

Documentation

SESEcPy - SES Experiment Control Python

Experiment Control as Part of the Extended SES/MB Infrastructure

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1 Introduction and Description of SESEcPy

This is the Experiment Control (EC) SESEcPy as part of the System Entity Structure (SES)/Model Base (MB) infrastructure introduced in the documentation of the SES modeling tool SESToPy. It provides scripts for the procedure of automatic simulation experiment control. For information on the SES and its extensions to the extended SES/MB (eSES/MB) infrastructure please read the documentation of SESToPy and how to connect the SES to an MB please read the documentation of SESMoPy. This software was written in the Research Group Computational Engineering und Automation (CEA) at the University of Applied Sciences Wismar.

It is written in Python 3.4.1, but as of August 2018 it runs in current Python versions as well. Currently there are no more modules needed than given in the Python Standard Library.

As shown in detail in the documentation of SESToPy the SES can be connected to an MB for generating models. It was extended to allow automatic model generation and execution of models. The process is depicted in Figure 1.1.

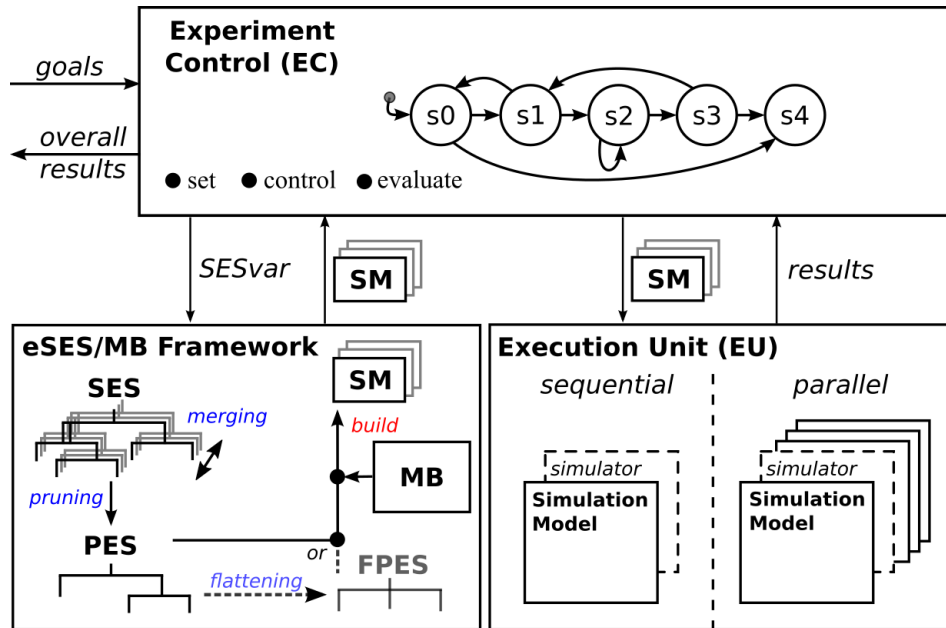


Figure 1.1: Extended SES/MB-based infrastructure.

This software controls the specification of simulation experiments, automatic experiment execution, and the evaluation of simulation results. The part of the eSES/MB infrastructure as well as the interfaces needed are shown in Figure 1.2 for clarification.

A detailed explanation on the Python-based software structure supporting the eSES/MB infrastructure is given in the documentation of SESToPy.

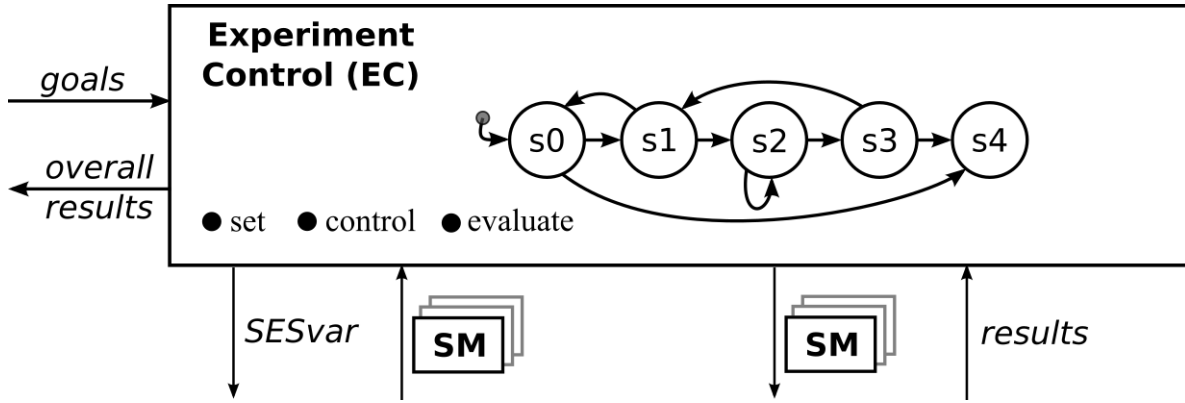


Figure 1.2: Part of the eSES/MB infrastructure supported by SESEcPy.

SESEcPy has no graphical user interface.

SESEcPy has three scripts: a main script, a script to control the general process, and a script defining the experiment. In the main script functions of the two other scripts are called in a loop until the experiment goals are reached.

Experiment specific parts are defined in two functions in the experiment specific script. The function *initialSettings* sets the initial settings of the experiment like the initial values for the SES variable (SESvar) or the starttime and stoptime for the simulator. Furthermore the path to the SES derived as Flattened Pruned Entity Structure (FPES) is defined here. The script describing the general process calls the methods pruning and flattening of SESToPy before the build method of SESMoPy is called and the model is executed with the tool SESEuPy which returns simulation results. The second function of the script defining the experiment *nextState* calculates based on the simulation results returned by SESEuPy how to set the SESvars next and whether the experiment goals are met. So this allows a reactive control of an experiment. Examples make that process clear.

2 Example

In the documentation of SESToPy an example describing a feedback control system with optional feedforward control is introduced thoroughly. This example shall clarify the usage of the eSES/MB infrastructure.

The experiment is defined in the experiment specific part of SESEcPy. Some values and the initial setting of the SESvars is set.

Furthermore the calculation of the next SESvar settings based on the results of the simulation run before is defined.

When the experiment goals are met, the overall results are returned.

This is given in the sourcecode of SESEcPy and shall not be discussed further.

3 Related Work

Related work with contributions to the development of the SES/MB framework is given in the documentation of SESToPy. Some related work regarding model building in connection with the SES is given in the documentation of SESMoPy.

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Acronyms

CEA Computational Engineering und Automation.

EC Experiment Control.

eSES/MB extended SES/MB.

FPES Flattened Pruned Entity Structure.

MB Model Base.

SES System Entity Structure.

SESvar SES variable.