

SocLab Tutorial

Getting started

SocLab is a pure Java application under GPL licence.

Requirements

SocLab needs a Java Virtual Machine (jvm) to be launched. Latest version of Sun JVM can be found [here](#). 1Gb of RAM is the minimum to run SocLab properly.

Installation & Start up

1. Get the last version of SocLab [here](#).
2. Extract the zipped archive into the folder of your choice.
3. Once in the SocLab folder, run the script according to your operating system to launch SocLab:
 1. for MS windows users, run the script_soclab_windows.bat batch file
 2. for Mac or *nix users, run the script_soclab_linux_Mac.sh file.
4. That's pretty much it !

Files format and extensions

SocLab Models are denoted with the .org file extension.
Simulation results are written in .xls files (MS Excel format).
Synthesis files are text files (.txt).
Screen Captures are PNG format pictures (.png).
Reports are rich text format (.rtf) files.

Tips

Create a folder for each model so that results, reports and other SocLab outputs won't mess with the others.

Increase or decrease the amount of memory allocated to SocLab by editing the script files:

```
java -Xms1024m -Xmx1024m [.....]
```

replace both -Xms and -Xmx arguments by the amount of memory (in Mb) you want to allow.

Creating and Editing an organization model

Creation & Edition

Model Panel

[Parameters Panel](#)
[Parameters Sub-Panels](#)

Creation & Edition

The File menu allows to classically create a new model, save it, open some previous models.

Once saved, the model appears as a .org file.

The Organization Model menu gathers the Model Editor, the Structural Analysis module, and the State Analysis module.

The Model Editor is where the structure of the organization is created/modified. Notice that the edition or modification of a model is not possible as long as any other module is opened at the same time.

A model is created following this meta-model:



For further description of this meta-model elements, see [this page](#).

This module features three panels:

- The Model panel, where you create, rename or delete some **Actors** and **Relations**.
- The Parameters panel, where you define **controls**, **stakes**, **effects**, **solidarities** and **constraints**.
- The Description panel, where you can write a description of the model file, stating background and hypothesis elements to clarify the model.

Model Panel

Actors and Relations are created by writing their names in the corresponding fields and by clicking the add Actor or the add Relation button, or pressing the [Enter] key.

A description can be written for each Actor and/or Relation by clicking on the description button. During the description of a Relation (Edition → Qualitative scale of state), some interpretations can be associated to state values intervals, who will be used in the State Analysis module.

Parameters Panel

For each of the Parameters sub-panels the following buttons are available:

Edit : This button lock or unlock the edition of Controls, Stakes, Solidarities, Fuzzy stakes and Fuzzy Solidarities. Once unlocked, the button turns green and modification of parameters is possible.

Apply : validates the model edition and updates the current model (N.B. it does not save these modifications into the .org file !).

Close : (obviously) closes the Model Editor module.

Description : allows to write a specific description for each Parameters sub-panel (controls, stakes, effects and so on...).

Save report : generates a .rtf file containing all the model's elements and parameters with the corresponding descriptions.

Parameters sub-panels

Controls : where you define for each Relation:

- the upper and lower bounds (b_min and b_max) of each relation state space.
- the Actor that controls each Relation.
- the Frequency , i.e. the probability for a relation state to be modified during a simulation step.

Stakes : This panel allows to define the stakes of an Actor on every Relation he depends on. The stakes of an Actor should sum up to 10.

Effects : This panel allows to define the effect functions and their parameters, for every Relation an Actor depends on. Several classes of function are available e.g. Linear, Quadratic and Sigmoid. See [TODO LINK] for further details about effect functions.

Constraint : Constraints functions define how the state of a Relation R1 (the constraining relation) can restrict the state space of another Relation R2 (the constrained Relation). These functions associate the b_min and b_max values of R2 (on y-axis) to the state of R1 (on x-axis).

Solidarities : This panel allows to define the solidarity an Actor A1 (in row) put on the others (in columns).

Fuzzy Stakes, Fuzzy Solidarities : Instead of constant values, stakes and solidarities can be defined as fuzzy variables, whose values will randomly vary within an interval during a simulation. These intervals are defined in these panels.

Simulations

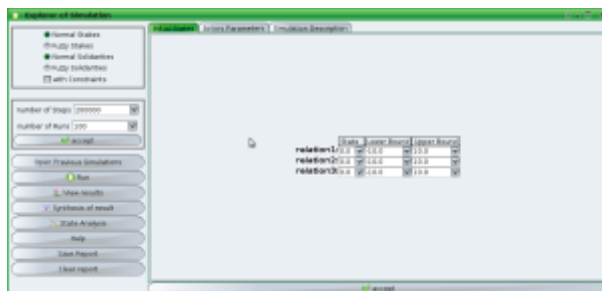
The Simulation module of SocLab (in Simulations → Simulation Explorer) allows to simulate the way social actors could regularize their behaviors. This page focuses on the usage of this module to run some simulation experiments and handle their results.

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Launching simulations

That is how the simulation module looks like:



SocLab's Simulation module (click to enlarge)

The left panel is divided in three parts.

The upper zone allows to select whether the simulations will use fuzzy or normal stakes and/or solidarities. The constraints functions (if any) can be applied to the simulation experiment.

The middle zone is where the length of a simulation. is defined. A simulation experiment consists in several runs (defined in number of Runs) , each run lasting up to a certain number of steps. If a stationary state is reached in a smaller number of steps, the run ends, otherwise the run last until the number of steps is reached. These values are validated by the Accept button.

The lower zone is made of several buttons:

- Open previous simulations : restore previous simulation results and parameters by opening any previous simulations folder.

- **Run** : Run a simulation with the last accepted parameters. Prompt the user to define a folder where the results will be written (model's folder by default).
- **View Results** : see the [Results visualization section](#)
- **Synthesis** of results: produce basics statistics (mean and standard deviation) on simulation results (Actors' satisfactions and Relations States)
- **State Analysis**: invoke the State analysis module (see the [TODO LINK] page), adding the mean convergence state to the Significant states list.
- **Help**: invoke a small manual of the Simulation Module
- **Save/Clear Report**: allows to export some of the results in a .rtf file. File name follows the pattern <model_name><date><time>Synthesis.rtf

The right panel is divided in three tabs. The Initial States tab purpose is to define the initial Relations' states values (almost deprecated feature). The Actors Parameters tab allows to define psycho-cognitive traits for each Actor (see the next section). The Description tab allows to write some remarks and further information about a simulation experiment.

Actors Parameters

In the Actors Parameters tab, Actors rationality can be customized with various parameters.

These parameters affect the rationality algorithm described here [TODO LINK]

- **Distance min/max satisfaction** : the Euclidean distance between the minimal and maximal satisfaction of the actor.
- **Scope** : reflects the Actor's ability to discriminate situations, therefore his ability to select the applicable rules of his base in the current situation. With a Scope of 1, rules are always applicable, with a Scope of 3, situations are discriminated into bad ones, average ones and good ones.
- **Tenacity** : reflects the Actor's relentlessness. The higher his tenacity, the more he will explore, to the detriment of the exploitation. High tenacity values increase simulations length.
- **Reactivity** : reflects how quickly an Actor updates his ambition and his exploration rate, according to the satisfaction he receives in the current situation. Small values increase the length of simulation.
- **Repartition of reward** : repartition of the reward between the last applied rule and the penultimate applied rule.
- **Types of rules**:
 - **Simple** : Rules are reinforced with a fixed **reward**, independently of the satisfaction gain (or loss) their application produced. This reward is added (or deducted) to the rule *strength* until a certain threshold. Rules are progressively removed from the rule base with an **oblivion** factor.
 - **Self learning** : Rules are reinforced with a reward which is proportional to the satisfaction gain (or loss) their application produce. This reinforcement follows the formula

$$strength \leftarrow al * strength + (1 - al) * reward,$$
 where $al \in [0; 1]$ progressively increase, following the exploitation rate.
- **Oblivion** : only used with simple rules.
- **Reward** : only used with simple rules.

- **Action range** : reflects the importance of an Actor's actions (i.e. the magnitude of state modification he performs on relation he controls). The more the action range, the more energetic the exploration.

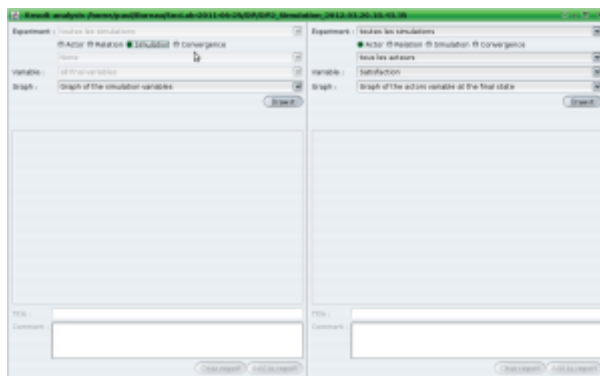


Don't forget to click the Accept button to take these values into account during the simulation experiment

Results Visualization

When you open previous simulation results, or once a simulation experiment is over, the visualization module (triggered by a click on the View Results button).

This what the results viewing GUI looks like:



Results visualization interface (click to enlarge)

Different results can be displayed on each side of this frame. Several options are available, chosen by the radio buttons at the top of each side. For each option, several type of results can be displayed. Once option and type are selected, results are displayed by a click on the Draw it ! button

- Option **Simulation** : display of simulation runs' length as a bar plot (mean value and standard deviation). In case of non converging simulation runs, length can be displayed for only converging runs.
- Option **Convergence** : display of converging and non-converging runs proportion as a pie chart.
- Option **Actor** : various results can be shown, according to the value of the Experiment and Variable fields
 - **Experiment**: either all the simulation runs or a particular run. If all the runs are selected, results will be displayed for an actor. If a particular run is selected, results will be displayed for all the actors.
 - **Variable** : either an histogram of mean satisfaction values and deviations (if all the runs are selected in the Experiment field) or a curve (for a particular run). For curves, x-axis is the number of simulation steps and y-axis show the Satisfaction or Satisfaction Threshold value. Black circled cross indicates the end of a run. Putting the mouse anywhere over a curve will display the corresponding Actor. Solid red curve indicates the mean values of all the curves.

- Option **Relation** behave as the Actor option, except that state values are displayed instead of Satisfaction values.

Every graph drawn can be added to a report, using the Add/Clear Report button.

N.B. Opening previous simulations may cause SocLab to crash (exceptions displayed in your console/shell). Turn SocLab off and on again ;-).

Results Synthesis

Be sure to perform a visualization of results (just launching the module without displaying anything is sufficient) before clicking on the Synthesis of Results button.

Synthesis of Results produce a summary of an experiment, recapitulating the number of runs, the number of steps, the Actors' parameters and the mean and standard deviation of Relations states and Actors satisfactions.

Sensitivity Analysis

The Sensitivity Analysis module of SocLab allows to perform sensitivity analysis about one or several organization's structural parameters or Actors' psycho-cognitive parameters. This page focuses on the usage of this module.

Preliminary clarifications

Sensitivity analysis is about to make some of the parameters vary from a experiment to another, in order to cease its influence on the results. A **sensitivity analysis** (or **Experience** in SocLab GUI) is a replication of **simulation experiments**.

A simulation experiment consists in several **runs** , each one lasting up to a certain number of steps. From a simulation experiment to another, some parameters whose influence is under study vary. They're called **Experiences Parameters** in SocLab GUI.

Launching Sensitivity Analysis

This module is launched via the Sensitivity → Sensitivity Explorer menu. Sensitivity Analysis module's aspect is very similar to the Simulation module. See the [Simulations section](#) for the description of the elements they share. The main difference between a sensitivity analysis experiment and a simulation experiment are:

- **Number of Experiences** : The number of simulation experiments (i.e. a certain number runs, each one lasting a certain number of steps) to be performed. Between two simulation experiments, the selected parameters vary within in the intervals defined in the parameters tabs (see next section).
- **Run** : initiate the sensitivity analysis. Results are stored in a specific folder called Sensitivity , whose path can be chosen.
- To open previous sensitivity analysis results, look for the file named as <model_name>_SensitivityInitialParameters.xls in the Sensitivity folder.

Selecting Experience's parameters

The Experience's Parameters tab is where the parameters who will vary between each simulation experiment are selected.



Parameters selection (click to enlarge)

There are three categories of parameters to be selected:

- **Simu Parameters** are the psycho-cognitive parameters of Actors rationality (see [Simulations](#) section). Parameters variation can be applied for every Actor (the whole item), or each Actor separately.
- theStakes that each actor (selected in Actors cell) put on each relation (selected in Relations cell).
- the **Solidarities** of an actor (selected in the Actors cell) towards another (selected in the Solidarities cell).

Parameters whose sensitivity are to be studied are added or removed to the right panel list using right and left arrows buttons. For each parameters added to the list, the bounds of its interval within which it varies can be defined. First simulation experiment begin with the minimum value, second with the maximum value and the others with random values within the interval.



Don't forget to click the accept button before you run the sensitivity analysis, to validate the list of varying parameters.

Viewing Results

- Option **Actor** : graphs show variation of average Satisfaction obtained during simulation experiments (on y-axis) according to one of the following, on x-axis : selected varying parameters value OR the average number of steps.
- Option **Relation** behaves likewise, with relations states values instead of Satisfactions.

N.B. To retrieve the details of a specific run, launch the Simulation module and browse the Sensitivity folder. All the simulation experiments folders are stored in this folder. By opening the <model_name>SimulationInitialParameteres.xls file, you'll be able to retrieve the precise parametrization of a given experiment and plot the simulation results as usual.

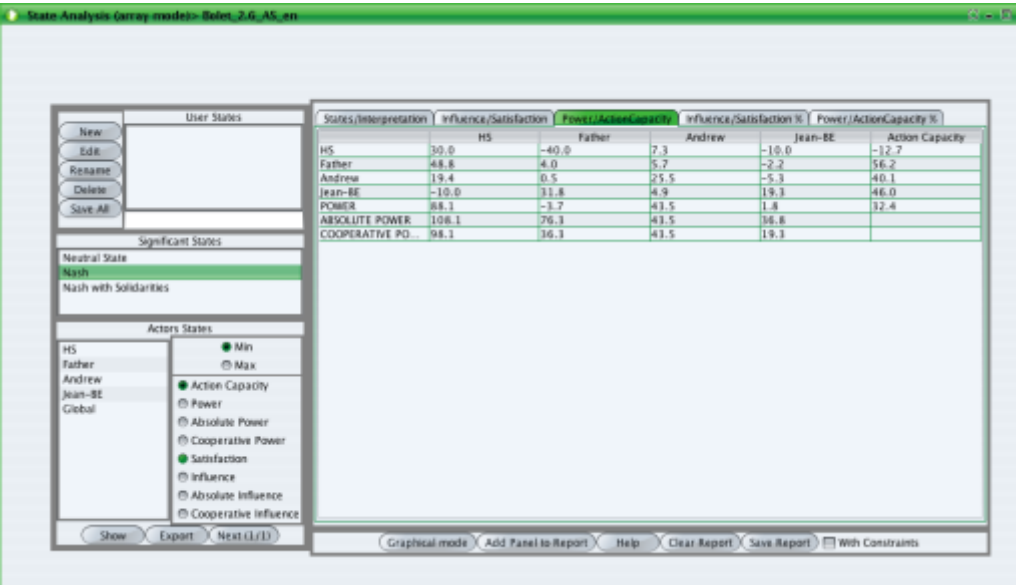
State Analysis

State Analysis module describes some particular states of the organization by computing the corresponding **Satisfaction/Action Capacity** and **Power/Influence** values for the Actors. See the [TODO LINK] page for a description of these measures.

Contents:

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State Analysis module is launched by selecting the Organization Model → State Analysis menu. This is what it looks like when it pops up :



State Analysis module (click to enlarge)

The module interface frame is divided in two zones. Left zone deals with selecting and manipulating states, right zone shows the measures corresponding to the selected state, as tables or histograms.

Selecting and Manipulating States

User states cell

The upper cell allows to define manually some organization states, by entering state values in the State/Interpretation tab of the right zone of the frame.
New : creates a new user state, whose name is entered in the lower text field.
Edit : allows to edit the selected user state. In Table Mode, Relations states values are entered in the table of the State/Interpretation tab (hit the [Enter] key to validate a value). In Graphical Mode, Relations states are defined by moving sliders.
Save : save state values and exits the state edition mode.
Save all : save all the user states. Every user state will be lost if the State Analysis module is closed without saving.

Significant States cell and Actors States cell

These cells allow to select some pre-computed significant states of an organization. Significant states cell show two Nash equilibrium states, and possibly the mean convergence state, if State analysis module is triggered from the Simulation module. Actors States allows to select with radio buttons the state(s) that maximizes or minimizes some measures, for an Actor or the whole organization (Global).

Show : displays the selected state and associated measures in the right zone tabs.

Export : send a copy of the selected significant state to the user states lists.

Next (1/n) : If several states match the criteria of “significance”, this button display the next matching state.

For any state, details can be viewed in two modes: Table Mode (default) and Graphical Mode.

Table Mode Display

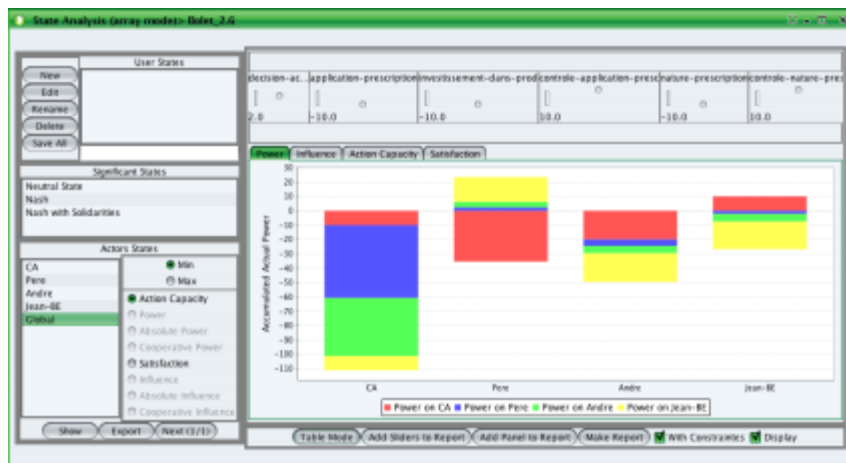
By default, State Analysis displays the details of a particular state as five tables, each one being framed in a tab of the right zone. These tabs are:

- **State/Interpretation** tab : displays each Relation state value, and the associated interpretation (defined in Model Editor module).
- **Influence/Satisfaction** tab : displays a table showing the contributions the Actors, one to another. A row of this table shows the satisfaction of an actor with the detail, by column, of each actor’s contribution ; the last cell of a row being the satisfaction itself.
INFLUENCE row : the sum of an Actor’s contributions to the others.
ABSOLUTE INFLUENCE row : the sum of an Actor contributions’ absolute values.
COOPERATIVE INFLUENCE : the sum of positives contributions only.
At the intersection of satisfaction column and influence row is the average of Actors’ satisfactions (which is also the average of Actors’ influences).
- **Power/ActionCapacity** tab is the the same as the Influence/Satisfaction tab, but without taking solidarities into account, i.e. Action Capacity instead of Satisfaction, and Power instead of Influence.
- **Influence/Satisfaction%** and **Power/ActionCapacity%** are similar to the two previous tabs, but each value is expressed as a percentage of its interval: 100% is the maximum value, 0% the minimum value and 50% is $\frac{\text{max} - \text{min}}{2}$.

Any table can be added to a report, using the Add panel to Report button. Constraints are taken into account by clicking the With Constraints tick-box in the lower right corner.

Graphical Mode Display

State analysis module also comes with a graphical visualization of the values displayed in the Table mode. This visualization is triggered by the Graphical Mode button



Graphical mode of State Analysis module (click to enlarge)

Satisfaction, Action Capacity, Power and Influence appear as colored histograms, each Actor's contribution being drawn with its own color. Relations state values appear as sliders, on the top of histograms. Visualization or Sliders values can be added to a report using the appropriate Add [...] to Report button. Notice that when editing one of the users states, you can modify Relations states values using the sliders. The Display tick-box triggers the update of the histograms when the sliders are moved.