Tutorial - BioBricks model generator for electronic simulator.

- Requirements

First you need to download the software at these following URLs:

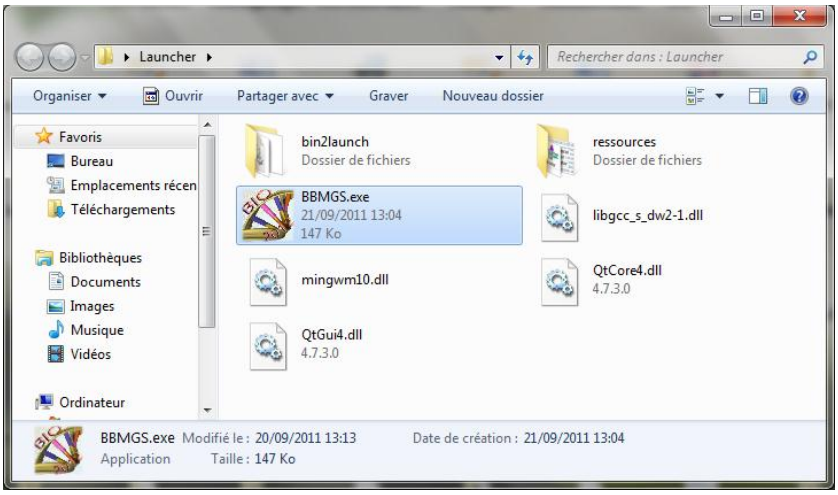
Main repository: https://github.com/igemsoftware/ENSPS-Strasbourg_2011

Mirror: https://github.com/Dadomba/IGEM_2011_ENSPS_Final_Folder

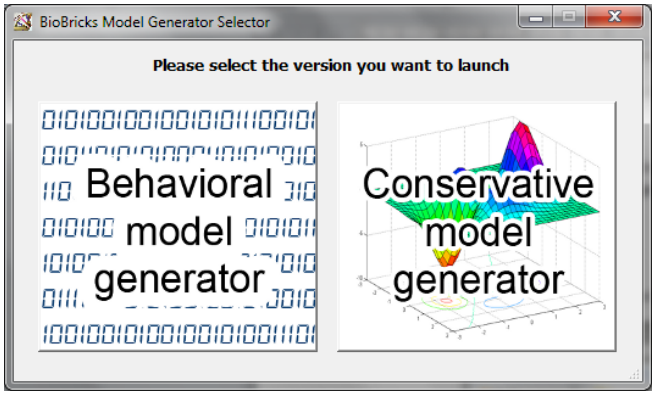
For the simulation part, you need Dolphin Smash, mixed-signal multi-level and multi-domain simulation software to use the model files generated by the BioBricks model generator. You can found it at: http://www.dolphin.fr/medal/smash/smash_overview.php.

- Launcher

After downloading the software, go to Launcher folder and double-click on “BBMGS.exe”

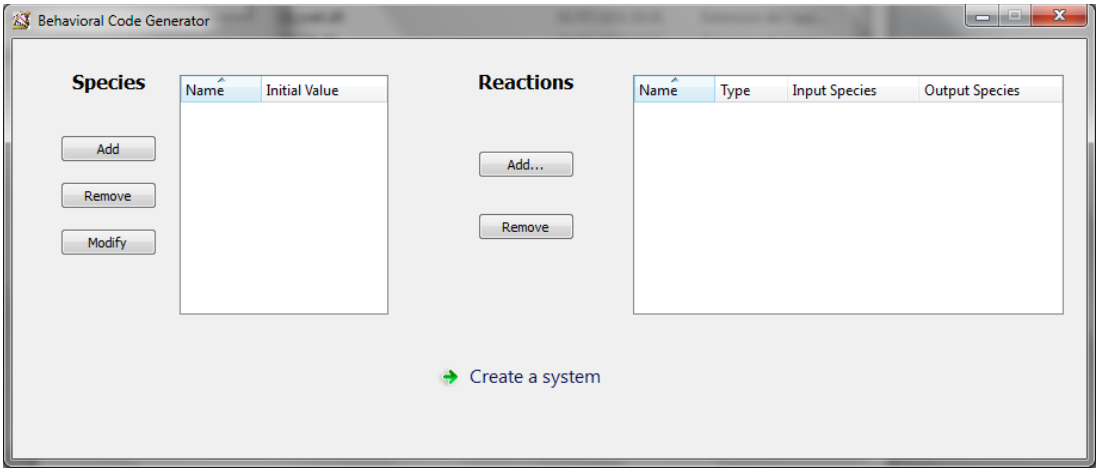


Then the launcher opens. You have two choices: “Behavioral model generator” or “Conservative model generator”.



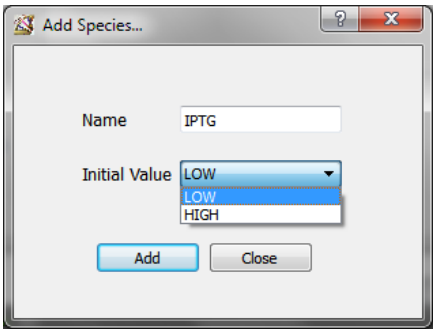
- Behavioral model generator

After clicking on “Behavioral model generator” from the launcher, it opens the main window for this generator.



On the left panel, you can “Add”, “Remove” or “Modify” a species from the available species list.

“Add” button opens the species window, where you can choose the name of the species you want to add and the initial value (absent: LOW, present: HIGH)

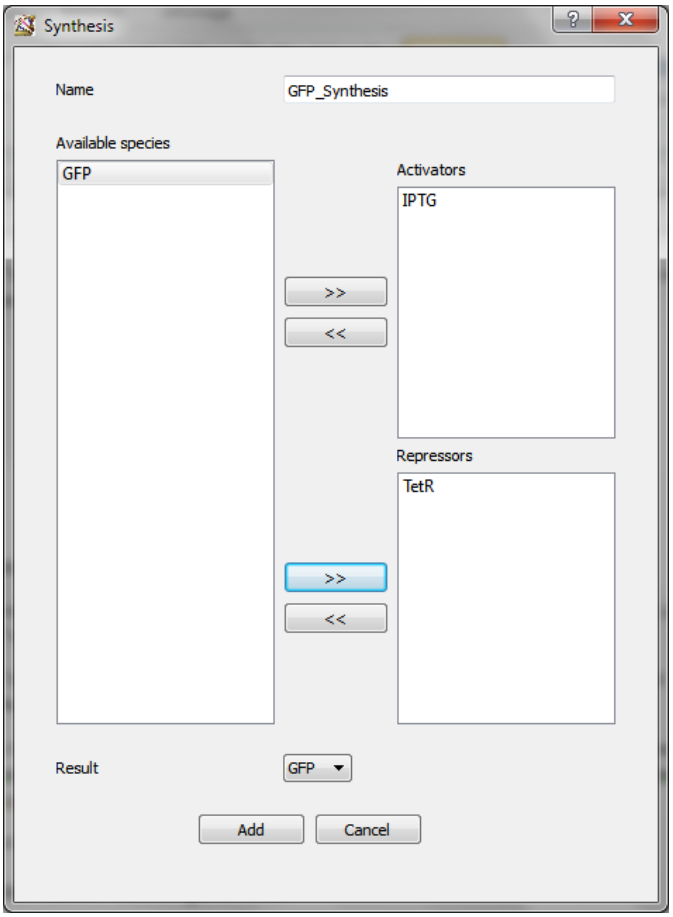


“Modify” button allows to change the initial value of the selected species.

When all the species you want to use are added, you can go to the right panel. On this panel, you can “Add” or “Remove” a reaction.

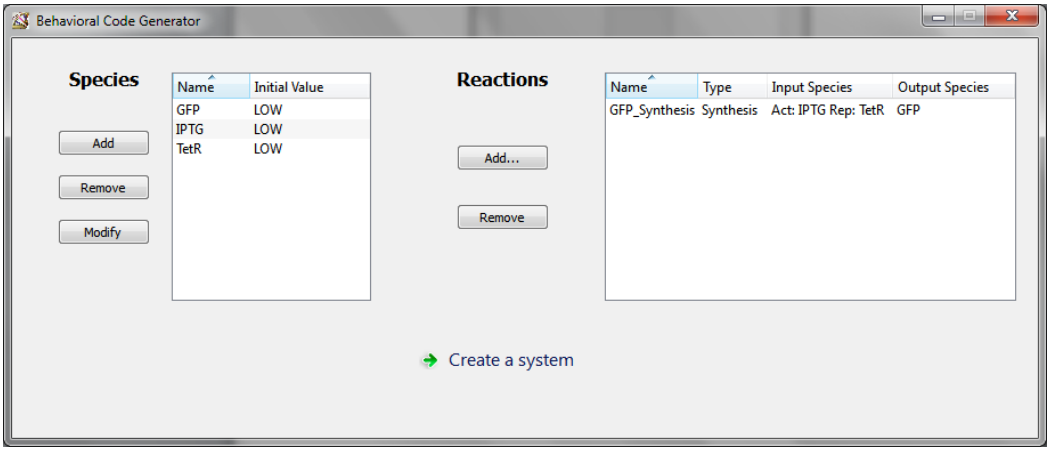
“Add” button opens a selection window to choose between “Inhibition”, “Complexation” and “Synthesis” mechanisms.

In this tutorial, we will see the example of GFP synthesis with IPTG as activator and TetR as repressor. To create this mechanism, first you can select a species and then click on the “>>” or “<<” button to move it in the desired box. You obtain the following configuration. To validate, click on “Add”.

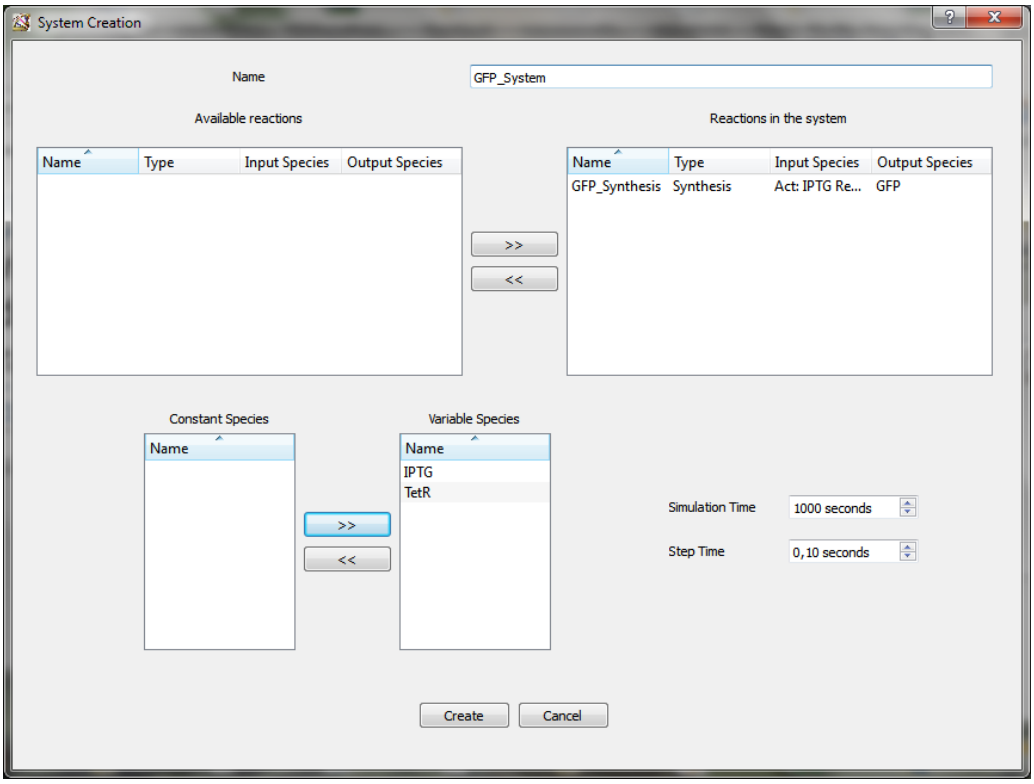


This principle is the same for other mechanisms.

You obtain the following main window, where the reaction was added into reaction panel.



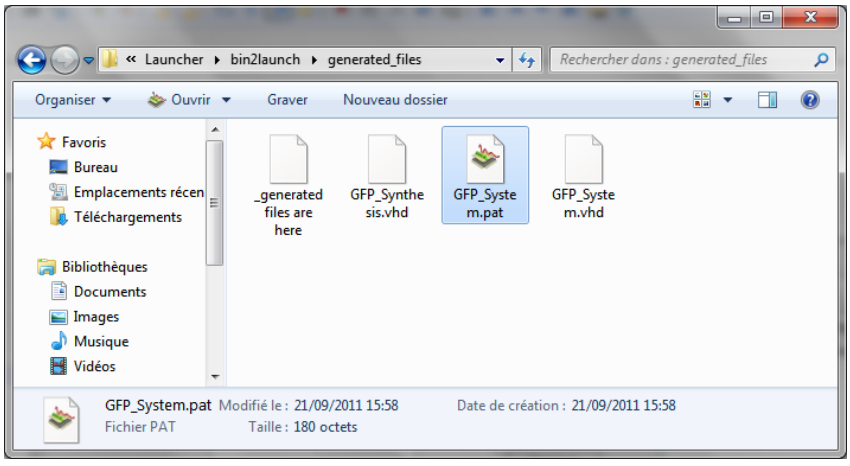
Then the last thing to do is to click on “Create a system”. This opens the “System creation” window.



After putting the reactions you want into reactions in the system panel, input species will automatically appear in the constant species panel. You can choose if you want that they will stay constant or become variable species. Finally you select the simulation and the step time and you click on “Create”.

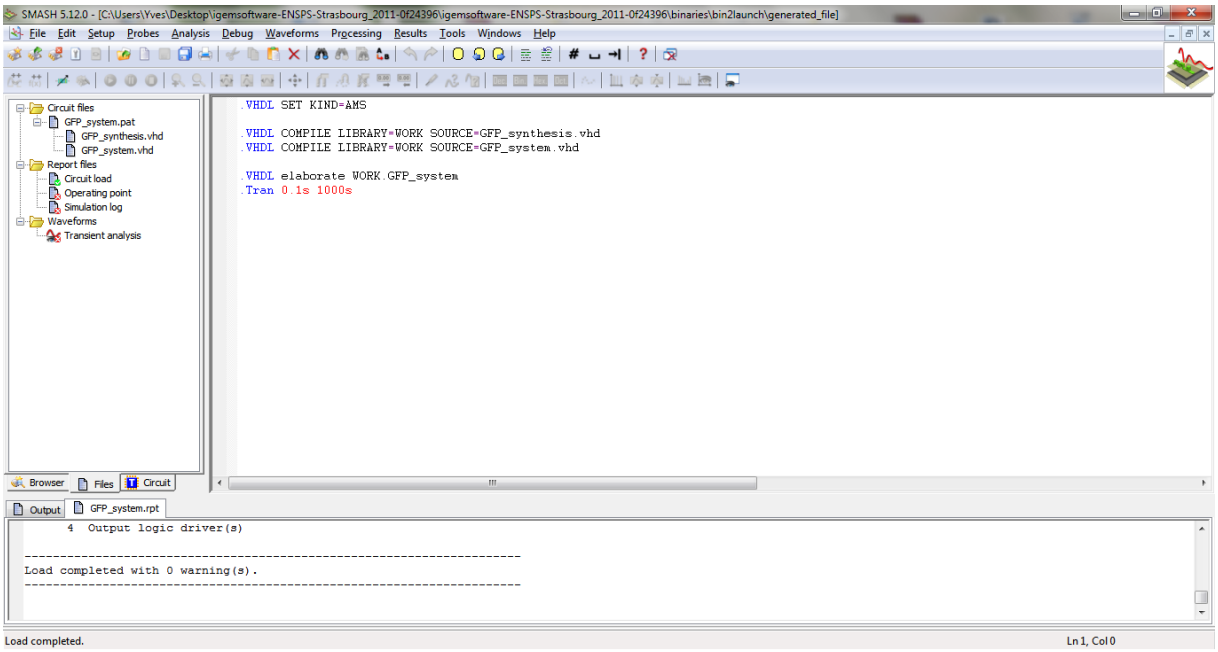
- Files obtained

The models and simulation files were now generated in the sub-folder “bin2launch/generated_files”.

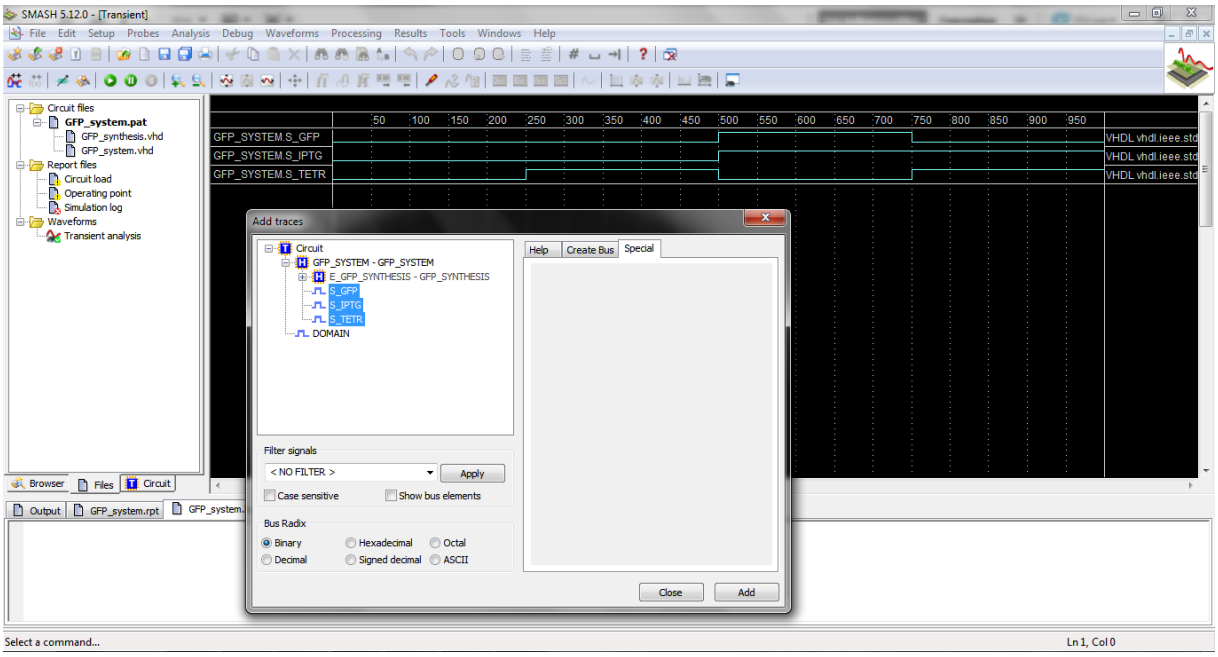


- Simulations

To launch Smash, you can double-click on the file “*.pat” in the generated files folder. You obtain the following window.



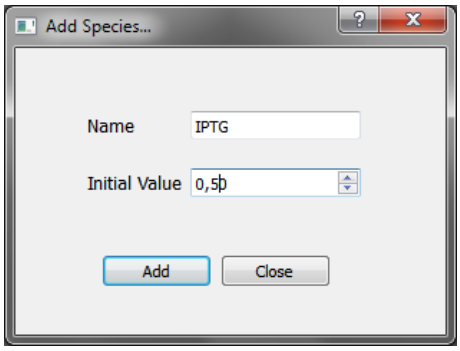
To launch the simulation, you just have to tap the “ctrl+T” keyboard shortcut. You obtain the following window, in which you can select the species you want to see, and click on “Add” button to see them in the scope.



- Conservative model generator

The conservative model generator works in the same way as behavioral model generator. But some differences are listed below:

The initial value of a species is now a real number and is a concentration.



The “Inhibition” mechanism has disappeared from the suggested mechanisms list because it is not useful in conservative model and can be simulated with a complexation mechanism.

Finally the main modification is the adding of BioBricks parameters in the mechanism window.