits;
01959 if (input->algorithm == ALGORITHM_SWEEP)
01960     calibrate->nsimulations = 1;
01961 else if (input->algorithm == ALGORITHM_GENETIC)
01962     for (i = 0; i < input->nvariables; ++i)
01963     {
01964         if (calibrate->algorithm == ALGORITHM_SWEEP)
01965         {
01966             calibrate->nsimulations *= input->nsweeps[i];
01967 #if DEBUG
01968             fprintf (stderr, "calibrate_new: nsweeps=%u nsimulations=%u\n",
01969                     calibrate->nsweeps[i], calibrate->nsimulations);
01970 #endif
01971         }
01972     }
01973 // Allocating values
01974 #if DEBUG
01975 fprintf (stderr, "calibrate_new: allocating variables\n");
01976 fprintf (stderr, "calibrate_new: nvariables=%u\n", calibrate->nvariables);
01977 #endif
01978 calibrate->genetic_variable = NULL;
01979 if (calibrate->algorithm == ALGORITHM_GENETIC)
01980 {
01981     calibrate->genetic_variable = (GeneticVariable *)
01982         g_malloc (calibrate->nvariables * sizeof (GeneticVariable));
01983     for (i = 0; i < calibrate->nvariables; ++i)
01984     {
01985 #if DEBUG
01986         fprintf (stderr, "calibrate_new: i=%u min=%lg max=%lg nbits=%u\n",
01987                 i, calibrate->rangemin[i], calibrate->rangemax[i], nbits[i]);
01988 #endif
01989         calibrate->genetic_variable[i].minimum = calibrate->
01990             rangemin[i];
01991         calibrate->genetic_variable[i].maximum = calibrate->
01992             rangemax[i];
01993         calibrate->genetic_variable[i].nbits = nbits[i];
01994     }
01995 }
01996 #if DEBUG

```

```

01997     fprintf (stderr, "calibrate_new: nvariables=%u nsimulations=%u\n",
01998               calibrate->nvariables, calibrate->nsimulations);
01999 #endif
02000     calibrate->value = (double *) g_malloc (calibrate->nsimulations *
02001                                           calibrate->nvariables *
02002                                           sizeof (double));
02003
02004     // Calculating simulations to perform on each task
02005 #if HAVE_MPI
02006 #if DEBUG
02007     fprintf (stderr, "calibrate_new: rank=%u ntasks=%u\n",
02008             calibrate->mpi_rank, ntasks);
02009 #endif
02010     calibrate->nstart = calibrate->mpi_rank * calibrate->
02011     nsimulations / ntasks;
02012     calibrate->nend = (1 + calibrate->mpi_rank) * calibrate->
02013     nsimulations
02014     / ntasks;
02015 #else
02016     calibrate->nstart = 0;
02017     calibrate->nend = calibrate->nsimulations;
02018 #endif
02019 #if DEBUG
02020     fprintf (stderr, "calibrate_new: nstart=%u nend=%u\n", calibrate->nstart,
02021             calibrate->nend);
02022 #endif
02023 // Calculating simulations to perform on each thread
02024 calibrate->thread
02025 = (unsigned int *) alloca ((1 + nthreads) * sizeof (unsigned int));
02026 for (i = 0; i <= nthreads; ++i)
02027 {
02028     calibrate->thread[i] = calibrate->nstart
02029     + i * (calibrate->nend - calibrate->nstart) / nthreads;
02030 #if DEBUG
02031     fprintf (stderr, "calibrate_new: i=%u thread=%u\n", i,
02032             calibrate->thread[i]);
02033 #endif
02034 }
02035 // Opening result files
02036 calibrate->file_result = fopen ("result", "w");
02037 calibrate->file_variables = fopen ("variables", "w");
02038
02039 // Performing the algorithm
02040 switch (calibrate->algorithm)
02041 {
02042     // Genetic algorithm
02043     case ALGORITHM_GENETIC:
02044         calibrate_genetic ();
02045         break;
02046     // Iterative algorithm
02047     default:
02048         calibrate_iterate ();
02049 }
02050
02051 // Closing result files
02052 fclose (calibrate->file_variables);
02053 fclose (calibrate->file_result);
02054
02055 #if DEBUG
02056     fprintf (stderr, "calibrate_new: end\n");
02057 #endif
02058 }
02059
02060 #if HAVE_GTK
02061 void
02062 input_save (char *filename)
02063 {
02064     unsigned int i, j;
02065     char *buffer;
02066     xmlDoc *doc;
02067     xmlNode *node, *child;
02068     GFile *file, *file2;
02069
02070     // Getting the input file directory
02071     input->name = g_path_get_basename (filename);
02072     input->directory = g_path_get_dirname (filename);
02073     file = g_file_new_for_path (input->directory);
02074
02075     // Opening the input file
02076     doc = xmlNewDoc ((const xmlChar *) "1.0");
02077
02078     // Setting root XML node
02079     node = xmlNewDocNode (doc, 0, XML_CALIBRATE, 0);

```

```

02088 xmlDocSetRootElement (doc, node);
02089
02090 // Adding properties to the root XML node
02091 file2 = g_file_new_for_path (input->simulator);
02092 buffer = g_file_get_relative_path (file, file2);
02093 g_object_unref (file2);
02094 xmlSetProp (node, XML_SIMULATOR, (xmlChar *) buffer);
02095 g_free (buffer);
02096 if (input->evaluator)
02097 {
02098     file2 = g_file_new_for_path (input->evaluator);
02099     buffer = g_file_get_relative_path (file, file2);
02100     g_object_unref (file2);
02101     if (xmlStrlen ((xmlChar *) buffer))
02102         xmlSetProp (node, XML_EVALUATOR, (xmlChar *) buffer);
02103     g_free (buffer);
02104 }
02105
02106 // Setting the algorithm
02107 buffer = (char *) g_malloc (64);
02108 switch (input->algorithm)
02109 {
02110     case ALGORITHM_MONTE_CARLO:
02111         xmlSetProp (node, XML_ALGORITHM, XML_MONTE_CARLO);
02112         snprintf (buffer, 64, "%u", input->nsimulations);
02113         xmlSetProp (node, XML_NSIMULATIONS, (xmlChar *) buffer);
02114         snprintf (buffer, 64, "%u", input->niterations);
02115         xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02116         snprintf (buffer, 64, "%.3lg", input->tolerance);
02117         xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02118         snprintf (buffer, 64, "%u", input->nbest);
02119         xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02120         break;
02121     case ALGORITHM_SWEEP:
02122         xmlSetProp (node, XML_ALGORITHM, XML_SWEEP);
02123         snprintf (buffer, 64, "%u", input->niterations);
02124         xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02125         snprintf (buffer, 64, "%.3lg", input->tolerance);
02126         xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02127         snprintf (buffer, 64, "%u", input->nbest);
02128         xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02129         break;
02130     default:
02131         xmlSetProp (node, XML_ALGORITHM, XML_GENETIC);
02132         snprintf (buffer, 64, "%u", input->nsimulations);
02133         xmlSetProp (node, XML_NPOPULATION, (xmlChar *) buffer);
02134         snprintf (buffer, 64, "%u", input->niterations);
02135         xmlSetProp (node, XML_NGENERATIONS, (xmlChar *) buffer);
02136         snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
02137         xmlSetProp (node, XML_MUTATION, (xmlChar *) buffer);
02138         snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
02139         xmlSetProp (node, XML_REPRODUCTION, (xmlChar *) buffer);
02140         snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
02141         xmlSetProp (node, XML_ADAPTATION, (xmlChar *) buffer);
02142         break;
02143 }
02144 g_free (buffer);
02145
02146 // Setting the experimental data
02147 for (i = 0; i < input->nexperiments; ++i)
02148 {
02149     child = xmlNewChild (node, 0, XML_EXPERIMENT, 0);
02150     xmlSetProp (child, XML_NAME, (xmlChar *) input->experiment[i]);
02151     if (input->weight[i] != 1.)
02152         xml_node_set_float (child, XML_WEIGHT, input->
weight[i]);
02153     for (j = 0; j < input->ninputs; ++j)
02154         xmlSetProp (child, template[j], (xmlChar *) input->template[j][i]);
02155 }
02156
02157 // Setting the variables data
02158 for (i = 0; i < input->nvariables; ++i)
02159 {
02160     child = xmlNewChild (node, 0, XML_VARIABLE, 0);
02161     xmlSetProp (child, XML_NAME, (xmlChar *) input->label[i]);
02162     xml_node_set_float (child, XML_MINIMUM, input->
rangemin[i]);
02163     if (input->rangeminabs[i] != -G_MAXDOUBLE)
02164         xml_node_set_float (child, XML_ABSOLUTE_MINIMUM, input->
rangeminabs[i]);
02165     xml_node_set_float (child, XML_MAXIMUM, input->
rangemax[i]);
02166     if (input->rangemaxabs[i] != G_MAXDOUBLE)
02167         xml_node_set_float (child, XML_ABSOLUTE_MAXIMUM, input->
rangemaxabs[i]);
02168     if (input->precision[i] != DEFAULT_PRECISION)
02169         xml_node_set_uint (child, XML_PRECISION, input->

```

```

        precision[i]);
02170         if (input->algorithm == ALGORITHM_SWEEP)
02171             xml_node_set_uint (child, XML_NSWEEPS, input->
nsweeps[i]);
02172         else if (input->algorithm == ALGORITHM_GENETIC)
02173             xml_node_set_uint (child, XML_NBITS, input->
nbits[i]);
02174     }
02175
02176     // Saving the XML file
02177     xmlSaveFormatFile (filename, doc, 1);
02178
02179     // Freeing memory
02180     xmlFreeDoc (doc);
02181 }
02182
02187 void
02188 options_new ()
02189 {
02190     options->label_processors
02191         = (GtkLabel *) gtk_label_new (gettext ("Processors number"));
02192     options->spin_processors
02193         = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
02194     gtk_spin_button_set_value (options->spin_processors, (gdouble)
nthreads);
02195     options->grid = (GtkGrid *) gtk_grid_new ();
02196     gtk_grid_attach (options->grid, GTK_WIDGET (options->label_processors),
02197                     0, 0, 1, 1);
02198     gtk_grid_attach (options->grid, GTK_WIDGET (options->spin_processors),
02199                     1, 0, 1, 1);
02200     gtk_widget_show_all (GTK_WIDGET (options->grid));
02201     options->dialog = (GtkDialog *)
02202         gtk_dialog_new_with_buttons (gettext ("Options"),
02203                                     window->window,
02204                                     GTK_DIALOG_MODAL,
02205                                     gettext ("_OK"), GTK_RESPONSE_OK,
02206                                     gettext ("_Cancel"), GTK_RESPONSE_CANCEL,
02207                                     NULL);
02208     gtk_container_add
02209         (GTK_CONTAINER (gtk_dialog_get_content_area (options->dialog)),
02210          GTK_WIDGET (options->grid));
02211     if (gtk_dialog_run (options->dialog) == GTK_RESPONSE_OK)
02212         nthreads = gtk_spin_button_get_value_as_int (options->spin_processors);
02213     gtk_widget_destroy (GTK_WIDGET (options->dialog));
02214 }
02215
02220 void
02221 running_new ()
02222 {
02223     running->label = (GtkLabel *) gtk_label_new (gettext ("Calculating ..."));
02224     running->dialog = (GtkDialog *)
02225         gtk_dialog_new_with_buttons (gettext ("Calculating"),
02226                                     window->window,
02227                                     GTK_DIALOG_DESTROY_WITH_PARENT, NULL, NULL);
02228     gtk_container_add
02229         (GTK_CONTAINER (gtk_dialog_get_content_area (running->dialog)),
02230          GTK_WIDGET (running->label));
02231     gtk_widget_show_all (GTK_WIDGET (running->dialog));
02232 }
02233
02239 int
02240 window_save ()
02241 {
02242     char *buffer;
02243     GtkFileChooserDialog *dlg;
02244
02245     #if DEBUG
02246         fprintf (stderr, "window_save: start\n");
02247     #endif
02248
02249     // Opening the saving dialog
02250     dlg = (GtkFileChooserDialog *)
02251         gtk_file_chooser_dialog_new (gettext ("Save file"),
02252                                     window->window,
02253                                     GTK_FILE_CHOOSER_ACTION_SAVE,
02254                                     gettext ("_Cancel"),
02255                                     GTK_RESPONSE_CANCEL,
02256                                     gettext ("_OK"), GTK_RESPONSE_OK, NULL);
02257     gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
02258
02259     // If OK response then saving
02260     if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
02261     {
02262
02263         // Adding properties to the root XML node
02264         input->simulator = gtk_file_chooser_get_filename
02265             (GTK_FILE_CHOOSER (window->button_simulator));

```



```

02266     if (gtk_toggle_button_get_active
02267         (GTK_TOGGLE_BUTTON (window->check_evaluator)))
02268         input->evaluator = gtk_file_chooser_get_filename
02269         (GTK_FILE_CHOOSER (window->button_evaluator));
02270     else
02271         input->evaluator = NULL;
02272
02273     // Setting the algorithm
02274     switch (window_get_algorithm ())
02275     {
02276     case ALGORITHM_MONTE_CARLO:
02277         input->algorithm = ALGORITHM_MONTE_CARLO;
02278         input->nsimulations
02279             = gtk_spin_button_get_value_as_int (window->spin_simulations);
02280         input->niterations
02281             = gtk_spin_button_get_value_as_int (window->spin_iterations);
02282         input->tolerance = gtk_spin_button_get_value (window->
spin_tolerance);
02283         input->nbest = gtk_spin_button_get_value_as_int (window->
spin_bests);
02284         break;
02285     case ALGORITHM_SWEEP:
02286         input->algorithm = ALGORITHM_SWEEP;
02287         input->niterations
02288             = gtk_spin_button_get_value_as_int (window->spin_iterations);
02289         input->tolerance = gtk_spin_button_get_value (window->
spin_tolerance);
02290         input->nbest = gtk_spin_button_get_value_as_int (window->
spin_bests);
02291         break;
02292     default:
02293         input->algorithm = ALGORITHM_GENETIC;
02294         input->nsimulations
02295             = gtk_spin_button_get_value_as_int (window->spin_population);
02296         input->niterations
02297             = gtk_spin_button_get_value_as_int (window->spin_generations);
02298         input->mutation_ratio
02299             = gtk_spin_button_get_value (window->spin_mutation);
02300         input->reproduction_ratio
02301             = gtk_spin_button_get_value (window->spin_reproduction);
02302         input->adaptation_ratio
02303             = gtk_spin_button_get_value (window->spin_adaptation);
02304         break;
02305     }
02306
02307     // Saving the XML file
02308     buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
02309     input_save (buffer);
02310
02311     // Closing and freeing memory
02312     g_free (buffer);
02313     gtk_widget_destroy (GTK_WIDGET (dlg));
02314 #if DEBUG
02315     fprintf (stderr, "window_save: end\n");
02316 #endif
02317     return 1;
02318 }
02319
02320 // Closing and freeing memory
02321 gtk_widget_destroy (GTK_WIDGET (dlg));
02322 #if DEBUG
02323 fprintf (stderr, "window_save: end\n");
02324 #endif
02325 return 0;
02326 }
02327
02332 void
02333 window_run ()
02334 {
02335     unsigned int i;
02336     char *msg, *msg2, buffer[64], buffer2[64];
02337 #if DEBUG
02338     fprintf (stderr, "window_run: start\n");
02339 #endif
02340     if (!window_save ())
02341     {
02342 #if DEBUG
02343         fprintf (stderr, "window_run: end\n");
02344 #endif
02345         return;
02346     }
02347     running_new ();
02348     while (g_main_context_pending (NULL))
02349         g_main_context_iteration (NULL, FALSE);
02350     calibrate_new ();
02351     gtk_widget_destroy (GTK_WIDGET (running->dialog));
02352     snprintf (buffer, 64, "error=%.15le\n", calibrate->error_old[0]);

```

```

02353 msg2 = g_strdup (buffer);
02354 for (i = 0; i < calibrate->nvariables; ++i, msg2 = msg)
02355 {
02356     snprintf (buffer, 64, "%s=%s\n",
02357               calibrate->label[i], format[calibrate->precision[i]]);
02358     snprintf (buffer2, 64, buffer, calibrate->value_old[i]);
02359     msg = g_strconcat (msg2, buffer2, NULL);
02360     g_free (msg2);
02361 }
02362 show_message (gettext ("Best result"), msg2, INFO_TYPE);
02363 g_free (msg2);
02364 calibrate_free ();
02365 #if DEBUG
02366 fprintf (stderr, "window_run: end\n");
02367 #endif
02368 }
02369
02374 void
02375 window_help ()
02376 {
02377     char *buffer, *buffer2;
02378     buffer2 = g_build_filename (current_directory, "manuals",
02379                                "user-manual.pdf", NULL);
02380     buffer = g_filename_to_uri (buffer2, NULL, NULL);
02381     g_free (buffer2);
02382     gtk_show_uri (NULL, buffer, GDK_CURRENT_TIME, NULL);
02383     g_free (buffer);
02384 }
02385
02390 void
02391 window_about ()
02392 {
02393     gchar *authors[] = {
02394         "Javier Burguete Tolosa (jburguete@eead.csic.es)",
02395         "Borja Latorre Garcés (borja.latorre@csic.es)",
02396         NULL
02397     };
02398     gtk_show_about_dialog (window->window,
02399                           "program_name",
02400                           "Calibrator",
02401                           "comments",
02402                           gettext ("A software to make calibrations of "
02403                                    "empirical parameters"),
02404                           "authors", authors,
02405                           "translator-credits",
02406                           "Javier Burguete Tolosa (jburguete@eead.csic.es)",
02407                           "version", "1.1.26", "copyright",
02408                           "Copyright 2012-2015 Javier Burguete Tolosa",
02409                           "logo", window->logo,
02410                           "website-label", gettext ("Website"),
02411                           "website",
02412                           "https://github.com/jburguete/calibrator", NULL);
02413 }
02414
02420 int
02421 window_get_algorithm ()
02422 {
02423     unsigned int i;
02424     for (i = 0; i < NALGORITHMS; ++i)
02425         if (gtk_toggle_button_get_active
02426             (GTK_TOGGLE_BUTTON (window->button_algorithm[i])))
02427             break;
02428     return i;
02429 }
02430
02435 void
02436 window_update ()
02437 {
02438     unsigned int i;
02439     gtk_widget_set_sensitive
02440         (GTK_WIDGET (window->button_evaluator),
02441          gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
02442                                         (window->check_evaluator)));
02443     gtk_widget_hide (GTK_WIDGET (window->label_simulations));
02444     gtk_widget_hide (GTK_WIDGET (window->spin_simulations));
02445     gtk_widget_hide (GTK_WIDGET (window->label_iterations));
02446     gtk_widget_hide (GTK_WIDGET (window->spin_iterations));
02447     gtk_widget_hide (GTK_WIDGET (window->label_tolerance));
02448     gtk_widget_hide (GTK_WIDGET (window->spin_tolerance));
02449     gtk_widget_hide (GTK_WIDGET (window->label_bests));
02450     gtk_widget_hide (GTK_WIDGET (window->spin_bests));
02451     gtk_widget_hide (GTK_WIDGET (window->label_population));
02452     gtk_widget_hide (GTK_WIDGET (window->spin_population));
02453     gtk_widget_hide (GTK_WIDGET (window->label_generations));
02454     gtk_widget_hide (GTK_WIDGET (window->spin_generations));
02455     gtk_widget_hide (GTK_WIDGET (window->label_mutation));
02456     gtk_widget_hide (GTK_WIDGET (window->spin_mutation));

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02457 gtk_widget_hide (GTK_WIDGET (window->label_reproduction));
02458 gtk_widget_hide (GTK_WIDGET (window->spin_reproduction));
02459 gtk_widget_hide (GTK_WIDGET (window->label_adaptation));
02460 gtk_widget_hide (GTK_WIDGET (window->spin_adaptation));
02461 gtk_widget_hide (GTK_WIDGET (window->label_sweeps));
02462 gtk_widget_hide (GTK_WIDGET (window->spin_sweeps));
02463 gtk_widget_hide (GTK_WIDGET (window->label_bits));
02464 gtk_widget_hide (GTK_WIDGET (window->spin_bits));
02465 i = gtk_spin_button_get_value_as_int (window->spin_iterations);
02466 switch (window_get_algorithm ())
02467 {
02468     case ALGORITHM_MONTE_CARLO:
02469         gtk_widget_show (GTK_WIDGET (window->label_simulations));
02470         gtk_widget_show (GTK_WIDGET (window->spin_simulations));
02471         gtk_widget_show (GTK_WIDGET (window->label_iterations));
02472         gtk_widget_show (GTK_WIDGET (window->spin_iterations));
02473         if (i > 1)
02474         {
02475             gtk_widget_show (GTK_WIDGET (window->label_tolerance));
02476             gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
02477             gtk_widget_show (GTK_WIDGET (window->label_bests));
02478             gtk_widget_show (GTK_WIDGET (window->spin_bests));
02479         }
02480         break;
02481     case ALGORITHM_SWEEP:
02482         gtk_widget_show (GTK_WIDGET (window->label_iterations));
02483         gtk_widget_show (GTK_WIDGET (window->spin_iterations));
02484         gtk_widget_show (GTK_WIDGET (window->label_tolerance));
02485         gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
02486         if (i > 1)
02487         {
02488             gtk_widget_show (GTK_WIDGET (window->label_tolerance));
02489             gtk_widget_show (GTK_WIDGET (window->spin_tolerance));
02490             gtk_widget_show (GTK_WIDGET (window->label_bests));
02491             gtk_widget_show (GTK_WIDGET (window->spin_bests));
02492         }
02493         gtk_widget_show (GTK_WIDGET (window->label_sweeps));
02494         gtk_widget_show (GTK_WIDGET (window->spin_sweeps));
02495         break;
02496     default:
02497         gtk_widget_show (GTK_WIDGET (window->label_population));
02498         gtk_widget_show (GTK_WIDGET (window->spin_population));
02499         gtk_widget_show (GTK_WIDGET (window->label_generations));
02500         gtk_widget_show (GTK_WIDGET (window->spin_generations));
02501         gtk_widget_show (GTK_WIDGET (window->label_mutation));
02502         gtk_widget_show (GTK_WIDGET (window->spin_mutation));
02503         gtk_widget_show (GTK_WIDGET (window->label_reproduction));
02504         gtk_widget_show (GTK_WIDGET (window->spin_reproduction));
02505         gtk_widget_show (GTK_WIDGET (window->label_adaptation));
02506         gtk_widget_show (GTK_WIDGET (window->spin_adaptation));
02507         gtk_widget_show (GTK_WIDGET (window->label_bits));
02508         gtk_widget_show (GTK_WIDGET (window->spin_bits));
02509     }
02510     gtk_widget_set_sensitive
02511     (GTK_WIDGET (window->button_remove_experiment), input->
nexperiments > 1);
02512     gtk_widget_set_sensitive
02513     (GTK_WIDGET (window->button_remove_variable), input->
nvariables > 1);
02514     for (i = 0; i < input->ninputs; ++i)
02515     {
02516         gtk_widget_show (GTK_WIDGET (window->check_template[i]));
02517         gtk_widget_show (GTK_WIDGET (window->button_template[i]));
02518         gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 0);
02519         gtk_widget_set_sensitive (GTK_WIDGET (window->button_template[i]), 1);
02520         g_signal_handler_block
02521         (window->check_template[i], window->id_template[i]);
02522         g_signal_handler_block (window->button_template[i], window->
id_input[i]);
02523         gtk_toggle_button_set_active
02524         (GTK_TOGGLE_BUTTON (window->check_template[i]), 1);
02525         g_signal_handler_unblock
02526         (window->button_template[i], window->id_input[i]);
02527         g_signal_handler_unblock
02528         (window->check_template[i], window->id_template[i]);
02529     }
02530     if (i > 0)
02531     {
02532         gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i - 1]), 1);
02533         gtk_widget_set_sensitive
02534         (GTK_WIDGET (window->button_template[i - 1]),
02535          gtk_toggle_button_get_active
02536          (GTK_TOGGLE_BUTTON (window->check_template[i - 1])));
02537     }
02538     if (i < MAX_NINPUTS)
02539     {
02540         gtk_widget_show (GTK_WIDGET (window->check_template[i]));

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```

02541     gtk_widget_show (GTK_WIDGET (window->button_template[i]));
02542     gtk_widget_set_sensitive (GTK_WIDGET (window->check_template[i]), 1);
02543     gtk_widget_set_sensitive
02544     (GTK_WIDGET (window->button_template[i]),
02545      gtk_toggle_button_get_active
02546      (GTK_TOGGLE_BUTTON (window->check_template[i]));
02547     g_signal_handler_block
02548     (window->check_template[i], window->id_template[i]);
02549     g_signal_handler_block (window->button_template[i], window->
id_input[i]);
02550     gtk_toggle_button_set_active
02551     (GTK_TOGGLE_BUTTON (window->check_template[i]), 0);
02552     g_signal_handler_unblock
02553     (window->button_template[i], window->id_input[i]);
02554     g_signal_handler_unblock
02555     (window->check_template[i], window->id_template[i]);
02556 }
02557 while (++i < MAX_NINPUTS)
02558 {
02559     gtk_widget_hide (GTK_WIDGET (window->check_template[i]));
02560     gtk_widget_hide (GTK_WIDGET (window->button_template[i]));
02561 }
02562 gtk_widget_set_sensitive
02563 (GTK_WIDGET (window->spin_minabs),
02564  gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (window->check_minabs)));
02565 gtk_widget_set_sensitive
02566 (GTK_WIDGET (window->spin_maxabs),
02567  gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON (window->check_maxabs)));
02568 }
02569
02574 void
02575 window_set_algorithm ()
02576 {
02577     unsigned int i;
02578     i = window_get_algorithm ();
02579     switch (i)
02580     {
02581     case ALGORITHM_SWEEP:
02582         input->nsweeps = (unsigned int *) g_realloc
02583         (input->nsweeps, input->nvariables * sizeof (unsigned int));
02584         break;
02585     case ALGORITHM_GENETIC:
02586         input->nbits = (unsigned int *) g_realloc
02587         (input->nbits, input->nvariables * sizeof (unsigned int));
02588     }
02589     window_update ();
02590 }
02591
02596 void
02597 window_set_experiment ()
02598 {
02599     unsigned int i, j;
02600     char *buffer1, *buffer2;
02601     #if DEBUG
02602     fprintf (stderr, "window_set_experiment: start\n");
02603     #endif
02604     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02605     gtk_spin_button_set_value (window->spin_weight, input->weight[i]);
02606     buffer1 = gtk_combo_box_text_get_active_text (window->combo_experiment);
02607     buffer2 = g_build_filename (input->directory, buffer1, NULL);
02608     g_free (buffer1);
02609     g_signal_handler_block
02610     (window->button_experiment, window->id_experiment_name);
02611     gtk_file_chooser_set_filename
02612     (GTK_FILE_CHOOSER (window->button_experiment), buffer2);
02613     g_signal_handler_unblock
02614     (window->button_experiment, window->id_experiment_name);
02615     g_free (buffer2);
02616     for (j = 0; j < input->ninputs; ++j)
02617     {
02618         g_signal_handler_block (window->button_template[j], window->
id_input[j]);
02619         buffer2
02620         = g_build_filename (input->directory, input->template[j][i], NULL);
02621         gtk_file_chooser_set_filename
02622         (GTK_FILE_CHOOSER (window->button_template[j]), buffer2);
02623         g_free (buffer2);
02624         g_signal_handler_unblock
02625         (window->button_template[j], window->id_input[j]);
02626     }
02627     #if DEBUG
02628     fprintf (stderr, "window_set_experiment: end\n");
02629     #endif
02630 }
02631
02636 void
02637 window_remove_experiment ()

```

```

02638 {
02639     unsigned int i, j;
02640     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02641     g_signal_handler_block (window->combo_experiment, window->
id_experiment);
02642     gtk_combo_box_text_remove (window->combo_experiment, i);
02643     g_signal_handler_unblock (window->combo_experiment, window->
id_experiment);
02644     xmlFree (input->experiment[i]);
02645     --input->nexperiments;
02646     for (j = i; j < input->nexperiments; ++j)
02647     {
02648         input->experiment[j] = input->experiment[j + 1];
02649         input->weight[j] = input->weight[j + 1];
02650     }
02651     j = input->nexperiments - 1;
02652     if (i > j)
02653         i = j;
02654     for (j = 0; j < input->ninputs; ++j)
02655         g_signal_handler_block (window->button_template[j], window->
id_input[j]);
02656     g_signal_handler_block
02657         (window->button_experiment, window->id_experiment_name);
02658     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
02659     g_signal_handler_unblock
02660         (window->button_experiment, window->id_experiment_name);
02661     for (j = 0; j < input->ninputs; ++j)
02662         g_signal_handler_unblock (window->button_template[j], window->
id_input[j]);
02663     window_update ();
02664 }
02665
02670 void
02671 window_add_experiment ()
02672 {
02673     unsigned int i, j;
02674     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02675     g_signal_handler_block (window->combo_experiment, window->
id_experiment);
02676     gtk_combo_box_text_insert_text
02677         (window->combo_experiment, i, input->experiment[i]);
02678     g_signal_handler_unblock (window->combo_experiment, window->
id_experiment);
02679     input->experiment = (char **) g_realloc
02680         (input->experiment, (input->nexperiments + 1) * sizeof (char *));
02681     input->weight = (double *) g_realloc
02682         (input->weight, (input->nexperiments + 1) * sizeof (double));
02683     for (j = input->nexperiments - 1; j > i; --j)
02684     {
02685         input->experiment[j + 1] = input->experiment[j];
02686         input->weight[j + 1] = input->weight[j];
02687     }
02688     input->experiment[j + 1]
02689         = (char *) xmlStrdup ((xmlChar *) input->experiment[j]);
02690     input->weight[j + 1] = input->weight[j];
02691     ++input->nexperiments;
02692     for (j = 0; j < input->ninputs; ++j)
02693         g_signal_handler_block (window->button_template[j], window->
id_input[j]);
02694     g_signal_handler_block
02695         (window->button_experiment, window->id_experiment_name);
02696     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i + 1);
02697     g_signal_handler_unblock
02698         (window->button_experiment, window->id_experiment_name);
02699     for (j = 0; j < input->ninputs; ++j)
02700         g_signal_handler_unblock (window->button_template[j], window->
id_input[j]);
02701     window_update ();
02702 }
02703
02708 void
02709 window_name_experiment ()
02710 {
02711     unsigned int i;
02712     char *buffer;
02713     GFile *file1, *file2;
02714     #if DEBUG
02715     fprintf (stderr, "window_name_experiment: start\n");
02716     #endif
02717     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02718     file1
02719         = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_experiment));
02720     file2 = g_file_new_for_path (input->directory);
02721     buffer = g_file_get_relative_path (file2, file1);
02722     g_signal_handler_block (window->combo_experiment, window->
id_experiment);
02723     gtk_combo_box_text_remove (window->combo_experiment, i);

```

```

02724     gtk_combo_box_text_insert_text (window->combo_experiment, i, buffer);
02725     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), i);
02726     g_signal_handler_unblock (window->combo_experiment, window->
id_experiment);
02727     g_free (buffer);
02728     g_object_unref (file2);
02729     g_object_unref (file1);
02730     #if DEBUG
02731     fprintf (stderr, "window_name_experiment: end\n");
02732     #endif
02733 }
02734
02735 void
02736 window_weight_experiment ()
02737 {
02738     unsigned int i;
02739     #if DEBUG
02740     fprintf (stderr, "window_weight_experiment: start\n");
02741     #endif
02742     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02743     input->weight[i] = gtk_spin_button_get_value (window->spin_weight);
02744     #if DEBUG
02745     fprintf (stderr, "window_weight_experiment: end\n");
02746     #endif
02747 }
02748
02749 void
02750 window_inputs_experiment ()
02751 {
02752     unsigned int j;
02753     #if DEBUG
02754     fprintf (stderr, "window_inputs_experiment: start\n");
02755     #endif
02756     j = input->ninputs - 1;
02757     if (j
02758         && !gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
(window->check_template[j])))
02759         --input->ninputs;
02760     if (input->ninputs < MAX_NINPUTS
02761         && gtk_toggle_button_get_active (GTK_TOGGLE_BUTTON
(window->check_template[j])))
02762     {
02763         ++input->ninputs;
02764         for (j = 0; j < input->ninputs; ++j)
02765         {
02766             input->template[j] = (char **)
g_realloc (input->template[j], input->nvariables * sizeof (char *));
02767         }
02768     }
02769     window_update ();
02770     #if DEBUG
02771     fprintf (stderr, "window_inputs_experiment: end\n");
02772     #endif
02773 }
02774
02775 void
02776 window_template_experiment (void *data)
02777 {
02778     unsigned int i, j;
02779     char *buffer;
02780     GFile *file1, *file2;
02781     #if DEBUG
02782     fprintf (stderr, "window_template_experiment: start\n");
02783     #endif
02784     i = (size_t) data;
02785     j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02786     file1
= gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
02787     file2 = g_file_new_for_path (input->directory);
02788     buffer = g_file_get_relative_path (file2, file1);
02789     input->template[i][j] = (char *) xmlStrdup ((xmlChar *) buffer);
02790     g_free (buffer);
02791     g_object_unref (file2);
02792     g_object_unref (file1);
02793     #if DEBUG
02794     fprintf (stderr, "window_template_experiment: end\n");
02795     #endif
02796 }
02797
02798 void
02799 window_set_variable ()
02800 {
02801     unsigned int i;
02802     #if DEBUG
02803     fprintf (stderr, "window_set_variable: start\n");
02804     #endif
02805     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));

```

```

02830 g_signal_handler_block (window->entry_variable, window->
id_variable_label);
02831 gtk_entry_set_text (window->entry_variable, input->label[i]);
02832 g_signal_handler_unblock (window->entry_variable, window->
id_variable_label);
02833 gtk_spin_button_set_value (window->spin_min, input->rangemin[i]);
02834 gtk_spin_button_set_value (window->spin_max, input->rangemax[i]);
02835 if (input->rangeminabs[i] != -G_MAXDOUBLE)
02836 {
02837     gtk_spin_button_set_value (window->spin_minabs, input->
rangeminabs[i]);
02838     gtk_toggle_button_set_active
02839     (GTK_TOGGLE_BUTTON (window->check_minabs), 1);
02840 }
02841 else
02842 {
02843     gtk_spin_button_set_value (window->spin_minabs, -G_MAXDOUBLE);
02844     gtk_toggle_button_set_active
02845     (GTK_TOGGLE_BUTTON (window->check_minabs), 0);
02846 }
02847 if (input->rangemaxabs[i] != G_MAXDOUBLE)
02848 {
02849     gtk_spin_button_set_value (window->spin_maxabs, input->
rangemaxabs[i]);
02850     gtk_toggle_button_set_active
02851     (GTK_TOGGLE_BUTTON (window->check_maxabs), 1);
02852 }
02853 else
02854 {
02855     gtk_spin_button_set_value (window->spin_maxabs, G_MAXDOUBLE);
02856     gtk_toggle_button_set_active
02857     (GTK_TOGGLE_BUTTON (window->check_maxabs), 0);
02858 }
02859 gtk_spin_button_set_value (window->spin_precision, input->
precision[i]);
02860 switch (input->algorithm)
02861 {
02862     case ALGORITHM_SWEEP:
02863         gtk_spin_button_set_value (window->spin_sweeps,
02864                                     (gdouble) input->nsweeps[i]);
02865         break;
02866     case ALGORITHM_GENETIC:
02867         gtk_spin_button_set_value (window->spin_bits, (gdouble) input->
nbits[i]);
02868         break;
02869 }
02870 window_update ();
02871 #if DEBUG
02872 fprintf (stderr, "window_set_variable: end\n");
02873 #endif
02874 }
02875
02880 void
02881 window_remove_variable ()
02882 {
02883     unsigned int i, j;
02884     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
02885     g_signal_handler_block (window->combo_variable, window->
id_variable_label);
02886     gtk_combo_box_text_remove (window->combo_variable, i);
02887     g_signal_handler_unblock (window->combo_variable, window->
id_variable_label);
02888     xmlFree (input->label[i]);
02889     --input->nvariables;
02890     for (j = i; j < input->nvariables; ++j)
02891     {
02892         input->label[j] = input->label[j + 1];
02893         input->rangemin[j] = input->rangemin[j + 1];
02894         input->rangemax[j] = input->rangemax[j + 1];
02895         input->rangeminabs[j] = input->rangeminabs[j + 1];
02896         input->rangemaxabs[j] = input->rangemaxabs[j + 1];
02897         input->precision[j] = input->precision[j + 1];
02898         switch (window_get_algorithm ())
02899         {
02900             case ALGORITHM_SWEEP:
02901                 input->nsweeps[j] = input->nsweeps[j + 1];
02902                 break;
02903             case ALGORITHM_GENETIC:
02904                 input->nbits[j] = input->nbits[j + 1];
02905         }
02906     }
02907     j = input->nvariables - 1;
02908     if (i > j)
02909         i = j;
02910     g_signal_handler_block (window->entry_variable, window->
id_variable_label);
02911     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);

```

```

02912 g_signal_handler_unblock (window->entry_variable, window->
    id_variable_label);
02913 window_update ();
02914 }
02915
02920 void
02921 window_add_variable ()
02922 {
02923     unsigned int i, j;
02924     #if DEBUG
02925         fprintf (stderr, "window_add_variable: start\n");
02926     #endif
02927     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
02928     g_signal_handler_block (window->combo_variable, window->
        id_variable);
02929     gtk_combo_box_text_insert_text (window->combo_variable, i, input->
        label[i]);
02930     g_signal_handler_unblock (window->combo_variable, window->
        id_variable);
02931     input->label = (char **) g_realloc
02932         (input->label, (input->nvariables + 1) * sizeof (char *));
02933     input->rangemin = (double *) g_realloc
02934         (input->rangemin, (input->nvariables + 1) * sizeof (double));
02935     input->rangemax = (double *) g_realloc
02936         (input->rangemax, (input->nvariables + 1) * sizeof (double));
02937     input->rangeminabs = (double *) g_realloc
02938         (input->rangeminabs, (input->nvariables + 1) * sizeof (double));
02939     input->rangemaxabs = (double *) g_realloc
02940         (input->rangemaxabs, (input->nvariables + 1) * sizeof (double));
02941     input->precision = (unsigned int *) g_realloc
02942         (input->precision, (input->nvariables + 1) * sizeof (unsigned int));
02943     for (j = input->nvariables - 1; j > i; --j)
02944     {
02945         input->label[j + 1] = input->label[j];
02946         input->rangemin[j + 1] = input->rangemin[j];
02947         input->rangemax[j + 1] = input->rangemax[j];
02948         input->rangeminabs[j + 1] = input->rangeminabs[j];
02949         input->rangemaxabs[j + 1] = input->rangemaxabs[j];
02950         input->precision[j + 1] = input->precision[j];
02951     }
02952     input->label[j + 1] = (char *) xmlStrdup ((xmlChar *) input->label[j]);
02953     input->rangemin[j + 1] = input->rangemin[j];
02954     input->rangemax[j + 1] = input->rangemax[j];
02955     input->rangeminabs[j + 1] = input->rangeminabs[j];
02956     input->rangemaxabs[j + 1] = input->rangemaxabs[j];
02957     input->precision[j + 1] = input->precision[j];
02958     switch (window_get_algorithm ())
02959     {
02960         case ALGORITHM_SWEEP:
02961             input->nsweeps = (unsigned int *) g_realloc
02962                 (input->nsweeps, (input->nvariables + 1) * sizeof (unsigned int));
02963             for (j = input->nvariables - 1; j > i; --j)
02964                 input->nsweeps[j + 1] = input->nsweeps[j];
02965             input->nsweeps[j + 1] = input->nsweeps[j];
02966             break;
02967         case ALGORITHM_GENETIC:
02968             input->nbits = (unsigned int *) g_realloc
02969                 (input->nbits, (input->nvariables + 1) * sizeof (unsigned int));
02970             for (j = input->nvariables - 1; j > i; --j)
02971                 input->nbits[j + 1] = input->nbits[j];
02972             input->nbits[j + 1] = input->nbits[j];
02973     }
02974     ++input->nvariables;
02975     g_signal_handler_block (window->entry_variable, window->
        id_variable_label);
02976     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i + 1);
02977     g_signal_handler_unblock (window->entry_variable, window->
        id_variable_label);
02978     window_update ();
02979     #if DEBUG
02980         fprintf (stderr, "window_add_variable: end\n");
02981     #endif
02982 }
02983
02988 void
02989 window_label_variable ()
02990 {
02991     unsigned int i;
02992     const char *buffer;
02993     #if DEBUG
02994         fprintf (stderr, "window_label_variable: start\n");
02995     #endif
02996     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
02997     buffer = gtk_entry_get_text (window->entry_variable);
02998     g_signal_handler_block (window->combo_variable, window->
        id_variable);
02999     gtk_combo_box_text_remove (window->combo_variable, i);

```



```

03000   gtk_combo_box_text_insert_text (window->combo_variable, i, buffer);
03001   gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), i);
03002   g_signal_handler_unblock (window->combo_variable, window->
    id_variable);
03003   #if DEBUG
03004   fprintf (stderr, "window_label_variable: end\n");
03005   #endif
03006 }
03007
03012 void
03013 window_precision_variable ()
03014 {
03015   unsigned int i;
03016   #if DEBUG
03017   fprintf (stderr, "window_precision_variable: start\n");
03018   #endif
03019   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03020   input->precision[i]
03021   = (unsigned int) gtk_spin_button_get_value_as_int (window->spin_precision);
03022   gtk_spin_button_set_digits (window->spin_min, input->precision[i]);
03023   gtk_spin_button_set_digits (window->spin_max, input->precision[i]);
03024   gtk_spin_button_set_digits (window->spin_minabs, input->precision[i]);
03025   gtk_spin_button_set_digits (window->spin_maxabs, input->precision[i]);
03026   #if DEBUG
03027   fprintf (stderr, "window_precision_variable: end\n");
03028   #endif
03029 }
03030
03035 void
03036 window_rangemin_variable ()
03037 {
03038   unsigned int i;
03039   #if DEBUG
03040   fprintf (stderr, "window_rangemin_variable: start\n");
03041   #endif
03042   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03043   input->rangemin[i] = gtk_spin_button_get_value (window->spin_min);
03044   #if DEBUG
03045   fprintf (stderr, "window_rangemin_variable: end\n");
03046   #endif
03047 }
03048
03053 void
03054 window_rangemax_variable ()
03055 {
03056   unsigned int i;
03057   #if DEBUG
03058   fprintf (stderr, "window_rangemax_variable: start\n");
03059   #endif
03060   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03061   input->rangemax[i] = gtk_spin_button_get_value (window->spin_max);
03062   #if DEBUG
03063   fprintf (stderr, "window_rangemax_variable: end\n");
03064   #endif
03065 }
03066
03071 void
03072 window_rangeminabs_variable ()
03073 {
03074   unsigned int i;
03075   #if DEBUG
03076   fprintf (stderr, "window_rangeminabs_variable: start\n");
03077   #endif
03078   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03079   input->rangeminabs[i] = gtk_spin_button_get_value (window->
    spin_minabs);
03080   #if DEBUG
03081   fprintf (stderr, "window_rangeminabs_variable: end\n");
03082   #endif
03083 }
03084
03089 void
03090 window_rangemaxabs_variable ()
03091 {
03092   unsigned int i;
03093   #if DEBUG
03094   fprintf (stderr, "window_rangemaxabs_variable: start\n");
03095   #endif
03096   i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03097   input->rangemaxabs[i] = gtk_spin_button_get_value (window->
    spin_maxabs);
03098   #if DEBUG
03099   fprintf (stderr, "window_rangemaxabs_variable: end\n");
03100   #endif
03101 }
03102
03107 void

```

```

03108 window_update_variable ()
03109 {
03110     unsigned int i;
03111     #if DEBUG
03112         fprintf (stderr, "window_update_variable: start\n");
03113     #endif
03114     i = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_variable));
03115     switch (window_get_algorithm ())
03116     {
03117         case ALGORITHM_SWEEP:
03118             input->nsweeps[i]
03119                 = gtk_spin_button_get_value_as_int (window->spin_sweeps);
03120             break;
03121         case ALGORITHM_GENETIC:
03122             input->nbits[i] = gtk_spin_button_get_value_as_int (window->spin_bits);
03123     }
03124     #if DEBUG
03125         fprintf (stderr, "window_update_variable: end\n");
03126     #endif
03127 }
03128
03136 int
03137 window_read (char *filename)
03138 {
03139     unsigned int i;
03140     char *buffer;
03141     #if DEBUG
03142         fprintf (stderr, "window_read: start\n");
03143     #endif
03144     input_free ();
03145     if (!input_open (filename))
03146     {
03147         #if DEBUG
03148             fprintf (stderr, "window_read: end\n");
03149         #endif
03150         return 0;
03151     }
03152     buffer = g_build_filename (input->directory, input->simulator, NULL);
03153     puts (buffer);
03154     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
03155                                   (window->button_simulator), buffer);
03156     g_free (buffer);
03157     gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
03158                                   (size_t) input->evaluator);
03159     if (input->evaluator)
03160     {
03161         buffer = g_build_filename (input->directory, input->evaluator, NULL);
03162         gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
03163                                       (window->button_evaluator), buffer);
03164         g_free (buffer);
03165     }
03166     gtk_toggle_button_set_active
03167         (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
03168 algorithm]), TRUE);
03169     switch (input->algorithm)
03170     {
03171         case ALGORITHM_MONTE_CARLO:
03172             gtk_spin_button_set_value (window->spin_simulations,
03173                                         (gdouble) input->nsimulations);
03174         case ALGORITHM_SWEEP:
03175             gtk_spin_button_set_value (window->spin_iterations,
03176                                         (gdouble) input->niterations);
03177             gtk_spin_button_set_value (window->spin_best, (gdouble) input->
03178 nbest);
03179             gtk_spin_button_set_value (window->spin_tolerance, input->
03180 tolerance);
03181             break;
03182         default:
03183             gtk_spin_button_set_value (window->spin_population,
03184                                         (gdouble) input->nsimulations);
03185             gtk_spin_button_set_value (window->spin_generations,
03186                                         (gdouble) input->niterations);
03187             gtk_spin_button_set_value (window->spin_mutation, input->
03188 mutation_ratio);
03189             gtk_spin_button_set_value (window->spin_reproduction,
03190                                         input->reproduction_ratio);
03191             gtk_spin_button_set_value (window->spin_adaptation,
03192                                         input->adaptation_ratio);
03193     }
03194     g_signal_handler_block (window->combo_experiment, window->
03195 id_experiment);
03196     g_signal_handler_block (window->button_experiment,
03197                             window->id_experiment_name);
03198     gtk_combo_box_text_remove_all (window->combo_experiment);
03199     for (i = 0; i < input->nexperiments; ++i)
03200         gtk_combo_box_text_append_text (window->combo_experiment,
03201                                         input->experiment[i]);

```

```

03197 g_signal_handler_unblock
03198 (window->button_experiment, window->id_experiment_name);
03199 g_signal_handler_unblock (window->combo_experiment, window->
id_experiment);
03200 gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
03201 g_signal_handler_block (window->combo_variable, window->
id_variable);
03202 g_signal_handler_block (window->entry_variable, window->
id_variable_label);
03203 gtk_combo_box_text_remove_all (window->combo_variable);
03204 for (i = 0; i < input->nvariables; ++i)
03205     gtk_combo_box_text_append_text (window->combo_variable, input->
label[i]);
03206 g_signal_handler_unblock (window->entry_variable, window->
id_variable_label);
03207 g_signal_handler_unblock (window->combo_variable, window->
id_variable);
03208 gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
03209 window_set_variable ();
03210 window_update ();
03211 #if DEBUG
03212 fprintf (stderr, "window_read: end\n");
03213 #endif
03214 return 1;
03215 }
03216
03221 void
03222 window_open ()
03223 {
03224     char *buffer;
03225     GtkFileChooserDialog *dlg;
03226     dlg = (GtkFileChooserDialog *)
03227         gtk_file_chooser_dialog_new (gettext ("Open input file"),
03228                                     window->window,
03229                                     GTK_FILE_CHOOSER_ACTION_OPEN,
03230                                     gettext ("Cancel"), GTK_RESPONSE_CANCEL,
03231                                     gettext ("OK"), GTK_RESPONSE_OK, NULL);
03232     if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
03233     {
03234         buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
03235         if (!window_read (buffer))
03236             g_application_quit (G_APPLICATION (window->application));
03237         g_free (buffer);
03238     }
03239     gtk_widget_destroy (GTK_WIDGET (dlg));
03240 }
03241
03246 void
03247 window_new ()
03248 {
03249     unsigned int i;
03250     char *buffer, *buffer2, buffer3[64];
03251     GtkViewport *viewport;
03252     char *label_algorithm[NALGORITHMS] = {
03253         "_Monte-Carlo", gettext ("_Sweep"), gettext ("_Genetic")
03254     };
03255
03256     // Creating the window
03257     window->window = (GtkWindow *) gtk_application_window_new (window->application);
03258
03259     // Setting the window title
03260     gtk_window_set_title (window->window, PROGRAM_INTERFACE);
03261
03262     // Creating the open button
03263     window->button_open = (GtkToolButton *) gtk_tool_button_new
03264         (gtk_image_new_from_icon_name ("document-open",
03265                                     GTK_ICON_SIZE_LARGE_TOOLBAR),
03266         gettext ("Open"));
03267     g_signal_connect (window->button_open, "clicked", window_open, NULL);
03268
03269     // Creating the save button
03270     window->button_save = (GtkToolButton *) gtk_tool_button_new
03271         (gtk_image_new_from_icon_name ("document-save",
03272                                     GTK_ICON_SIZE_LARGE_TOOLBAR),
03273         gettext ("Save"));
03274     g_signal_connect (window->button_save, "clicked", (void (*)(void))
03275         window_save,
03276         NULL);
03277
03278     // Creating the run button
03279     window->button_run = (GtkToolButton *) gtk_tool_button_new
03280         (gtk_image_new_from_icon_name ("system-run",
03281                                     GTK_ICON_SIZE_LARGE_TOOLBAR),
03282         gettext ("Run"));
03283     g_signal_connect (window->button_run, "clicked", window_run, NULL);
03284

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```

03285 // Creating the options button
03286 window->button_options = (GtkToolButton *) gtk_tool_button_new
03287     (gtk_image_new_from_icon_name ("preferences-system",
03288         GTK_ICON_SIZE_LARGE_TOOLBAR),
03289     gettext ("Options"));
03290 g_signal_connect (window->button_options, "clicked", options_new, NULL);
03291
03292 // Creating the help button
03293 window->button_help = (GtkToolButton *) gtk_tool_button_new
03294     (gtk_image_new_from_icon_name ("help-browser",
03295         GTK_ICON_SIZE_LARGE_TOOLBAR),
03296     gettext ("Help"));
03297 g_signal_connect (window->button_help, "clicked", window_help, NULL);
03298
03299 // Creating the about button
03300 window->button_about = (GtkToolButton *) gtk_tool_button_new
03301     (gtk_image_new_from_icon_name ("help-about",
03302         GTK_ICON_SIZE_LARGE_TOOLBAR),
03303     gettext ("About"));
03304 g_signal_connect (window->button_about, "clicked", window_about, NULL);
03305
03306 // Creating the exit button
03307 window->button_exit = (GtkToolButton *) gtk_tool_button_new
03308     (gtk_image_new_from_icon_name ("application-exit",
03309         GTK_ICON_SIZE_LARGE_TOOLBAR),
03310     gettext ("Exit"));
03311 g_signal_connect_swapped (window->button_exit, "clicked",
03312     (void (*)(void)) gtk_widget_destroy, window->window);
03313
03314 // Creating the buttons bar
03315 window->bar_buttons = (GtkToolbar *) gtk_toolbar_new ();
03316 gtk_toolbar_insert
03317     (window->bar_buttons, GTK_TOOL_ITEM (window->button_open), 0);
03318 gtk_toolbar_insert
03319     (window->bar_buttons, GTK_TOOL_ITEM (window->button_save), 1);
03320 gtk_toolbar_insert
03321     (window->bar_buttons, GTK_TOOL_ITEM (window->button_run), 2);
03322 gtk_toolbar_insert
03323     (window->bar_buttons, GTK_TOOL_ITEM (window->button_options), 3);
03324 gtk_toolbar_insert
03325     (window->bar_buttons, GTK_TOOL_ITEM (window->button_help), 4);
03326 gtk_toolbar_insert
03327     (window->bar_buttons, GTK_TOOL_ITEM (window->button_about), 5);
03328 gtk_toolbar_insert
03329     (window->bar_buttons, GTK_TOOL_ITEM (window->button_exit), 6);
03330 gtk_toolbar_set_style (window->bar_buttons, GTK_TOOLBAR_BOTH);
03331
03332 // Creating the simulator program label and entry
03333 window->label_simulator
03334     = (GtkLabel *) gtk_label_new (gettext ("Simulator program"));
03335 window->button_simulator = (GtkFileChooserButton *)
03336     gtk_file_chooser_button_new (gettext ("Simulator program"),
03337         GTK_FILE_CHOOSER_ACTION_OPEN);
03338 gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_simulator),
03339     gettext ("Simulator program executable file"));
03340
03341 // Creating the evaluator program label and entry
03342 window->check_evaluator = (GtkCheckButton *)
03343     gtk_check_button_new_with_mnemonic (gettext ("Evaluator program"));
03344 g_signal_connect (window->check_evaluator, "toggled",
03345     window_update, NULL);
03346 window->button_evaluator = (GtkFileChooserButton *)
03347     gtk_file_chooser_button_new (gettext ("Evaluator program"),
03348         GTK_FILE_CHOOSER_ACTION_OPEN);
03349 gtk_widget_set_tooltip_text
03350     (GTK_WIDGET (window->button_evaluator),
03351     gettext ("Optional evaluator program executable file"));
03352
03353 // Creating the algorithm properties
03354 window->label_simulations = (GtkLabel *) gtk_label_new
03355     (gettext ("Simulations number"));
03356 window->spin_simulations
03357     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
03358 window->label_iterations = (GtkLabel *)
03359     gtk_label_new (gettext ("Iterations number"));
03360 window->spin_iterations
03361     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
03362 g_signal_connect
03363     (window->spin_iterations, "value-changed", window_update, NULL);
03364 window->label_tolerance = (GtkLabel *) gtk_label_new (gettext ("Tolerance"));
03365 window->spin_tolerance
03366     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
03367 window->label_bests = (GtkLabel *) gtk_label_new (gettext ("Bests number"));
03368 window->spin_bests
03369     = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
03370 window->label_population
03371     = (GtkLabel *) gtk_label_new (gettext ("Population number"));

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03371 window->spin_population
03372 = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
03373 window->label_generations
03374 = (GtkLabel *) gtk_label_new (gettext ("Generations number"));
03375 window->spin_generations
03376 = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e6, 1.);
03377 window->label_mutation
03378 = (GtkLabel *) gtk_label_new (gettext ("Mutation ratio"));
03379 window->spin_mutation
03380 = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
03381 window->label_reproduction
03382 = (GtkLabel *) gtk_label_new (gettext ("Reproduction ratio"));
03383 window->spin_reproduction
03384 = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
03385 window->label_adaptation
03386 = (GtkLabel *) gtk_label_new (gettext ("Adaptation ratio"));
03387 window->spin_adaptation
03388 = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
03389
03390 // Creating the array of algorithms
03391 window->grid_algorithm = (GtkGrid *) gtk_grid_new ();
03392 window->button_algorithm[0] = (GtkRadioButton *)
03393   gtk_radio_button_new_with_mnemonic (NULL, label_algorithm[0]);
03394 gtk_grid_attach (window->grid_algorithm,
03395   GTK_WIDGET (window->button_algorithm[0]), 0, 0, 1, 1);
03396 g_signal_connect (window->button_algorithm[0], "clicked",
03397   window_set_algorithm, NULL);
03398 for (i = 0; ++i < NALGORITHMS;)
03399 {
03400   window->button_algorithm[i] = (GtkRadioButton *)
03401     gtk_radio_button_new_with_mnemonic
03402       (gtk_radio_button_get_group (window->button_algorithm[0]),
03403        label_algorithm[i]);
03404   gtk_grid_attach (window->grid_algorithm,
03405     GTK_WIDGET (window->button_algorithm[i]), 0, i, 1, 1);
03406   g_signal_connect (window->button_algorithm[i], "clicked",
03407     window_set_algorithm, NULL);
03408 }
03409 gtk_grid_attach (window->grid_algorithm,
03410   GTK_WIDGET (window->label_simulations), 0,
03411   NALGORITHMS, 1, 1);
03412 gtk_grid_attach (window->grid_algorithm,
03413   GTK_WIDGET (window->spin_simulations), 1, NALGORITHMS, 1, 1);
03414 gtk_grid_attach (window->grid_algorithm,
03415   GTK_WIDGET (window->label_iterations), 0,
03416   NALGORITHMS + 1, 1, 1);
03417 gtk_grid_attach (window->grid_algorithm,
03418   GTK_WIDGET (window->spin_iterations), 1,
03419   NALGORITHMS + 1, 1, 1);
03420 gtk_grid_attach (window->grid_algorithm,
03421   GTK_WIDGET (window->label_tolerance), 0,
03422   NALGORITHMS + 2, 1, 1);
03423 gtk_grid_attach (window->grid_algorithm,
03424   GTK_WIDGET (window->spin_tolerance), 1,
03425   NALGORITHMS + 2, 1, 1);
03426 gtk_grid_attach (window->grid_algorithm,
03427   GTK_WIDGET (window->label_bests), 0, NALGORITHMS + 3, 1, 1);
03428 gtk_grid_attach (window->grid_algorithm,
03429   GTK_WIDGET (window->spin_bests), 1, NALGORITHMS + 3, 1, 1);
03430 gtk_grid_attach (window->grid_algorithm,
03431   GTK_WIDGET (window->label_population), 0,
03432   NALGORITHMS + 4, 1, 1);
03433 gtk_grid_attach (window->grid_algorithm,
03434   GTK_WIDGET (window->spin_population), 1,
03435   NALGORITHMS + 4, 1, 1);
03436 gtk_grid_attach (window->grid_algorithm,
03437   GTK_WIDGET (window->label_generations), 0,
03438   NALGORITHMS + 5, 1, 1);
03439 gtk_grid_attach (window->grid_algorithm,
03440   GTK_WIDGET (window->spin_generations), 1,
03441   NALGORITHMS + 5, 1, 1);
03442 gtk_grid_attach (window->grid_algorithm,
03443   GTK_WIDGET (window->label_mutation), 0,
03444   NALGORITHMS + 6, 1, 1);
03445 gtk_grid_attach (window->grid_algorithm,
03446   GTK_WIDGET (window->spin_mutation), 1,
03447   NALGORITHMS + 6, 1, 1);
03448 gtk_grid_attach (window->grid_algorithm,
03449   GTK_WIDGET (window->label_reproduction), 0,
03450   NALGORITHMS + 7, 1, 1);
03451 gtk_grid_attach (window->grid_algorithm,
03452   GTK_WIDGET (window->spin_reproduction), 1,
03453   NALGORITHMS + 7, 1, 1);
03454 gtk_grid_attach (window->grid_algorithm,
03455   GTK_WIDGET (window->label_adaptation), 0,
03456   NALGORITHMS + 8, 1, 1);
03457 gtk_grid_attach (window->grid_algorithm,

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03458         GTK_WIDGET (window->spin_adaptation), 1,
03459         NALGORITHMS + 8, 1, 1);
03460 window->frame_algorithm = (GtkFrame *) gtk_frame_new (gettext ("Algorithm"));
03461 gtk_container_add (GTK_CONTAINER (window->frame_algorithm),
03462         GTK_WIDGET (window->grid_algorithm));
03463
03464 // Creating the variable widgets
03465 window->combo_variable = (GtkComboBoxText *) gtk_combo_box_text_new ();
03466 gtk_widget_set_tooltip_text (GTK_WIDGET (window->combo_variable),
03467         gettext ("Variables selector"));
03468 window->id_variable = g_signal_connect
03469         (window->combo_variable, "changed", window_set_variable, NULL);
03470 window->button_add_variable
03471         = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
03472         GTK_ICON_SIZE_BUTTON);
03473 g_signal_connect
03474         (window->button_add_variable, "clicked",
03475         window_add_variable, NULL);
03476 gtk_widget_set_tooltip_text (GTK_WIDGET
03477         (window->button_add_variable),
03478         gettext ("Add variable"));
03479 window->button_remove_variable
03480         = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
03481         GTK_ICON_SIZE_BUTTON);
03482 g_signal_connect
03483         (window->button_remove_variable, "clicked",
03484         window_remove_variable, NULL);
03485 gtk_widget_set_tooltip_text (GTK_WIDGET
03486         (window->button_remove_variable),
03487         gettext ("Remove variable"));
03488 window->label_variable = (GtkLabel *) gtk_label_new (gettext ("Name"));
03489 window->entry_variable = (GtkEntry *) gtk_entry_new ();
03490 window->id_variable_label = g_signal_connect
03491         (window->entry_variable, "changed", window_label_variable, NULL);
03492 window->spin_min = (GtkSpinButton *) gtk_spin_button_new_with_range
03493         (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
03494 viewport = (GtkViewport *) gtk_viewport_new (NULL, NULL);
03495 gtk_container_add (GTK_CONTAINER (viewport), GTK_WIDGET (window->spin_min));
03496 window->scrolled_min
03497         = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
03498 gtk_container_add (GTK_CONTAINER (window->scrolled_min),
03499         GTK_WIDGET (viewport));
03500 g_signal_connect (window->spin_min, "value-changed",
03501         window_rangemin_variable, NULL);
03502 window->label_max = (GtkLabel *) gtk_label_new (gettext ("Maximum"));
03503 window->spin_max = (GtkSpinButton *) gtk_spin_button_new_with_range
03504         (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
03505 viewport = (GtkViewport *) gtk_viewport_new (NULL, NULL);
03506 gtk_container_add (GTK_CONTAINER (viewport), GTK_WIDGET (window->spin_max));
03507 window->scrolled_max
03508         = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
03509 gtk_container_add (GTK_CONTAINER (window->scrolled_max),
03510         GTK_WIDGET (viewport));
03511 g_signal_connect (window->spin_max, "value-changed",
03512         window_rangemax_variable, NULL);
03513 window->check_minabs = (GtkCheckButton *)
03514         gtk_check_button_new_with_mnemonic (gettext ("Absolute minimum"));
03515 g_signal_connect (window->check_minabs, "toggled", window_update, NULL);
03516 window->spin_minabs = (GtkSpinButton *) gtk_spin_button_new_with_range
03517         (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
03518 viewport = (GtkViewport *) gtk_viewport_new (NULL, NULL);
03519 gtk_container_add (GTK_CONTAINER (viewport),
03520         GTK_WIDGET (window->spin_minabs));
03521 window->scrolled_minabs
03522         = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
03523 gtk_container_add (GTK_CONTAINER (window->scrolled_minabs),
03524         GTK_WIDGET (viewport));
03525 g_signal_connect (window->spin_minabs, "value-changed",
03526         window_rangeminabs_variable, NULL);
03527 window->check_maxabs = (GtkCheckButton *)
03528         gtk_check_button_new_with_mnemonic (gettext ("Absolute maximum"));
03529 g_signal_connect (window->check_maxabs, "toggled", window_update, NULL);
03530 window->spin_maxabs = (GtkSpinButton *) gtk_spin_button_new_with_range
03531         (-G_MAXDOUBLE, G_MAXDOUBLE, precision[DEFAULT_PRECISION]);
03532 viewport = (GtkViewport *) gtk_viewport_new (NULL, NULL);
03533 gtk_container_add (GTK_CONTAINER (viewport),
03534         GTK_WIDGET (window->spin_maxabs));
03535 window->scrolled_maxabs
03536         = (GtkScrolledWindow *) gtk_scrolled_window_new (NULL, NULL);
03537 gtk_container_add (GTK_CONTAINER (window->scrolled_maxabs),
03538         GTK_WIDGET (viewport));
03539 g_signal_connect (window->spin_maxabs, "value-changed",
03540         window_rangemaxabs_variable, NULL);
03541 window->label_precision
03542         = (GtkLabel *) gtk_label_new (gettext ("Precision digits"));
03543 window->spin_precision = (GtkSpinButton *)

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03543     gtk_spin_button_new_with_range (0., (gdouble) DEFAULT_PRECISION, 1.);
03544     g_signal_connect (window->spin_precision, "value-changed",
03545         window_precision_variable, NULL);
03546     window->label_sweeps = (GtkLabel *) gtk_label_new (gettext ("Sweeps number"));
03547     window->spin_sweeps
03548         = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 1.e12, 1.);
03549     g_signal_connect
03550         (window->spin_sweeps, "value-changed", window_update_variable, NULL);
03551     window->label_bits = (GtkLabel *) gtk_label_new (gettext ("Bits number"));
03552     window->spin_bits
03553         = (GtkSpinButton *) gtk_spin_button_new_with_range (1., 64., 1.);
03554     g_signal_connect
03555         (window->spin_bits, "value-changed", window_update_variable, NULL);
03556     window->grid_variable = (GtkGrid *) gtk_grid_new ();
03557     gtk_grid_attach (window->grid_variable,
03558         GTK_WIDGET (window->combo_variable), 0, 0, 2, 1);
03559     gtk_grid_attach (window->grid_variable,
03560         GTK_WIDGET (window->button_add_variable), 2, 0, 1, 1);
03561     gtk_grid_attach (window->grid_variable,
03562         GTK_WIDGET (window->button_remove_variable), 3, 0, 1, 1);
03563     gtk_grid_attach (window->grid_variable,
03564         GTK_WIDGET (window->label_variable), 0, 1, 1, 1);
03565     gtk_grid_attach (window->grid_variable,
03566         GTK_WIDGET (window->entry_variable), 1, 1, 3, 1);
03567     gtk_grid_attach (window->grid_variable,
03568         GTK_WIDGET (window->label_min), 0, 2, 1, 1);
03569     gtk_grid_attach (window->grid_variable,
03570         GTK_WIDGET (window->scrolled_min), 1, 2, 3, 1);
03571     gtk_grid_attach (window->grid_variable,
03572         GTK_WIDGET (window->label_max), 0, 3, 1, 1);
03573     gtk_grid_attach (window->grid_variable,
03574         GTK_WIDGET (window->scrolled_max), 1, 3, 3, 1);
03575     gtk_grid_attach (window->grid_variable,
03576         GTK_WIDGET (window->check_minabs), 0, 4, 1, 1);
03577     gtk_grid_attach (window->grid_variable,
03578         GTK_WIDGET (window->scrolled_minabs), 1, 4, 3, 1);
03579     gtk_grid_attach (window->grid_variable,
03580         GTK_WIDGET (window->check_maxabs), 0, 5, 1, 1);
03581     gtk_grid_attach (window->grid_variable,
03582         GTK_WIDGET (window->scrolled_maxabs), 1, 5, 3, 1);
03583     gtk_grid_attach (window->grid_variable,
03584         GTK_WIDGET (window->label_precision), 0, 6, 1, 1);
03585     gtk_grid_attach (window->grid_variable,
03586         GTK_WIDGET (window->spin_precision), 1, 6, 3, 1);
03587     gtk_grid_attach (window->grid_variable,
03588         GTK_WIDGET (window->label_sweeps), 0, 7, 1, 1);
03589     gtk_grid_attach (window->grid_variable,
03590         GTK_WIDGET (window->spin_sweeps), 1, 7, 3, 1);
03591     gtk_grid_attach (window->grid_variable,
03592         GTK_WIDGET (window->label_bits), 0, 8, 1, 1);
03593     gtk_grid_attach (window->grid_variable,
03594         GTK_WIDGET (window->spin_bits), 1, 8, 3, 1);
03595     window->frame_variable = (GtkFrame *) gtk_frame_new (gettext ("Variable"));
03596     gtk_container_add (GTK_CONTAINER (window->frame_variable),
03597         GTK_WIDGET (window->grid_variable));
03598
03599     // Creating the experiment widgets
03600     window->combo_experiment = (GtkComboBoxText *) gtk_combo_box_text_new ();
03601     gtk_widget_set_tooltip_text (GTK_WIDGET (window->combo_experiment),
03602         gettext ("Experiment selector"));
03603     window->id_experiment = g_signal_connect
03604         (window->combo_experiment, "changed", window_set_experiment, NULL);
03605
03606     window->button_add_experiment
03607         = (GtkButton *) gtk_button_new_from_icon_name ("list-add",
03608             GTK_ICON_SIZE_BUTTON);
03609     g_signal_connect
03610         (window->button_add_experiment, "clicked",
03611         window_add_experiment, NULL);
03612     gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_add_experiment),
03613         gettext ("Add experiment"));
03614     window->button_remove_experiment
03615         = (GtkButton *) gtk_button_new_from_icon_name ("list-remove",
03616             GTK_ICON_SIZE_BUTTON);
03617     g_signal_connect (window->button_remove_experiment, "clicked",
03618         window_remove_experiment, NULL);
03619     gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_remove_experiment),
03620         gettext ("Remove experiment"));
03621     window->label_experiment
03622         = (GtkLabel *) gtk_label_new (gettext ("Experimental data file"));
03623     window->button_experiment = (GtkFileChooserButton *)
03624         gtk_file_chooser_button_new (gettext ("Experimental data file"),
03625             GTK_FILE_CHOOSER_ACTION_OPEN);
03626     gtk_widget_set_tooltip_text (GTK_WIDGET (window->button_experiment),
03627         gettext ("Experimental data file"));
03628     window->id_experiment_name
03629         = g_signal_connect (window->button_experiment, "selection-changed",

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03628         window_name_experiment, NULL);
03629 window->label_weight = (GtkLabel *) gtk_label_new (gettext ("Weight"));
03630 window->spin_weight
03631     = (GtkSpinButton *) gtk_spin_button_new_with_range (0., 1., 0.001);
03632 gtk_widget_set_tooltip_text
03633     (GTK_WIDGET (window->spin_weight),
03634      gettext ("Weight factor to build the objective function"));
03635 g_signal_connect
03636     (window->spin_weight, "value-changed", window_weight_experiment,
NULL);
03637 window->grid_experiment = (GtkGrid *) gtk_grid_new ();
03638 gtk_grid_attach (window->grid_experiment,
03639                 GTK_WIDGET (window->combo_experiment), 0, 0, 2, 1);
03640 gtk_grid_attach (window->grid_experiment,
03641                 GTK_WIDGET (window->button_add_experiment), 2, 0, 1, 1);
03642 gtk_grid_attach (window->grid_experiment,
03643                 GTK_WIDGET (window->button_remove_experiment), 3, 0, 1, 1);
03644 gtk_grid_attach (window->grid_experiment,
03645                 GTK_WIDGET (window->label_experiment), 0, 1, 1, 1);
03646 gtk_grid_attach (window->grid_experiment,
03647                 GTK_WIDGET (window->button_experiment), 1, 1, 3, 1);
03648 gtk_grid_attach (window->grid_experiment,
03649                 GTK_WIDGET (window->label_weight), 0, 2, 1, 1);
03650 gtk_grid_attach (window->grid_experiment,
03651                 GTK_WIDGET (window->spin_weight), 1, 2, 3, 1);
03652 for (i = 0; i < MAX_NINPITS; ++i)
03653 {
03654     snprintf (buffer3, 64, "%s %u", gettext ("Input template"), i + 1);
03655     window->check_template[i] = (GtkCheckButton *)
03656         gtk_check_button_new_with_label (buffer3);
03657     window->id_template[i]
03658         = g_signal_connect (window->check_template[i], "toggled",
03659                             window_inputs_experiment, NULL);
03660     gtk_grid_attach (window->grid_experiment,
03661                     GTK_WIDGET (window->check_template[i]), 0, 3 + i, 1, 1);
03662     window->button_template[i] = (GtkFileChooserButton *)
03663         gtk_file_chooser_button_new (gettext ("Input template"),
03664                                     GTK_FILE_CHOOSER_ACTION_OPEN);
03665     gtk_widget_set_tooltip_text
03666         (GTK_WIDGET (window->button_template[i]),
03667          gettext ("Experimental input template file"));
03668     window->id_input[i]
03669         = g_signal_connect_swapped (window->button_template[i],
03670                                     "selection-changed",
03671                                     (void *) window_template_experiment,
03672                                     (void *) (size_t) i);
03673     gtk_grid_attach (window->grid_experiment,
03674                     GTK_WIDGET (window->button_template[i]), 1, 3 + i, 3, 1);
03675 }
03676 window->frame_experiment
03677     = (GtkFrame *) gtk_frame_new (gettext ("Experiment"));
03678 gtk_container_add (GTK_CONTAINER (window->frame_experiment),
03679                   GTK_WIDGET (window->grid_experiment));
03680
03681 // Creating the grid and attaching the widgets to the grid
03682 window->grid = (GtkGrid *) gtk_grid_new ();
03683 gtk_grid_attach (window->grid, GTK_WIDGET (window->bar_buttons), 0, 0, 6, 1);
03684 gtk_grid_attach (window->grid,
03685                 GTK_WIDGET (window->label_simulator), 0, 1, 1, 1);
03686 gtk_grid_attach (window->grid,
03687                 GTK_WIDGET (window->button_simulator), 1, 1, 1, 1);
03688 gtk_grid_attach (window->grid,
03689                 GTK_WIDGET (window->check_evaluator), 2, 1, 1, 1);
03690 gtk_grid_attach (window->grid,
03691                 GTK_WIDGET (window->button_evaluator), 3, 1, 1, 1);
03692 gtk_grid_attach (window->grid,
03693                 GTK_WIDGET (window->frame_algorithm), 0, 2, 2, 1);
03694 gtk_grid_attach (window->grid,
03695                 GTK_WIDGET (window->frame_variable), 2, 2, 2, 1);
03696 gtk_grid_attach (window->grid,
03697                 GTK_WIDGET (window->frame_experiment), 4, 2, 2, 1);
03698 gtk_container_add (GTK_CONTAINER (window->window), GTK_WIDGET (window->
grid));
03699
03700 // Setting the window logo
03701 window->logo = gdk_pixbuf_new_from_xpm_data (logo);
03702 gtk_window_set_icon (window->window, window->logo);
03703
03704 // Showing the window
03705 gtk_widget_show_all (GTK_WIDGET (window->window));
03706
03707 // In Windows the default scrolled size is wrong
03708 #ifdef G_OS_WIN32
03709 gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_min), -1, 40);
03710 gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_max), -1, 40);
03711 gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_minabs), -1, 40);
03712 gtk_widget_set_size_request (GTK_WIDGET (window->scrolled_maxabs), -1, 40);

```



```

03713 #endif
03714
03715 // Reading initial example
03716 buffer2 = g_get_current_dir ();
03717 buffer = g_build_filename (buffer2, "tests", "test1", INPUT_FILE, NULL);
03718 g_free (buffer2);
03719 window_read (buffer);
03720 g_free (buffer);
03721 }
03722
03723 #endif
03724
03730 int
03731 cores_number ()
03732 {
03733 #ifdef G_OS_WIN32
03734     SYSTEM_INFO sysinfo;
03735     GetSystemInfo (&sysinfo);
03736     return sysinfo.dwNumberOfProcessors;
03737 #else
03738     return (int) sysconf (_SC_NPROCESSORS_ONLN);
03739 #endif
03740 }
03741
03751 int
03752 main (int argn, char **argc)
03753 {
03754 #if HAVE_GTK
03755     int status;
03756 #endif
03757 #if HAVE_MPI
03758     // Starting MPI
03759     MPI_Init (&argn, &argc);
03760     MPI_Comm_size (MPI_COMM_WORLD, &ntasks);
03761     MPI_Comm_rank (MPI_COMM_WORLD, &calibrate->mpi_rank);
03762     printf ("rank=%d tasks=%d\n", calibrate->mpi_rank, ntasks);
03763 #else
03764     ntasks = 1;
03765 #endif
03766 // Starting pseudo-random numbers generator
03767 calibrate->rng = gsl_rng_alloc (gsl_rng_taus2);
03768 gsl_rng_set (calibrate->rng, DEFAULT_RANDOM_SEED);
03769 // Allowing spaces in the XML data file
03770 xmlKeepBlanksDefault (0);
03771
03772 #if HAVE_GTK
03773     nthreads = cores_number ();
03774     setlocale (LC_ALL, "");
03775     setlocale (LC_NUMERIC, "C");
03776     current_directory = g_get_current_dir ();
03777     bindtextdomain
03778     (PROGRAM_INTERFACE, g_build_filename (current_directory,
03779     LOCALE_DIR, NULL));
03780     bind_textdomain_codeset (PROGRAM_INTERFACE, "UTF-8");
03781     textdomain (PROGRAM_INTERFACE);
03782     gtk_disable_setlocale ();
03783     window->application = gtk_application_new ("git.jburguete.calibrator",
03784     G_APPLICATION_FLAGS_NONE);
03785     g_signal_connect (window->application, "activate", window_new, NULL);
03786     status = g_application_run (G_APPLICATION (window->application), argn, argc);
03787     g_object_unref (window->application);
03788 #else
03789 // Checking syntax
03790 if (!(argn == 2 || (argn == 4 && !strcmp (argc[1], "-nthreads"))))
03791 {
03792     printf ("The syntax is:\ncalibrator [-nthreads x] data_file\n");
03793 }
03794 #if HAVE_MPI
03795 // Closing MPI
03796 MPI_Finalize ();
03797 #endif
03798 return 1;
03799 }
03800 // Getting threads number
03801 if (argn == 2)
03802     nthreads = cores_number ();
03803 else
03804     nthreads = atoi (argc[2]);
03805 printf ("nthreads=%u\n", nthreads);
03806 // Making calibration
03807 if (input_open (argc[argn - 1]))
03808     calibrate_new ();
03809 // Freeing memory
03810 calibrate_free ();
03811
03812

```

```

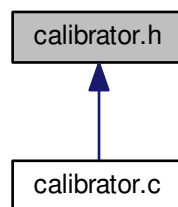
03813 #endif
03814
03815 // Freeing memory
03816 gsl_rng_free (calibrate->rng);
03817 #if HAVE_MPI
03818 // Closing MPI
03819 MPI_Finalize ();
03820 #endif
03821
03822 #if HAVE_GTK
03823 g_free (current_directory);
03824 return status;
03825 #else
03826 return 0;
03827 #endif
03828 }

```

## 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.*
- int [input\\_open](#) (char \*filename)

*Function to open the input file.*
- void [input\\_free](#) ()

*Function to free the memory of the input file data.*
- 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

Javier Burguete.

#### 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 49 of file [calibrator.h](#).

```
00050 {
00051     ALGORITHM_MONTE_CARLO = 0,
00052     ALGORITHM_SWEEP = 1,
00053     ALGORITHM_GENETIC = 2
00054 };
```

### 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 1267 of file [calibrator.c](#).

```

01268 {
01269     unsigned int i, j;
01270     double e;
01271     #if DEBUG
01272     fprintf (stderr, "calibrate_best_sequential: start\n");
01273     #endif
01274     if (calibrate->nsaveds < calibrate->nbest
01275         || value < calibrate->error_best[calibrate->nsaveds - 1])
01276     {
01277         if (calibrate->nsaveds < calibrate->nbest)
01278             ++calibrate->nsaveds;
01279         calibrate->error_best[calibrate->nsaveds - 1] = value;
01280         calibrate->simulation_best[calibrate->
01281 nsaveds - 1] = simulation;
01282         for (i = calibrate->nsaveds; --i;)
01283         {
01284             if (calibrate->error_best[i] < calibrate->
01285 error_best[i - 1])
01286             {
01287                 j = calibrate->simulation_best[i];
01288                 e = calibrate->error_best[i];
01289                 calibrate->simulation_best[i] = calibrate->
01290 simulation_best[i - 1];
01291                 calibrate->error_best[i] = calibrate->
01292 error_best[i - 1];
01293                 calibrate->simulation_best[i - 1] = j;
01294                 calibrate->error_best[i - 1] = e;
01295             }
01296             else
01297                 break;
01298         }
01299     }
01300     #if DEBUG
01301     fprintf (stderr, "calibrate_best_sequential: end\n");
01302     #endif
01303 }

```

### 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 1222 of file [calibrator.c](#).

```

01223 {
01224     unsigned int i, j;
01225     double e;
01226     #if DEBUG
01227     fprintf (stderr, "calibrate_best_thread: start\n");
01228     #endif
01229     if (calibrate->nsaveds < calibrate->nbest
01230         || value < calibrate->error_best[calibrate->nsaveds - 1])
01231     {
01232         g_mutex_lock (mutex);
01233         if (calibrate->nsaveds < calibrate->nbest)
01234             ++calibrate->nsaveds;
01235         calibrate->error_best[calibrate->nsaveds - 1] = value;
01236         calibrate->simulation_best[calibrate->
01237 nsaveds - 1] = simulation;
01238         for (i = calibrate->nsaveds; --i;)
01239         {
01240             if (calibrate->error_best[i] < calibrate->
01241 error_best[i - 1])
01242             {
01243                 j = calibrate->simulation_best[i];
01244                 e = calibrate->error_best[i];
01245                 calibrate->simulation_best[i] = calibrate->
01246 simulation_best[i - 1];
01247                 calibrate->error_best[i] = calibrate->
01248 error_best[i - 1];
01249                 calibrate->simulation_best[i - 1] = j;
01250                 calibrate->error_best[i - 1] = e;
01251             }
01252             else
01253                 break;
01254         }
01255         g_mutex_unlock (mutex);
01256     }
01257 }

```

```

01252     }
01253     #if DEBUG
01254     fprintf (stderr, "calibrate_best_thread: end\n");
01255     #endif
01256 }

```

### 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.

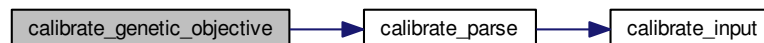
Definition at line 1576 of file [calibrator.c](#).

```

01577 {
01578     unsigned int j;
01579     double objective;
01580     char buffer[64];
01581     #if DEBUG
01582     fprintf (stderr, "calibrate_genetic_objective: start\n");
01583     #endif
01584     for (j = 0; j < calibrate->nvariables; ++j)
01585     {
01586         calibrate->value[entity->id * calibrate->nvariables + j]
01587         = genetic_get_variable (entity, calibrate->genetic_variable + j);
01588     }
01589     for (j = 0, objective = 0.; j < calibrate->nexperiments; ++j)
01590         objective += calibrate_parse (entity->id, j);
01591     g_mutex_lock (mutex);
01592     for (j = 0; j < calibrate->nvariables; ++j)
01593     {
01594         snprintf (buffer, 64, "%s ", format[calibrate->precision[j]]);
01595         fprintf (calibrate->file_variables, buffer,
01596                 genetic_get_variable (entity, calibrate->
01597                 genetic_variable + j));
01598     }
01598     fprintf (calibrate->file_variables, "%.14le\n", objective);
01599     g_mutex_unlock (mutex);
01600     #if DEBUG
01601     fprintf (stderr, "calibrate_genetic_objective: end\n");
01602     #endif
01603     return objective;
01604 }

```

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

Definition at line 971 of file `calibrator.c`.

```

00972 {
00973     unsigned int i;
00974     char buffer[32], value[32], *buffer2, *buffer3, *content;
00975     FILE *file;
00976     gsize length;
00977     GRegex *regex;
00978
00979     #if DEBUG
00980         fprintf (stderr, "calibrate_input: start\n");
00981     #endif
00982
00983     // Checking the file
00984     if (!template)
00985         goto calibrate_input_end;
00986
00987     // Opening template
00988     content = g_mapped_file_get_contents (template);
00989     length = g_mapped_file_get_length (template);
00990     #if DEBUG
00991         fprintf (stderr, "calibrate_input: length=%lu\ncontent:\n%s", length,
00992                 content);
00993     #endif
00994     file = fopen (input, "w");
00995
00996     // Parsing template
00997     for (i = 0; i < calibrate->nvariables; ++i)
00998     {
00999         #if DEBUG
01000             fprintf (stderr, "calibrate_input: variable=%u\n", i);
01001         #endif
01002         snprintf (buffer, 32, "@variable%u@", i + 1);
01003         regex = g_regex_new (buffer, 0, 0, NULL);
01004         if (i == 0)
01005         {
01006             buffer2 = g_regex_replace_literal (regex, content, length, 0,
01007                                                calibrate->label[i], 0, NULL);
01008             #if DEBUG
01009                 fprintf (stderr, "calibrate_input: buffer2\n%s", buffer2);
01010             #endif
01011         }
01012         else
01013         {
01014             length = strlen (buffer3);
01015             buffer2 = g_regex_replace_literal (regex, buffer3, length, 0,
01016                                                calibrate->label[i], 0, NULL);
01017             g_free (buffer3);
01018         }
01019         g_regex_unref (regex);
01020         length = strlen (buffer2);
01021         snprintf (buffer, 32, "@value%u@", i + 1);
01022         regex = g_regex_new (buffer, 0, 0, NULL);
01023         snprintf (value, 32, format[calibrate->precision[i]],
01024                  calibrate->value[simulation * calibrate->
01025                                nvariables + i]);
01026         #if DEBUG
01027             fprintf (stderr, "calibrate_input: value=%s\n", value);
01028         #endif
01029         buffer3 = g_regex_replace_literal (regex, buffer2, length, 0, value,
01030                                           0, NULL);
01031         g_free (buffer2);
01032         g_regex_unref (regex);
01033     }
01034
01035     // Saving input file
01036     fwrite (buffer3, strlen (buffer3), sizeof (char), file);
01037     g_free (buffer3);
01038     fclose (file);
01039
01040 calibrate_input_end:
01041     #if DEBUG
01042         fprintf (stderr, "calibrate_input: end\n");
01043     #endif
01044     return;
01045 }

```

### 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 1383 of file [calibrator.c](#).

```

01385 {
01386     unsigned int i, j, k, s[calibrate->nbest];
01387     double e[calibrate->nbest];
01388     #if DEBUG
01389     fprintf (stderr, "calibrate_merge: start\n");
01390     #endif
01391     i = j = k = 0;
01392     do
01393     {
01394         if (i == calibrate->nsaveds)
01395         {
01396             s[k] = simulation_best[j];
01397             e[k] = error_best[j];
01398             ++j;
01399             ++k;
01400             if (j == nsaveds)
01401                 break;
01402         }
01403         else if (j == nsaveds)
01404         {
01405             s[k] = calibrate->simulation_best[i];
01406             e[k] = calibrate->error_best[i];
01407             ++i;
01408             ++k;
01409             if (i == calibrate->nsaveds)
01410                 break;
01411         }
01412         else if (calibrate->error_best[i] > error_best[j])
01413         {
01414             s[k] = simulation_best[j];
01415             e[k] = error_best[j];
01416             ++j;
01417             ++k;
01418         }
01419         else
01420         {
01421             s[k] = calibrate->simulation_best[i];
01422             e[k] = calibrate->error_best[i];
01423             ++i;
01424             ++k;
01425         }
01426     }
01427     while (k < calibrate->nbest);
01428     calibrate->nsaveds = k;
01429     memcpy (calibrate->simulation_best, s, k * sizeof (unsigned int));
01430     memcpy (calibrate->error_best, e, k * sizeof (double));
01431     #if DEBUG
01432     fprintf (stderr, "calibrate_merge: end\n");
01433     #endif
01434 }
```

### 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 1058 of file [calibrator.c](#).

```

01059 {
01060     unsigned int i;
01061     double e;
01062     char buffer[512], input[MAX_NINPUTS][32], output[32], result[32], *buffer2,
01063         *buffer3, *buffer4;
01064     FILE *file_result;
01065
01066     #if DEBUG
01067         fprintf (stderr, "calibrate_parse: start\n");
01068         fprintf (stderr, "calibrate_parse: simulation=%u experiment=%u\n", simulation,
01069             experiment);
01070     #endif
01071
01072     // Opening input files
01073     for (i = 0; i < calibrate->ninputs; ++i)
01074     {
01075         snprintf (&input[i][0], 32, "input-%u-%u-%u", i, simulation, experiment);
01076     #if DEBUG
01077         fprintf (stderr, "calibrate_parse: i=%u input=%s\n", i, &input[i][0]);
01078     #endif
01079         calibrate_input (simulation, &input[i][0],
01080             calibrate->file[i][experiment]);
01081     }
01082     for (; i < MAX_NINPUTS; ++i)
01083         strcpy (&input[i][0], "");
01084     #if DEBUG
01085         fprintf (stderr, "calibrate_parse: parsing end\n");
01086     #endif
01087
01088     // Performing the simulation
01089     snprintf (output, 32, "output-%u-%u", simulation, experiment);
01090     buffer2 = g_path_get_dirname (calibrate->simulator);
01091     buffer3 = g_path_get_basename (calibrate->simulator);
01092     buffer4 = g_build_filename (buffer2, buffer3, NULL);
01093     snprintf (buffer, 512, "%s\ " %s %s %s %s %s %s %s %s %s",
01094         buffer4, input[0], input[1], input[2], input[3], input[4], input[5],
01095         input[6], input[7], output);
01096     g_free (buffer4);
01097     g_free (buffer3);
01098     g_free (buffer2);
01099     #if DEBUG
01100         fprintf (stderr, "calibrate_parse: %s\n", buffer);
01101     #endif
01102     system (buffer);
01103
01104     // Checking the objective value function
01105     if (calibrate->evaluator)
01106     {
01107         snprintf (result, 32, "result-%u-%u", simulation, experiment);
01108         buffer2 = g_path_get_dirname (calibrate->evaluator);
01109         buffer3 = g_path_get_basename (calibrate->evaluator);
01110         buffer4 = g_build_filename (buffer2, buffer3, NULL);
01111         snprintf (buffer, 512, "%s\ " %s %s %s",
01112             buffer4, output, calibrate->experiment[experiment], result);
01113         g_free (buffer4);
01114         g_free (buffer3);
01115         g_free (buffer2);
01116     #if DEBUG
01117         fprintf (stderr, "calibrate_parse: %s\n", buffer);
01118     #endif
01119         system (buffer);
01120         file_result = fopen (result, "r");
01121         e = atof (fgets (buffer, 512, file_result));
01122         fclose (file_result);
01123     }
01124     else
01125     {
01126         strcpy (result, "");
01127         file_result = fopen (output, "r");
01128         e = atof (fgets (buffer, 512, file_result));
01129         fclose (file_result);
01130     }
01131
01132     // Removing files
01133     #if !DEBUG
01134     for (i = 0; i < calibrate->ninputs; ++i)
01135     {
01136         if (calibrate->file[i][0])
01137         {

```

```

01138         snprintf (buffer, 512, RM " %s", &input[i][0]);
01139         system (buffer);
01140     }
01141 }
01142 snprintf (buffer, 512, RM " %s %s", output, result);
01143 system (buffer);
01144 #endif
01145
01146 #if DEBUG
01147 fprintf (stderr, "calibrate_parse: end\n");
01148 #endif
01149
01150 // Returning the objective function
01151 return e * calibrate->weight[experiment];
01152 }

```

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 1194 of file [calibrator.c](#).

```

01195 {
01196     unsigned int i;
01197     char buffer[64];
01198     #if DEBUG
01199     fprintf (stderr, "calibrate_save_variables: start\n");
01200     #endif
01201     for (i = 0; i < calibrate->nvariables; ++i)
01202     {
01203         snprintf (buffer, 64, "%s ", format[calibrate->precision[i]]);
01204         fprintf (calibrate->file_variables, buffer,
01205                 calibrate->value[simulation * calibrate->
01206                             nvariables + i]);
01207     }
01207     fprintf (calibrate->file_variables, "%.14le\n", error);
01208     #if DEBUG
01209     fprintf (stderr, "calibrate_save_variables: end\n");
01210     #endif
01211 }

```

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

Function to calibrate on a thread.

## Parameters

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

## Returns

NULL

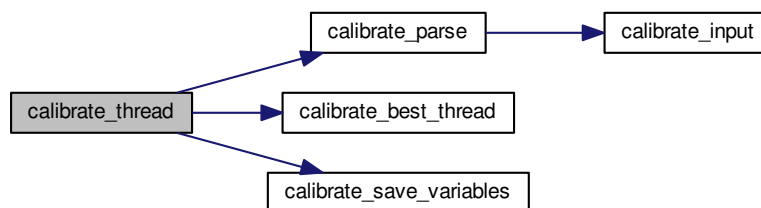
Definition at line 1309 of file [calibrator.c](#).

```

01310 {
01311     unsigned int i, j, thread;
01312     double e;
01313     #if DEBUG
01314     fprintf (stderr, "calibrate_thread: start\n");
01315     #endif
01316     thread = data->thread;
01317     #if DEBUG
01318     fprintf (stderr, "calibrate_thread: thread=%u start=%u end=%u\n", thread,
01319             calibrate->thread[thread], calibrate->thread[thread + 1]);
01320     #endif
01321     for (i = calibrate->thread[thread]; i < calibrate->thread[thread + 1]; ++i)
01322     {
01323         e = 0.;
01324         for (j = 0; j < calibrate->nexperiments; ++j)
01325             e += calibrate_parse (i, j);
01326         calibrate_best_thread (i, e);
01327         g_mutex_lock (mutex);
01328         calibrate_save_variables (i, e);
01329         g_mutex_unlock (mutex);
01330     #if DEBUG
01331     fprintf (stderr, "calibrate_thread: i=%u e=%lg\n", i, e);
01332     #endif
01333     }
01334     #if DEBUG
01335     fprintf (stderr, "calibrate_thread: end\n");
01336     #endif
01337     g_thread_exit (NULL);
01338     return NULL;
01339 }

```

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 458 of file [calibrator.c](#).

```

00459 {
00460     int error_code;
00461     unsigned int i;
00462     char buffer2[64];
00463     xmlChar *buffer;
00464     xmlDoc *doc;
00465     xmlNode *node, *child;
00466
00467     #if DEBUG
00468         fprintf (stderr, "input_new: start\n");
00469     #endif
00470
00471     // Resetting input data
00472     input_new ();
00473
00474     // Parsing the input file
00475     doc = xmlParseFile (filename);
00476     if (!doc)
00477     {
00478         show_error (gettext ("Unable to parse the input file"));
00479         return 0;
00480     }
00481
00482     // Getting the root node
00483     node = xmlDocGetRootElement (doc);
00484     if (xmlStrcmp (node->name, XML_CALIBRATE))
00485     {
00486         show_error (gettext ("Bad root XML node"));
00487         return 0;
00488     }
00489
00490     // Opening simulator program name
00491     input->simulator = (char *) xmlGetProp (node, XML_SIMULATOR);
00492     if (!input->simulator)
00493     {
00494         show_error (gettext ("Bad simulator program"));
00495         return 0;
00496     }
00497
00498     // Opening evaluator program name
00499     input->evaluator = (char *) xmlGetProp (node, XML_EVALUATOR);
00500
00501     // Opening algorithm
00502     buffer = xmlGetProp (node, XML_ALGORITHM);
00503     if (!xmlStrcmp (buffer, XML_MONTE_CARLO))
00504     {
00505         input->algorithm = ALGORITHM_MONTE_CARLO;
00506
00507         // Obtaining simulations number
00508         input->nsimulations
00509         = xml_node_get_int (node, XML_NSIMULATIONS, &error_code);
00510         if (error_code)
00511         {
00512             show_error (gettext ("Bad simulations number"));
00513             return 0;
00514         }
00515     }
00516     else if (!xmlStrcmp (buffer, XML_SWEEP))
00517         input->algorithm = ALGORITHM_SWEEP;
00518     else if (!xmlStrcmp (buffer, XML_GENETIC))
00519     {
00520         input->algorithm = ALGORITHM_GENETIC;
00521
00522         // Obtaining population
00523         if (xmlHasProp (node, XML_NPOPULATION))
00524         {
00525             input->nsimulations
00526             = xml_node_get_uint (node, XML_NPOPULATION, &error_code);
00527             if (error_code || input->nsimulations < 3)
00528             {
00529                 show_error (gettext ("Invalid population number"));
00530                 return 0;
00531             }
00532         }
00533         else

```

```

00534     {
00535         show_error (gettext ("No population number"));
00536         return 0;
00537     }
00538
00539     // Obtaining generations
00540     if (xmlHasProp (node, XML_NGENERATIONS))
00541     {
00542         input->niterations
00543         = xml_node_get_uint (node, XML_NGENERATIONS, &error_code);
00544         if (error_code || !input->niterations)
00545         {
00546             show_error (gettext ("Invalid generation number"));
00547             return 0;
00548         }
00549     }
00550     else
00551     {
00552         show_error (gettext ("No generation number"));
00553         return 0;
00554     }
00555
00556     // Obtaining mutation probability
00557     if (xmlHasProp (node, XML_MUTATION))
00558     {
00559         input->mutation_ratio
00560         = xml_node_get_float (node, XML_MUTATION, &error_code);
00561         if (error_code || input->mutation_ratio < 0.
00562             || input->mutation_ratio >= 1.)
00563         {
00564             show_error (gettext ("Invalid mutation probability"));
00565             return 0;
00566         }
00567     }
00568     else
00569     {
00570         show_error (gettext ("No mutation probability"));
00571         return 0;
00572     }
00573
00574     // Obtaining reproduction probability
00575     if (xmlHasProp (node, XML_REPRODUCTION))
00576     {
00577         input->reproduction_ratio
00578         = xml_node_get_float (node, XML_REPRODUCTION, &error_code);
00579         if (error_code || input->reproduction_ratio < 0.
00580             || input->reproduction_ratio >= 1.0)
00581         {
00582             show_error (gettext ("Invalid reproduction probability"));
00583             return 0;
00584         }
00585     }
00586     else
00587     {
00588         show_error (gettext ("No reproduction probability"));
00589         return 0;
00590     }
00591
00592     // Obtaining adaptation probability
00593     if (xmlHasProp (node, XML_ADAPTATION))
00594     {
00595         input->adaptation_ratio
00596         = xml_node_get_float (node, XML_ADAPTATION, &error_code);
00597         if (error_code || input->adaptation_ratio < 0.
00598             || input->adaptation_ratio >= 1.)
00599         {
00600             show_error (gettext ("Invalid adaptation probability"));
00601             return 0;
00602         }
00603     }
00604     else
00605     {
00606         show_error (gettext ("No adaptation probability"));
00607         return 0;
00608     }
00609
00610     // Checking survivals
00611     i = input->mutation_ratio * input->nsimulations;
00612     i += input->reproduction_ratio * input->
00613     nsimulations;
00614     i += input->adaptation_ratio * input->
00615     nsimulations;
00616     if (i > input->nsimulations - 2)
00617     {
00618         show_error
00619         (gettext
00620          ("No enough survival entities to reproduce the population"));

```

```

00619         return 0;
00620     }
00621 }
00622 else
00623 {
00624     show_error (gettext ("Unknown algorithm"));
00625     return 0;
00626 }
00627
00628 if (input->algorithm == ALGORITHM_MONTE_CARLO
00629 || input->algorithm == ALGORITHM_SWEEP)
00630 {
00631
00632     // Obtaining iterations number
00633     input->niterations
00634     = xml_node_get_int (node, XML_NITERATIONS, &error_code);
00635     if (error_code == 1)
00636         input->niterations = 1;
00637     else if (error_code)
00638     {
00639         show_error (gettext ("Bad iterations number"));
00640         return 0;
00641     }
00642
00643     // Obtaining best number
00644     if (xmlHasProp (node, XML_NBEST))
00645     {
00646         input->nbest = xml_node_get_uint (node,
XML_NBEST, &error_code);
00647         if (error_code || !input->nbest)
00648         {
00649             show_error (gettext ("Invalid best number"));
00650             return 0;
00651         }
00652     }
00653     else
00654         input->nbest = 1;
00655
00656     // Obtaining tolerance
00657     if (xmlHasProp (node, XML_TOLERANCE))
00658     {
00659         input->tolerance
00660         = xml_node_get_float (node, XML_TOLERANCE, &error_code);
00661         if (error_code || input->tolerance < 0.)
00662         {
00663             show_error (gettext ("Invalid tolerance"));
00664             return 0;
00665         }
00666     }
00667     else
00668         input->tolerance = 0.;
00669 }
00670
00671 // Reading the experimental data
00672 for (child = node->children; child; child = child->next)
00673 {
00674     if (xmlStrcmp (child->name, XML_EXPERIMENT))
00675         break;
00676 #if DEBUG
00677     fprintf (stderr, "input_new: nexperiments=%u\n", input->nexperiments);
00678 #endif
00679     if (xmlHasProp (child, XML_NAME))
00680     {
00681         input->experiment
00682         = g_realloc (input->experiment,
00683                     (1 + input->nexperiments) * sizeof (char *));
00684         input->experiment[input->nexperiments]
00685         = (char *) xmlGetProp (child, XML_NAME);
00686     }
00687     else
00688     {
00689         show_error (gettext ("No experiment file name"));
00690         return 0;
00691     }
00692 #if DEBUG
00693     fprintf (stderr, "input_new: experiment=%s\n",
00694             input->experiment[input->nexperiments]);
00695 #endif
00696     input->weight = g_realloc (input->weight,
00697                               (1 + input->nexperiments) * sizeof (double));
00698     if (xmlHasProp (child, XML_WEIGHT))
00699         input->weight[input->nexperiments]
00700         = xml_node_get_float (child, XML_WEIGHT, &error_code);
00701     else
00702         input->weight[input->nexperiments] = 1.;
00703 #if DEBUG
00704     fprintf (stderr, "input_new: weight=%lg\n",

```

```

00705         input->weight[input->nexperiments]);
00706 #endif
00707     if (!input->nexperiments)
00708         input->ninputs = 0;
00709 #if DEBUG
00710     fprintf (stderr, "input_new: template[0]\n");
00711 #endif
00712     if (xmlHasProp (child, XML_TEMPLATE1))
00713     {
00714         input->template[0]
00715             = (char **) g_realloc (input->template[0],
00716                                   (1 + input->nexperiments) * sizeof (char *));
00717         input->template[0][input->nexperiments]
00718             = (char *) xmlGetProp (child, template[0]);
00719 #if DEBUG
00720         fprintf (stderr, "input_new: experiment=%u templatel=%s\n",
00721                 input->nexperiments,
00722                 input->template[0][input->nexperiments]);
00723 #endif
00724         if (!input->nexperiments)
00725             ++input->ninputs;
00726 #if DEBUG
00727         fprintf (stderr, "input_new: ninputs=%u\n", input->ninputs);
00728 #endif
00729     }
00730     else
00731     {
00732         show_error (gettext ("No experiment template"));
00733         return 0;
00734     }
00735     for (i = 1; i < MAX_NINPUTS; ++i)
00736     {
00737 #if DEBUG
00738         fprintf (stderr, "input_new: template%u\n", i + 1);
00739 #endif
00740         if (xmlHasProp (child, template[i]))
00741         {
00742             if (input->nexperiments && input->ninputs < 2)
00743             {
00744                 snprintf (buffer2, 64,
00745                         gettext ("Experiment %u: bad templates number"),
00746                         input->nexperiments + 1);
00747                 show_error (buffer2);
00748                 return 0;
00749             }
00750             input->template[i] = (char **)
00751                 g_realloc (input->template[i],
00752                           (1 + input->nexperiments) * sizeof (char *));
00753             input->template[i][input->nexperiments]
00754                 = (char *) xmlGetProp (child, template[i]);
00755 #if DEBUG
00756             fprintf (stderr, "input_new: experiment=%u template%u=%s\n",
00757                     input->nexperiments, i + 1,
00758                     input->template[i][input->nexperiments]);
00759 #endif
00760             if (!input->nexperiments)
00761                 ++input->ninputs;
00762 #if DEBUG
00763             fprintf (stderr, "input_new: ninputs=%u\n", input->ninputs);
00764 #endif
00765         }
00766         else if (input->nexperiments && input->ninputs > 1)
00767         {
00768             snprintf (buffer2, 64, gettext ("No experiment %u template%u"),
00769                     input->nexperiments + 1, i + 1);
00770             show_error (buffer2);
00771             return 0;
00772         }
00773         else
00774             break;
00775     }
00776     ++input->nexperiments;
00777 #if DEBUG
00778     fprintf (stderr, "input_new: nexperiments=%u\n", input->nexperiments);
00779 #endif
00780 }
00781 if (!input->nexperiments)
00782 {
00783     show_error (gettext ("No calibration experiments"));
00784     return 0;
00785 }
00786
00787 // Reading the variables data
00788 for (; child; child = child->next)
00789 {
00790     if (xmlStrcmp (child->name, XML_VARIABLE))
00791     {

```

```

00792         show_error (gettext ("Bad XML node"));
00793         return 0;
00794     }
00795     if (xmlHasProp (child, XML_NAME))
00796     {
00797         input->label = g_realloc
00798             (input->label, (1 + input->nvariables) * sizeof (char *));
00799         input->label[input->nvariables]
00800             = (char *) xmlGetProp (child, XML_NAME);
00801     }
00802     else
00803     {
00804         show_error (gettext ("No variable name"));
00805         return 0;
00806     }
00807     if (xmlHasProp (child, XML_MINIMUM))
00808     {
00809         input->rangemin = g_realloc
00810             (input->rangemin, (1 + input->nvariables) * sizeof (double));
00811         input->rangeminabs = g_realloc
00812             (input->rangeminabs, (1 + input->nvariables) * sizeof (double));
00813         input->rangemin[input->nvariables]
00814             = xml_node_get_float (child, XML_MINIMUM, &error_code);
00815         if (xmlHasProp (child, XML_ABSOLUTE_MINIMUM))
00816         {
00817             input->rangeminabs[input->nvariables]
00818                 = xml_node_get_float (child,
XML_ABSOLUTE_MINIMUM, &error_code);
00819         }
00820         else
00821             input->rangeminabs[input->nvariables] = -G_MAXDOUBLE;
00822     }
00823     else
00824     {
00825         show_error (gettext ("No minimum range"));
00826         return 0;
00827     }
00828     if (xmlHasProp (child, XML_MAXIMUM))
00829     {
00830         input->rangemax = g_realloc
00831             (input->rangemax, (1 + input->nvariables) * sizeof (double));
00832         input->rangemaxabs = g_realloc
00833             (input->rangemaxabs, (1 + input->nvariables) * sizeof (double));
00834         input->rangemax[input->nvariables]
00835             = xml_node_get_float (child, XML_MAXIMUM, &error_code);
00836         if (xmlHasProp (child, XML_ABSOLUTE_MAXIMUM))
00837             input->rangemaxabs[input->nvariables]
00838                 = xml_node_get_float (child,
XML_ABSOLUTE_MAXIMUM, &error_code);
00839         else
00840             input->rangemaxabs[input->nvariables] = G_MAXDOUBLE;
00841     }
00842     else
00843     {
00844         show_error (gettext ("No maximum range"));
00845         return 0;
00846     }
00847     input->precision = g_realloc
00848         (input->precision, (1 + input->nvariables) * sizeof (unsigned int));
00849     if (xmlHasProp (child, XML_PRECISION))
00850         input->precision[input->nvariables]
00851             = xml_node_get_uint (child, XML_PRECISION, &error_code);
00852     else
00853         input->precision[input->nvariables] =
DEFAULT_PRECISION;
00854     if (input->algorithm == ALGORITHM_SWEEP)
00855     {
00856         if (xmlHasProp (child, XML_NSWEEPS))
00857         {
00858             input->nsweeps = (unsigned int *)
g_realloc (input->nsweeps,
(1 + input->nvariables) * sizeof (unsigned int));
00859             input->nsweeps[input->nvariables]
00860                 = xml_node_get_uint (child, XML_NSWEEPS, &error_code);
00861         }
00862         else
00863         {
00864             show_error (gettext ("No sweeps number"));
00865             return 0;
00866         }
00867     }
00868     #if DEBUG
00869     fprintf (stderr, "input_new: nsweeps=%u nsimulations=%u\n",
input->nsweeps[input->nvariables],
input->nsimulations);
00870     #endif
00871     }
00872     if (input->algorithm == ALGORITHM_GENETIC)

```

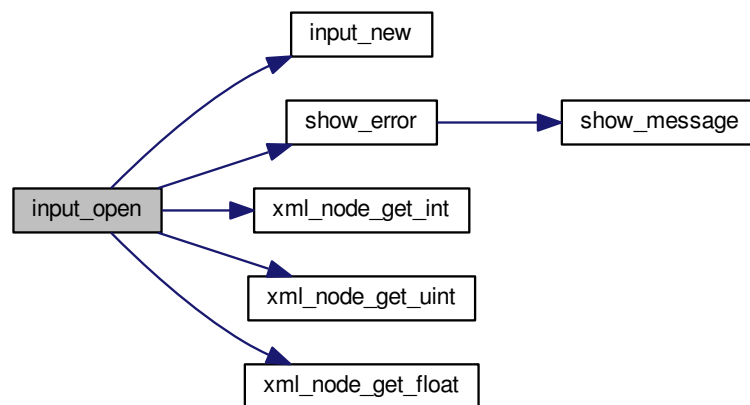


```

00875     {
00876         // Obtaining bits representing each variable
00877         if (xmlHasProp (child, XML_NBITS))
00878         {
00879             input->nbits = (unsigned int *)
00880                 g_realloc (input->nbits,
00881                     (1 + input->nvariables) * sizeof (unsigned int));
00882             i = xml_node_get_uint (child, XML_NBITS, &error_code);
00883             if (error_code || !i)
00884             {
00885                 show_error (gettext ("Invalid bit number"));
00886                 return 0;
00887             }
00888             input->nbits[input->nvariables] = i;
00889         }
00890         else
00891         {
00892             show_error (gettext ("No bits number"));
00893             return 0;
00894         }
00895     }
00896     ++input->nvariables;
00897 }
00898 if (!input->nvariables)
00899 {
00900     show_error (gettext ("No calibration variables"));
00901     return 0;
00902 }
00903
00904 // Getting the working directory
00905 input->directory = g_path_get_dirname (filename);
00906 input->name = g_path_get_basename (filename);
00907
00908 // Closing the XML document
00909 xmlFreeDoc (doc);
00910
00911 #if DEBUG
00912 fprintf (stderr, "input_new: end\n");
00913 #endif
00914
00915 return 1;
00916 }

```

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 273 of file [calibrator.c](#).

```
00274 {
00275     show_message (gettext ("ERROR!"), msg, ERROR_TYPE);
00276 }
```

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 243 of file [calibrator.c](#).

```
00244 {
00245     #if HAVE_GTK
00246         GtkMessageDialog *dlg;
00247
00248         // Creating the dialog
00249         dlg = (GtkMessageDialog *) gtk_message_dialog_new
00250             (window->window, GTK_DIALOG_MODAL, type, GTK_BUTTONS_OK, "%s", msg);
00251
00252         // Setting the dialog title
00253         gtk_window_set_title (GTK_WINDOW (dlg), title);
00254
00255         // Showing the dialog and waiting response
00256         gtk_dialog_run (GTK_DIALOG (dlg));
00257
00258         // Closing and freeing memory
00259         gtk_widget_destroy (GTK_WIDGET (dlg));
00260
00261     #else
00262         printf ("%s: %s\n", title, msg);
00263     #endif
00264 }
```

**5.3.3.12 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 352 of file [calibrator.c](#).

```

00353 {
00354     double x = 0.;
00355     xmlChar *buffer;
00356     buffer = xmlGetProp (node, prop);
00357     if (!buffer)
00358         *error_code = 1;
00359     else
00360     {
00361         if (sscanf ((char *) buffer, "%lf", &x) != 1)
00362             *error_code = 2;
00363         else
00364             *error_code = 0;
00365         xmlFree (buffer);
00366     }
00367     return x;
00368 }
```

### 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 290 of file [calibrator.c](#).

```

00291 {
00292     int i = 0;
00293     xmlChar *buffer;
00294     buffer = xmlGetProp (node, prop);
00295     if (!buffer)
00296         *error_code = 1;
00297     else
00298     {
00299         if (sscanf ((char *) buffer, "%d", &i) != 1)
00300             *error_code = 2;
00301         else
00302             *error_code = 0;
00303         xmlFree (buffer);
00304     }
00305     return i;
00306 }
```

### 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 321 of file [calibrator.c](#).

```
00322 {
00323     unsigned int i = 0;
00324     xmlChar *buffer;
00325     buffer = xmlGetProp (node, prop);
00326     if (!buffer)
00327         *error_code = 1;
00328     else
00329     {
00330         if (sscanf ((char *) buffer, "%u", &i) != 1)
00331             *error_code = 2;
00332         else
00333             *error_code = 0;
00334         xmlFree (buffer);
00335     }
00336     return i;
00337 }
```

**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 419 of file [calibrator.c](#).

```
00420 {
00421     xmlChar buffer[64];
00422     snprintf ((char *) buffer, 64, "%.14lg", value);
00423     xmlSetProp (node, prop, buffer);
00424 }
```

**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 381 of file [calibrator.c](#).

```
00382 {
00383     xmlChar buffer[64];
00384     snprintf ((char *) buffer, 64, "%d", value);
00385     xmlSetProp (node, prop, buffer);
00386 }
```

5.3.3.17 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 400 of file [calibrator.c](#).

```

00401 {
00402     xmlChar buffer[64];
00403     snprintf ((char *) buffer, 64, "%u", value);
00404     xmlSetProp (node, prop, buffer);
00405 }
```

## 5.4 calibrator.h

```

00001 /*
00002 Calibrator: a software to make calibrations of empirical parameters.
00003
00004 AUTHORS: Javier Burquete 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
00049 enum Algorithm
00050 {
00051     ALGORITHM_MONTE_CARLO = 0,
00052     ALGORITHM_SWEEP = 1,
00053     ALGORITHM_GENETIC = 2
00054 };
00055
00060 typedef struct
00061 {
00116     char *simulator, *evaluator, **experiment, **template[MAX_NINPUTS], **label,
00117         *directory, *name;
00118     double *rangemin, *rangemax, *rangeminabs, *rangemaxabs, *weight, tolerance,
00119         mutation_ratio, reproduction_ratio, adaptation_ratio;
00120     unsigned int nvariables, nexperiments, ninputs, nsimulations, algorithm,
00121         *precision, *nsweeps, *nbits, niterations, nbest;
00122 } Input;
00123
00128 typedef struct
00129 {
00208     char *simulator, *evaluator, **experiment, **template[MAX_NINPUTS], **label;
00209     unsigned int nvariables, nexperiments, ninputs, nsimulations, algorithm,
00210         *precision, *nsweeps, nstart, nend, *thread, niterations, nbest, nsaveds,
00211         *simulation_best;
00212     double *value, *rangemin, *rangemax, *rangeminabs, *rangemaxabs, *error_best,
00213         *weight, *value_old, *error_old, tolerance, mutation_ratio,
00214         reproduction_ratio, adaptation_ratio;
00215     FILE *file_result, *file_variables;
00216     gsl_rng *rng;
00217     GMappedFile **file[MAX_NINPUTS];
00218     GeneticVariable *genetic_variable;
00219 #if HAVE_MPI
00220     int mpi_rank;
```

```

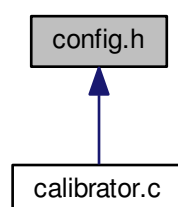
00221 #endif
00222 } Calibrate;
00223
00228 typedef struct
00229 {
00234     unsigned int thread;
00235 } ParallelData;
00236
00237 // Public functions
00238 void show_message (char *title, char *msg, int type);
00239 void show_error (char *msg);
00240 int xml_node_get_int (xmlNode * node, const xmlChar * prop, int *error_code);
00241 unsigned int xml_node_get_uint (xmlNode * node, const xmlChar * prop,
00242                                int *error_code);
00243 double xml_node_get_float (xmlNode * node, const xmlChar * prop,
00244                            int *error_code);
00245 void xml_node_set_int (xmlNode * node, const xmlChar * prop, int value);
00246 void xml_node_set_uint (xmlNode * node, const xmlChar * prop,
00247                        unsigned int value);
00248 void xml_node_set_float (xmlNode * node, const xmlChar * prop, double value);
00249 void input_new ();
00250 int input_open (char *filename);
00251 void input_free ();
00252 void calibrate_input (unsigned int simulation, char *input,
00253                     GMappedFile * template);
00254 double calibrate_parse (unsigned int simulation, unsigned int experiment);
00255 void calibrate_print ();
00256 void calibrate_save_variables (unsigned int simulation, double error);
00257 void calibrate_best_thread (unsigned int simulation, double value);
00258 void calibrate_best_sequential (unsigned int simulation, double value);
00259 void *calibrate_thread (ParallelData * data);
00260 void calibrate_sequential ();
00261 void calibrate_merge (unsigned int nsaveds, unsigned int *simulation_best,
00262                     double *error_best);
00263 #if HAVE_MPI
00264 void calibrate_synchronise ();
00265 #endif
00266 void calibrate_sweep ();
00267 void calibrate_MonteCarlo ();
00268 double calibrate_genetic_objective (Entity * entity);
00269 void calibrate_genetic ();
00270 void calibrate_save_old ();
00271 void calibrate_merge_old ();
00272 void calibrate_refine ();
00273 void calibrate_iterate ();
00274 void calibrate_new ();
00275
00276 #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_ALGORITHM` "Monte-Carlo"  
*Macro to set the default algorithm.*
- #define `DEFAULT_PRECISION` (`NPRECISIONS` - 1)  
*Macro to set the default precision digits.*
- #define `DEFAULT_RANDOM_SEED` 7007  
*Macro to set the 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\\_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

Copyright 2012-2014, all rights reserved.

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:
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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
00048 #define MAX_NINPUTS 8
00049 #define NALGORITHMS 3
00050 #define NPRECISIONS 15
00051
00052 // Default choices
00053
00062 #define DEFAULT_ALGORITHM "Monte-Carlo"
00063 #define DEFAULT_PRECISION (NPRECISIONS - 1)
00064 #define DEFAULT_RANDOM_SEED 7007
00065
00066 // Interface labels
00067
00074 #define LOCALE_DIR "locales"
00075 #define PROGRAM_INTERFACE "calibrator"
00076
00077 // XML labels
00078
00151 #define XML_ABSOLUTE_MINIMUM (const xmlChar*)"absolute_minimum"
00152 #define XML_ABSOLUTE_MAXIMUM (const xmlChar*)"absolute_maximum"
00153 #define XML_ADAPTATION (const xmlChar*)"adaptation"
00154 #define XML_ALGORITHM (const xmlChar*)"algorithm"
00155 #define XML_CALIBRATE (const xmlChar*)"calibrate"
00156 #define XML_EVALUATOR (const xmlChar*)"evaluator"
00157 #define XML_EXPERIMENT (const xmlChar*)"experiment"
00158 #define XML_GENETIC (const xmlChar*)"genetic"
00159 #define XML_MINIMUM (const xmlChar*)"minimum"
00160 #define XML_MAXIMUM (const xmlChar*)"maximum"
00161 #define XML_MONTE_CARLO (const xmlChar*)"Monte-Carlo"
00162 #define XML_MUTATION (const xmlChar*)"mutation"
00163 #define XML_NAME (const xmlChar*)"name"
00164 #define XML_NBEST (const xmlChar*)"nbest"
00165 #define XML_NBITS (const xmlChar*)"nbits"
00166 #define XML_NGENERATIONS (const xmlChar*)"ngenerations"
00167 #define XML_NITERATIONS (const xmlChar*)"niterations"
00168 #define XML_NPOPULATION (const xmlChar*)"npopulation"
00169 #define XML_NSIMULATIONS (const xmlChar*)"nsimulations"
00170 #define XML_NSWEEPS (const xmlChar*)"nsweeps"
00171 #define XML_PRECISION (const xmlChar*)"precision"
00172 #define XML_REPRODUCTION (const xmlChar*)"reproduction"
00173 #define XML_SIMULATOR (const xmlChar*)"simulator"
00174 #define XML_SWEEP (const xmlChar*)"sweep"
00175 #define XML_TEMPLATE1 (const xmlChar*)"template1"
00176 #define XML_TEMPLATE2 (const xmlChar*)"template2"
00177 #define XML_TEMPLATE3 (const xmlChar*)"template3"
00178 #define XML_TEMPLATE4 (const xmlChar*)"template4"
00179 #define XML_TEMPLATE5 (const xmlChar*)"template5"
00180 #define XML_TEMPLATE6 (const xmlChar*)"template6"
00181 #define XML_TEMPLATE7 (const xmlChar*)"template7"
00182 #define XML_TEMPLATE8 (const xmlChar*)"template8"
00183 #define XML_TOLERANCE (const xmlChar*)"tolerance"
00184 #define XML_VARIABLE (const xmlChar*)"variable"

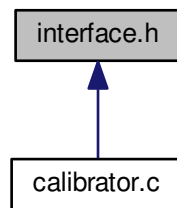
```

```
00185 #define XML_WEIGHT (const xmlChar*) "weight"
00186
00187 #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 [3731](#) of file [calibrator.c](#).

```
03732 {
03733     #ifdef G_OS_WIN32
03734         SYSTEM_INFO sysinfo;
03735         GetSystemInfo (&sysinfo);
03736         return sysinfo.dwNumberOfProcessors;
03737     #else
03738         return (int) sysconf (_SC_NPROCESSORS_ONLN);
03739     #endif
03740 }
```

#### 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 [2070](#) of file [calibrator.c](#).

```
02071 {
02072     unsigned int i, j;
02073     char *buffer;
02074     xmlDoc *doc;
02075     xmlNode *node, *child;
02076     GFile *file, *file2;
02077
02078     // Getting the input file directory
02079     input->name = g_path_get_basename (filename);
02080     input->directory = g_path_get_dirname (filename);
02081     file = g_file_new_for_path (input->directory);
02082
02083     // Opening the input file
02084     doc = xmlNewDoc ((const xmlChar *) "1.0");
02085
02086     // Setting root XML node
02087     node = xmlNewDocNode (doc, 0, XML_CALIBRATE, 0);
02088     xmlDocSetRootElement (doc, node);
02089
02090     // Adding properties to the root XML node
02091     file2 = g_file_new_for_path (input->simulator);
```

```

02092     buffer = g_file_get_relative_path (file, file2);
02093     g_object_unref (file2);
02094     xmlSetProp (node, XML_SIMULATOR, (xmlChar *) buffer);
02095     g_free (buffer);
02096     if (input->evaluator)
02097     {
02098         file2 = g_file_new_for_path (input->evaluator);
02099         buffer = g_file_get_relative_path (file, file2);
02100         g_object_unref (file2);
02101         if (xmlStrlen ((xmlChar *) buffer))
02102             xmlSetProp (node, XML_EVALUATOR, (xmlChar *) buffer);
02103         g_free (buffer);
02104     }
02105
02106     // Setting the algorithm
02107     buffer = (char *) g_malloc (64);
02108     switch (input->algorithm)
02109     {
02110         case ALGORITHM_MONTE_CARLO:
02111             xmlSetProp (node, XML_ALGORITHM, XML_MONTE_CARLO);
02112             snprintf (buffer, 64, "%u", input->nsimulations);
02113             xmlSetProp (node, XML_NSIMULATIONS, (xmlChar *) buffer);
02114             snprintf (buffer, 64, "%u", input->niterations);
02115             xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02116             snprintf (buffer, 64, "%.3lg", input->tolerance);
02117             xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02118             snprintf (buffer, 64, "%u", input->nbest);
02119             xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02120             break;
02121         case ALGORITHM_SWEEP:
02122             xmlSetProp (node, XML_ALGORITHM, XML_SWEEP);
02123             snprintf (buffer, 64, "%u", input->niterations);
02124             xmlSetProp (node, XML_NITERATIONS, (xmlChar *) buffer);
02125             snprintf (buffer, 64, "%.3lg", input->tolerance);
02126             xmlSetProp (node, XML_TOLERANCE, (xmlChar *) buffer);
02127             snprintf (buffer, 64, "%u", input->nbest);
02128             xmlSetProp (node, XML_NBEST, (xmlChar *) buffer);
02129             break;
02130         default:
02131             xmlSetProp (node, XML_ALGORITHM, XML_GENETIC);
02132             snprintf (buffer, 64, "%u", input->nsimulations);
02133             xmlSetProp (node, XML_NPOPULATION, (xmlChar *) buffer);
02134             snprintf (buffer, 64, "%u", input->niterations);
02135             xmlSetProp (node, XML_NGENERATIONS, (xmlChar *) buffer);
02136             snprintf (buffer, 64, "%.3lg", input->mutation_ratio);
02137             xmlSetProp (node, XML_MUTATION, (xmlChar *) buffer);
02138             snprintf (buffer, 64, "%.3lg", input->reproduction_ratio);
02139             xmlSetProp (node, XML_REPRODUCTION, (xmlChar *) buffer);
02140             snprintf (buffer, 64, "%.3lg", input->adaptation_ratio);
02141             xmlSetProp (node, XML_ADAPTATION, (xmlChar *) buffer);
02142             break;
02143     }
02144     g_free (buffer);
02145
02146     // Setting the experimental data
02147     for (i = 0; i < input->nexperiments; ++i)
02148     {
02149         child = xmlNewChild (node, 0, XML_EXPERIMENT, 0);
02150         xmlSetProp (child, XML_NAME, (xmlChar *) input->experiment[i]);
02151         if (input->weight[i] != 1.)
02152             xml_node_set_float (child, XML_WEIGHT, input->
weight[i]);
02153         for (j = 0; j < input->ninputs; ++j)
02154             xmlSetProp (child, template[j], (xmlChar *) input->template[j][i]);
02155     }
02156
02157     // Setting the variables data
02158     for (i = 0; i < input->nvariables; ++i)
02159     {
02160         child = xmlNewChild (node, 0, XML_VARIABLE, 0);
02161         xmlSetProp (child, XML_NAME, (xmlChar *) input->label[i]);
02162         xml_node_set_float (child, XML_MINIMUM, input->
rangemin[i]);
02163         if (input->rangeminabs[i] != -G_MAXDOUBLE)
02164             xml_node_set_float (child, XML_ABSOLUTE_MINIMUM,
input->rangeminabs[i]);
02165         xml_node_set_float (child, XML_MAXIMUM, input->
rangemax[i]);
02166         if (input->rangemaxabs[i] != G_MAXDOUBLE)
02167             xml_node_set_float (child, XML_ABSOLUTE_MAXIMUM,
input->rangemaxabs[i]);
02168         if (input->precision[i] != DEFAULT_PRECISION)
02169             xml_node_set_uint (child, XML_PRECISION,
input->precision[i]);
02170         if (input->algorithm == ALGORITHM_SWEEP)
02171             xml_node_set_uint (child, XML_NSWEEPS, input->
nsweeps[i]);

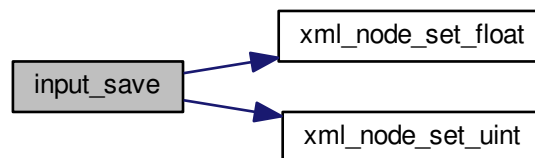
```

```

02172         else if (input->algorithm == ALGORITHM_GENETIC)
02173             xml_node_set_uint (child, XML_NBITS, input->
02174                               nbits[i]);
02174     }
02175
02176     // Saving the XML file
02177     xmlSaveFormatFile (filename, doc, 1);
02178
02179     // Freeing memory
02180     xmlFreeDoc (doc);
02181 }

```

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 2421 of file [calibrator.c](#).

```

02422 {
02423     unsigned int i;
02424     for (i = 0; i < NALGORITHMS; ++i)
02425         if (gtk_toggle_button_get_active
02426             (GTK_TOGGLE_BUTTON (window->button_algorithm[i])))
02427             break;
02428     return i;
02429 }

```

### 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 3137 of file [calibrator.c](#).

```

03138 {
03139     unsigned int i;
03140     char *buffer;
03141     #if DEBUG
03142     fprintf (stderr, "window_read: start\n");
03143     #endif
03144     input_free ();
03145     if (!input_open (filename))
03146     {
03147         #if DEBUG
03148         fprintf (stderr, "window_read: end\n");
03149         #endif
03150         return 0;
03151     }
03152     buffer = g_build_filename (input->directory, input->
simulator, NULL);
03153     puts (buffer);
03154     gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
03155                                     (window->button_simulator), buffer);
03156     g_free (buffer);
03157     gtk_toggle_button_set_active (GTK_TOGGLE_BUTTON (window->check_evaluator),
03158                                     (size_t) input->evaluator);
03159     if (input->evaluator)
03160     {
03161         buffer = g_build_filename (input->directory, input->
evaluator, NULL);
03162         gtk_file_chooser_set_filename (GTK_FILE_CHOOSER
03163                                         (window->button_evaluator), buffer);
03164         g_free (buffer);
03165     }
03166     gtk_toggle_button_set_active
03167     (GTK_TOGGLE_BUTTON (window->button_algorithm[input->
algorithm]), TRUE);
03168     switch (input->algorithm)
03169     {
03170     case ALGORITHM_MONTE_CARLO:
03171         gtk_spin_button_set_value (window->spin_simulations,
03172                                     (gdouble) input->nsimulations);
03173     case ALGORITHM_SWEEP:
03174         gtk_spin_button_set_value (window->spin_iterations,
03175                                     (gdouble) input->niterations);
03176         gtk_spin_button_set_value (window->spin_bests, (gdouble)
input->nbest);
03177         gtk_spin_button_set_value (window->spin_tolerance,
input->tolerance);
03178         break;
03179     default:
03180         gtk_spin_button_set_value (window->spin_population,
03181                                     (gdouble) input->nsimulations);
03182         gtk_spin_button_set_value (window->spin_generations,
03183                                     (gdouble) input->niterations);
03184         gtk_spin_button_set_value (window->spin_mutation, input->
mutation_ratio);
03185         gtk_spin_button_set_value (window->spin_reproduction,
input->reproduction_ratio);
03186         gtk_spin_button_set_value (window->spin_adaptation,
input->adaptation_ratio);
03187     }
03188     g_signal_handler_block (window->combo_experiment, window->
id_experiment);
03189     g_signal_handler_block (window->button_experiment,
window->id_experiment_name);
03190     gtk_combo_box_text_remove_all (window->combo_experiment);
03191     for (i = 0; i < input->nexperiments; ++i)
03192         gtk_combo_box_text_append_text (window->combo_experiment,
input->experiment[i]);
03193     g_signal_handler_unblock
03194     (window->button_experiment, window->
id_experiment_name);
03195     g_signal_handler_unblock (window->combo_experiment,
window->id_experiment);
03196     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_experiment), 0);
03197     g_signal_handler_block (window->combo_variable, window->
id_variable);
03198     g_signal_handler_block (window->entry_variable, window->
id_variable_label);
03199     gtk_combo_box_text_remove_all (window->combo_variable);
03200     for (i = 0; i < input->nvariables; ++i)
03201         gtk_combo_box_text_append_text (window->combo_variable,
input->label[i]);
03202     g_signal_handler_unblock (window->entry_variable, window->
id_variable_label);
03203     g_signal_handler_unblock (window->combo_variable, window->
id_variable);
03204     gtk_combo_box_set_active (GTK_COMBO_BOX (window->combo_variable), 0);
03205     window_set_variable ();
03206     window_update ();

```

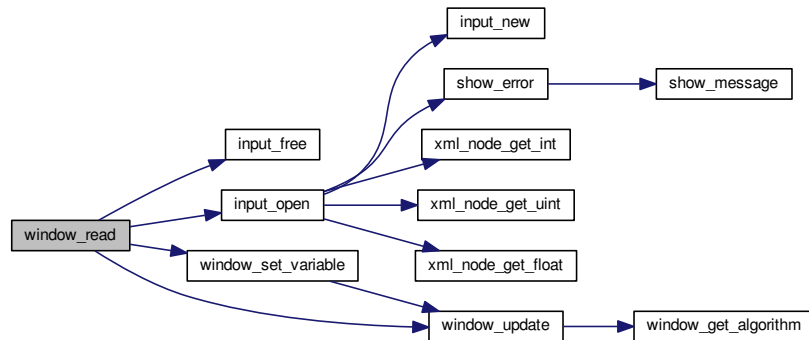


```

03211 #if DEBUG
03212     fprintf (stderr, "window_read: end\n");
03213 #endif
03214     return 1;
03215 }

```

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 2240 of file [calibrator.c](#).

```

02241 {
02242     char *buffer;
02243     GtkFileChooserDialog *dlg;
02244
02245     #if DEBUG
02246         fprintf (stderr, "window_save: start\n");
02247     #endif
02248
02249     // Opening the saving dialog
02250     dlg = (GtkFileChooserDialog *)
02251         gtk_file_chooser_dialog_new (gettext ("Save file"),
02252                                     window->window,
02253                                     GTK_FILE_CHOOSER_ACTION_SAVE,
02254                                     gettext ("_Cancel"),
02255                                     GTK_RESPONSE_CANCEL,
02256                                     gettext ("_OK"), GTK_RESPONSE_OK, NULL);
02257     gtk_file_chooser_set_do_overwrite_confirmation (GTK_FILE_CHOOSER (dlg), TRUE);
02258
02259     // If OK response then saving
02260     if (gtk_dialog_run (GTK_DIALOG (dlg)) == GTK_RESPONSE_OK)
02261     {
02262         // Adding properties to the root XML node
02263         input->simulator = gtk_file_chooser_get_filename
02264             (GTK_FILE_CHOOSER (window->button_simulator));
02265         if (gtk_toggle_button_get_active
02266             (GTK_TOGGLE_BUTTON (window->check_evaluator)))
02267             input->evaluator = gtk_file_chooser_get_filename
02268                 (GTK_FILE_CHOOSER (window->button_evaluator));
02269         else
02270             input->evaluator = NULL;
02271
02272         // Setting the algorithm
02273         switch (window_get_algorithm ())
02274         {
02275

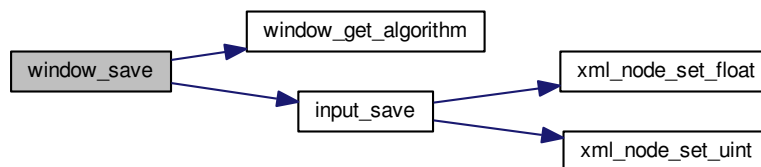
```

```

02276     case ALGORITHM_MONTE_CARLO:
02277         input->algorithm = ALGORITHM_MONTE_CARLO;
02278         input->nsimulations
02279             = gtk_spin_button_get_value_as_int (window->spin_simulations);
02280         input->niterations
02281             = gtk_spin_button_get_value_as_int (window->spin_iterations);
02282         input->tolerance = gtk_spin_button_get_value (window->
spin_tolerance);
02283         input->nbest = gtk_spin_button_get_value_as_int (window->
spin_best);
02284         break;
02285     case ALGORITHM_SWEEP:
02286         input->algorithm = ALGORITHM_SWEEP;
02287         input->niterations
02288             = gtk_spin_button_get_value_as_int (window->spin_iterations);
02289         input->tolerance = gtk_spin_button_get_value (window->
spin_tolerance);
02290         input->nbest = gtk_spin_button_get_value_as_int (window->
spin_best);
02291         break;
02292     default:
02293         input->algorithm = ALGORITHM_GENETIC;
02294         input->nsimulations
02295             = gtk_spin_button_get_value_as_int (window->spin_population);
02296         input->niterations
02297             = gtk_spin_button_get_value_as_int (window->spin_generations);
02298         input->mutation_ratio
02299             = gtk_spin_button_get_value (window->spin_mutation);
02300         input->reproduction_ratio
02301             = gtk_spin_button_get_value (window->spin_reproduction);
02302         input->adaptation_ratio
02303             = gtk_spin_button_get_value (window->spin_adaptation);
02304         break;
02305     }
02306
02307     // Saving the XML file
02308     buffer = gtk_file_chooser_get_filename (GTK_FILE_CHOOSER (dlg));
02309     input_save (buffer);
02310
02311     // Closing and freeing memory
02312     g_free (buffer);
02313     gtk_widget_destroy (GTK_WIDGET (dlg));
02314 #if DEBUG
02315     fprintf (stderr, "window_save: end\n");
02316 #endif
02317     return 1;
02318 }
02319
02320 // Closing and freeing memory
02321 gtk_widget_destroy (GTK_WIDGET (dlg));
02322 #if DEBUG
02323 fprintf (stderr, "window_save: end\n");
02324 #endif
02325 return 0;
02326 }

```

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 2795 of file `calibrator.c`.

```

02796 {
02797     unsigned int i, j;
02798     char *buffer;
02799     GFile *file1, *file2;
02800     #if DEBUG
02801     fprintf (stderr, "window_template_experiment: start\n");
02802     #endif
02803     i = (size_t) data;
02804     j = gtk_combo_box_get_active (GTK_COMBO_BOX (window->combo_experiment));
02805     file1
02806         = gtk_file_chooser_get_file (GTK_FILE_CHOOSER (window->button_template[i]));
02807     file2 = g_file_new_for_path (input->directory);
02808     buffer = g_file_get_relative_path (file2, file1);
02809     input->template[i][j] = (char *) xmlStrdup ((xmlChar *) buffer);
02810     g_free (buffer);
02811     g_object_unref (file2);
02812     g_object_unref (file1);
02813     #if DEBUG
02814     fprintf (stderr, "window_template_experiment: end\n");
02815     #endif
02816 }
```

## 5.8 interface.h

```

00001 /*
00002 Calibrator: a software to make calibrations of empirical parameters.
00003
00004 AUTHORS: Javier Burquete and Borja Latorre.
00005
00006 Copyright 2012-2015, AUTHORS.
00007
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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
00043 #define MAX_LENGTH (DEFAULT_PRECISION + 8)
00044
00049 typedef struct
00050 {
00059     char *name, *template[MAX_NINPUTS];
00060     double weight;
00061 } Experiment;
00062
00067 typedef struct
00068 {
00087     char *label;
00088     double rangemin, rangemax, rangeminabs, rangemaxabs;
00089     unsigned int precision, nsweeps, nbits;
00090 } Variable;
00091
00096 typedef struct
00097 {
00108     GtkLabel *label_processors;
00109     GtkSpinButton *spin_processors;
00110     GtkGrid *grid;
```

```

00111  GtkWidget *dialog;
00112 } Options;
00113
00118 typedef struct
00119 {
00126  GtkWidget *label;
00127  GtkWidget *dialog;
00128 } Running;
00129
00134 typedef struct
00135 {
00304  GtkToolButton *button_open, *button_save, *button_run, *button_options,
00305  *button_help, *button_about, *button_exit;
00306  GtkButton *button_add_variable, *button_remove_variable,
00307  *button_add_experiment, *button_remove_experiment;
00308  GtkRadioButton *button_algorithm[NALGORITHMS];
00309  GtkCheckButton *check_evaluator, *check_minabs, *check_maxabs,
00310  *check_template[MAX_NINPUTS];
00311  GtkWidget *label_simulator, *label_simulations, *label_iterations,
00312  *label_tolerance, *label_bests, *label_population, *label_generations,
00313  *label_mutation, *label_reproduction, *label_adaptation, *label_variable,
00314  *label_min, *label_max, *label_precision, *label_sweeps, *label_bits,
00315  *label_experiment, *label_weight;
00316  GtkEntry *entry_variable;
00317  GtkComboBoxText *combo_variable, *combo_experiment;
00318  GtkFileChooserButton *button_simulator, *button_evaluator, *button_experiment,
00319  *button_template[MAX_NINPUTS];
00320  GtkSpinButton *spin_min, *spin_max, *spin_minabs, *spin_maxabs,
00321  *spin_simulations, *spin_iterations, *spin_tolerance, *spin_bests,
00322  *spin_population, *spin_generations, *spin_mutation, *spin_reproduction,
00323  *spin_adaptation, *spin_precision, *spin_sweeps, *spin_bits, *spin_weight;
00324  GtkToolbar *bar_buttons;
00325  GtkGrid *grid, *grid_algorithm, *grid_variable, *grid_experiment;
00326  GtkFrame *frame_algorithm, *frame_variable, *frame_experiment;
00327  GdkPixbuf *logo;
00328  GtkScrolledWindow *scrolled_min, *scrolled_max, *scrolled_minabs,
00329  *scrolled_maxabs;
00330  GtkWidget *window;
00331  GtkApplication *application;
00332  Experiment *experiment;
00333  Variable *variable;
00334  gulong id_experiment, id_experiment_name, id_variable, id_variable_label,
00335  id_template[MAX_NINPUTS], id_input[MAX_NINPUTS];
00336  unsigned int nexperiments, nvariables;
00337 } Window;
00338
00339 // Public functions
00340 void input_save (char *filename);
00341 void options_new ();
00342 void running_new ();
00343 int window_save ();
00344 void window_run ();
00345 void window_help ();
00346 int window_get_algorithm ();
00347 void window_update ();
00348 void window_set_algorithm ();
00349 void window_set_experiment ();
00350 void window_remove_experiment ();
00351 void window_add_experiment ();
00352 void window_name_experiment ();
00353 void window_weight_experiment ();
00354 void window_inputs_experiment ();
00355 void window_template_experiment (void *data);
00356 void window_set_variable ();
00357 void window_remove_variable ();
00358 void window_add_variable ();
00359 void window_label_variable ();
00360 void window_precision_variable ();
00361 void window_rangemin_variable ();
00362 void window_rangemax_variable ();
00363 void window_rangeminabs_variable ();
00364 void window_rangemaxabs_variable ();
00365 void window_update_variable ();
00366 int window_read (char *filename);
00367 void window_open ();
00368 void window_new ();
00369 int cores_number ();
00370
00371 #endif

```

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