Parameter sweeps supervisor

Henry Gras, 2020-02-20 17:21:00

1 Introduction

Parameter sweeps supervisor is used to coordinate several parameter variations together. The different parameter variations set by the Parameter sweep devices or using the Set device parameter variation option of the Parametric tab are automatically started one after the other, encapsulated or in pair in order to obtain combinations of parameter variations.

Several types of parameter variation are available:

- Step-by-Step
- Bisection
- Pre-defined
- Statistical (Uniform, Gaussian, triangular, Exponential, Weibull, Gamma)

Bisection type of variation should never encapsulate other parameter variations. For example, in Figure 1, only KA_variation can be Bisection variation type.

An unlimited number of encapsulation can be built and several encapsulations can be made in series.

When variations are paired, the parameters of each variation vary together before each simulation. Paired variations must have the same number of runs.

When the simulations are completed, a report named named *designName*_+*supervisorName*_ parameter_values.csv is generated. This report sum up the parameter values for each run.

When the process is launched, it can be aborted by pressing the Abort button of the Parametric Study Termination Manager window (see Figure 2) which opens on parameter sweep study startup. This window is automatically closed when the parametric study is completed.

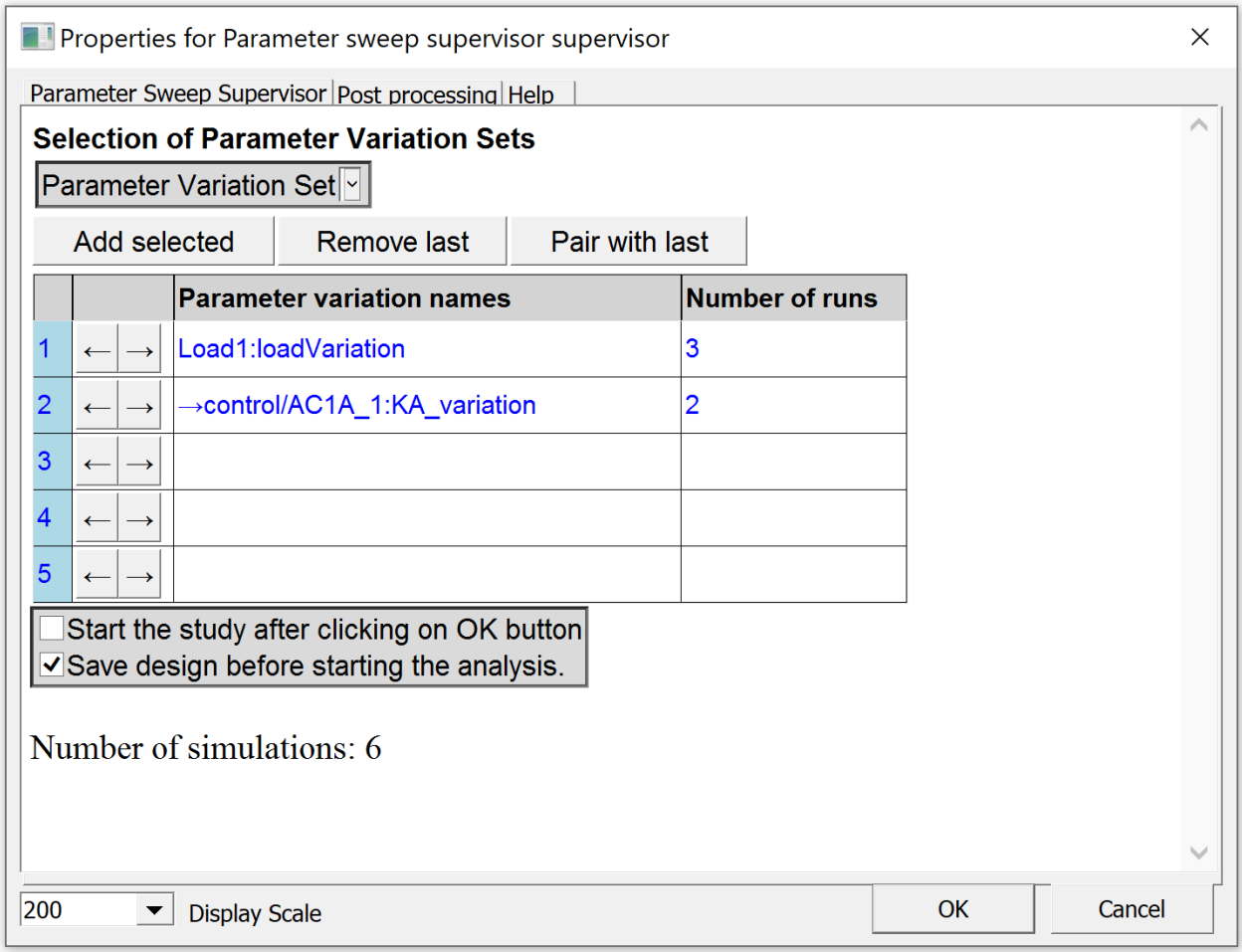

Figure 1: multi-parameter sweeps tree.

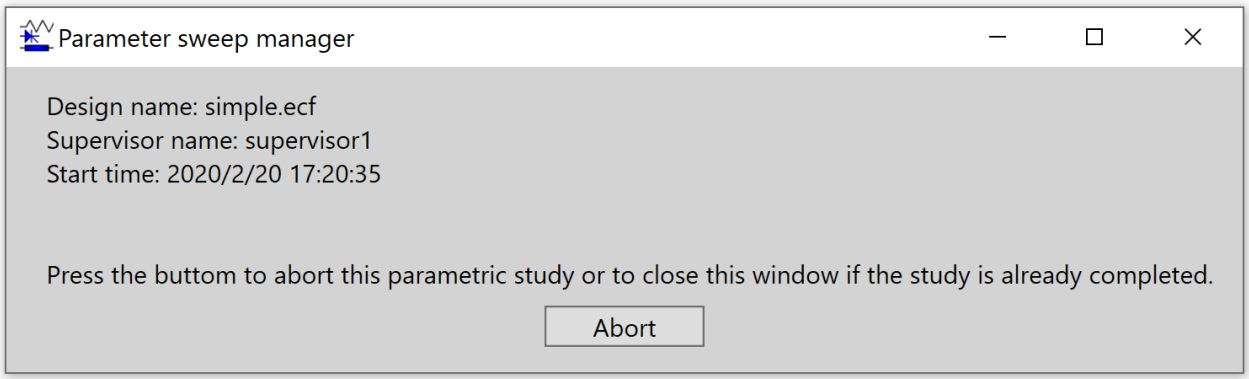

Figure 2: Parametric study termination manager window

2 Example

Encapsulation

In the example described in Figure 3, two Parameter variations are set. The first one is loadVariation. It changes the load value. The second one is KA_variation. It changes the KA gain of the exciter inside the 'control' subcircuit.

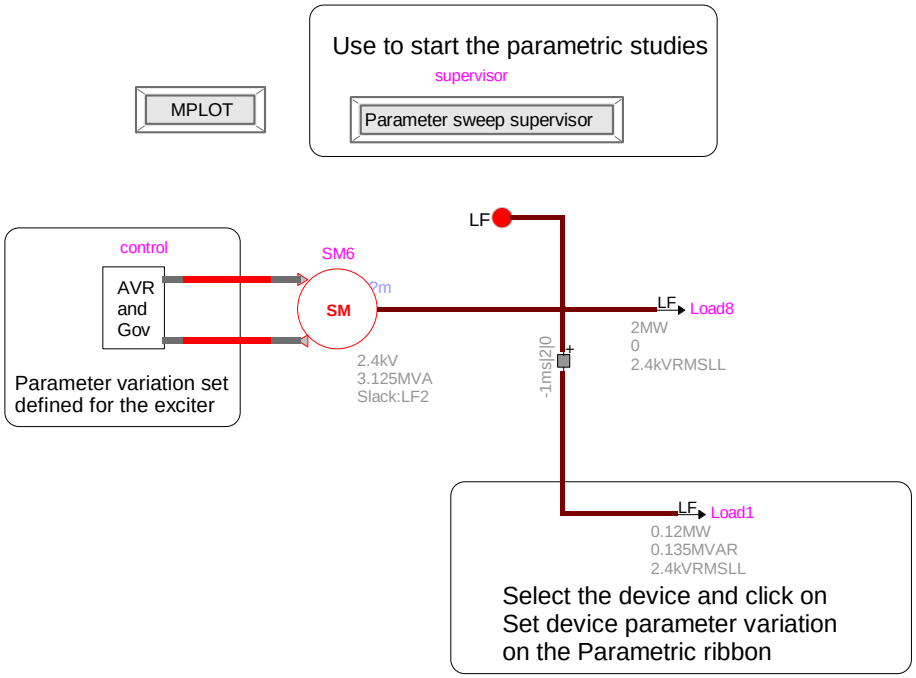

Figure 3: Example of parameter sweeps supervisor usage

Using a parameter sweeps supervisor, these two variations can be made in series (Figure 3) in which case, the full variation of the load parameter is performed, then the circuit is re-initialized to the base case. The base case is the simulation which is performed when the simulation is stared using the Run button of the Simulate tab.
The KA variation is then performed starting from the base case.
The total number of simulations is the sum of the simulations number of each variation.

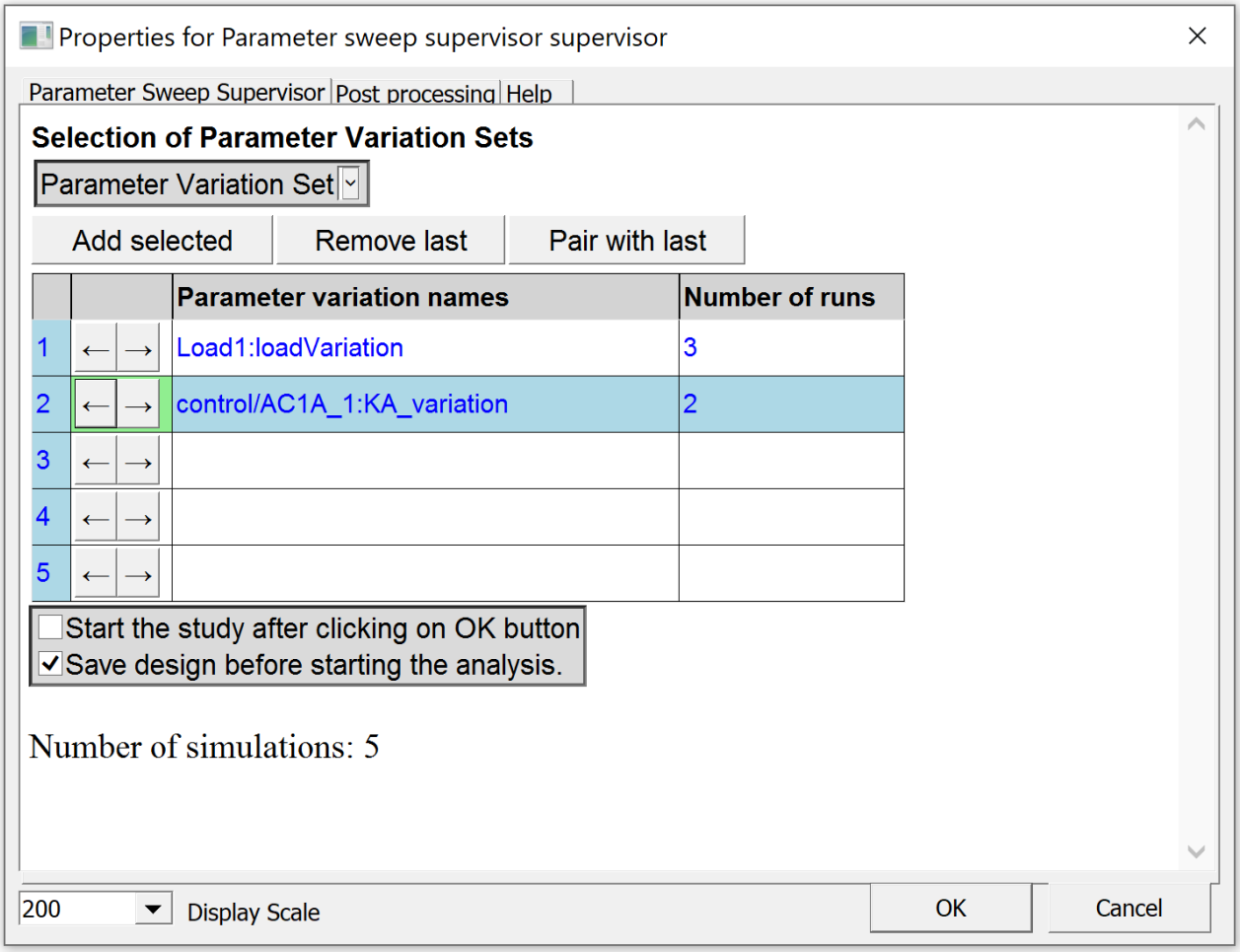

Figure 4: Series-2-parameter variation tree

The variations can also be encapsulated (Figure 1). In that case, for each variation of load value device, the full variation of KA value is performed. The total number of simulations is therefore the multiplication of the simulation number of each variation law.

Pairing

In the example presented Figure 5, the fault clearing is studied for different loading conditions. Therefore, the power references of LF1, LF2, LF3 and LF4 take the value of 250MW and 400MW.

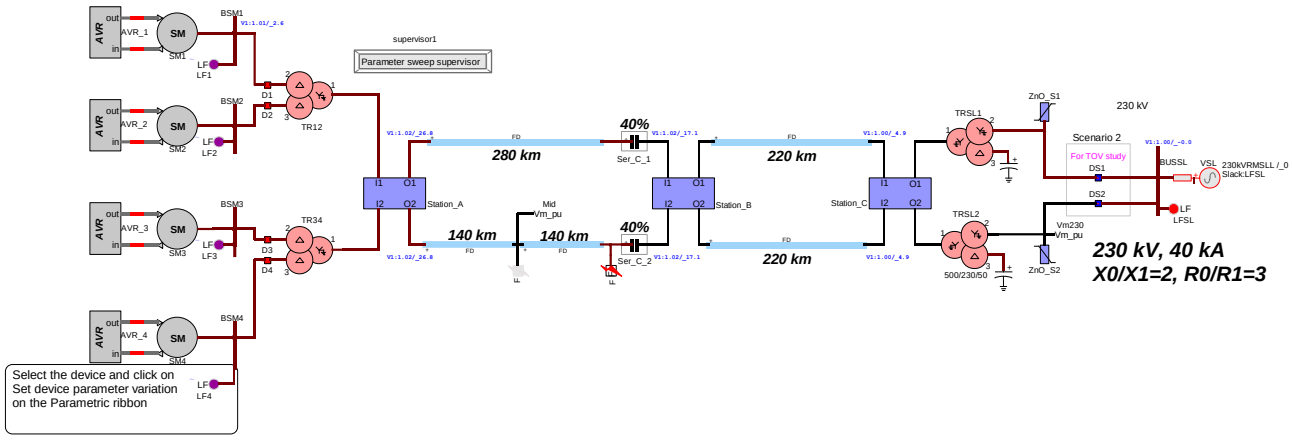

Figure 5: example 2

The parameter sweeps supervisor is presented in Figure 6.

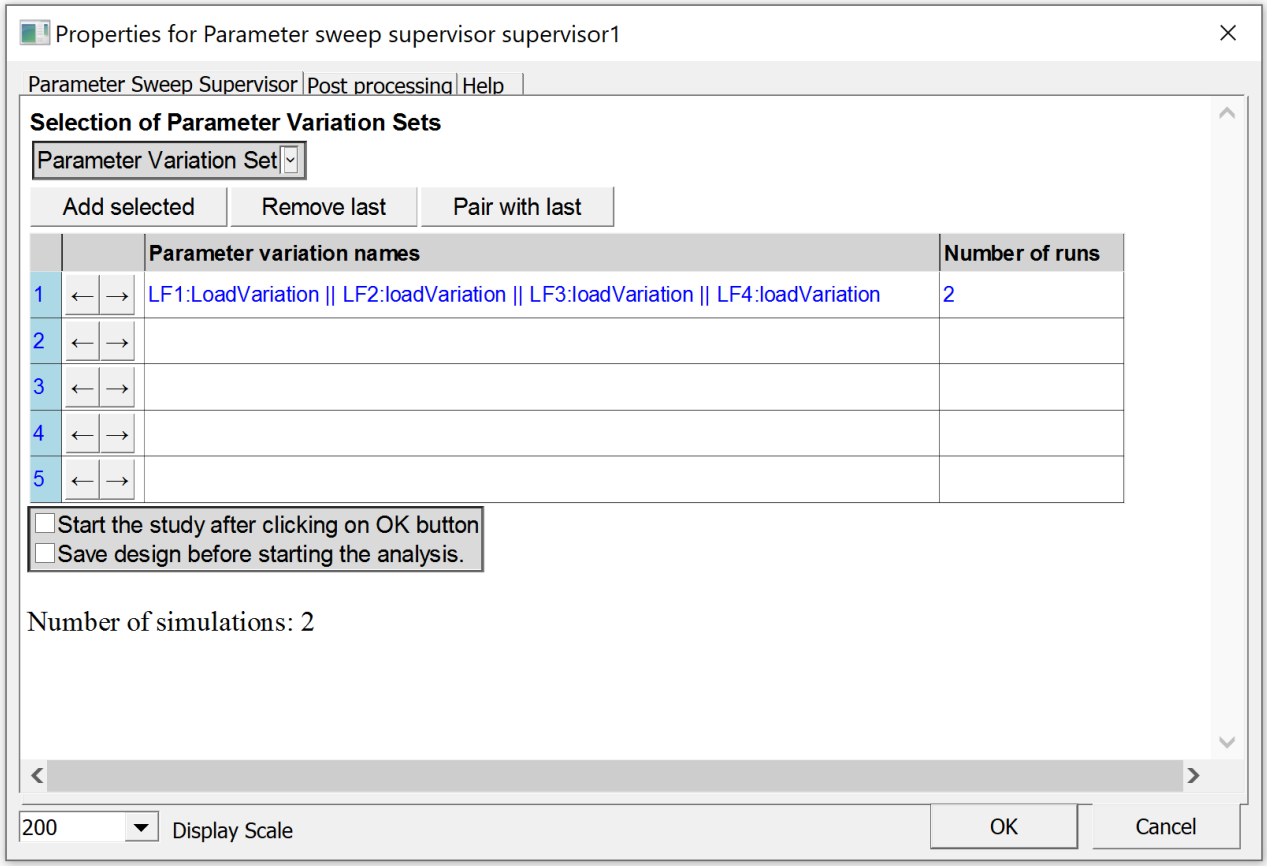

Figure 6: Parameter sweeps supervisor set up for parameter-variation pairing.

3 Parameters

- **Add Selected**: add the selected Variation Set to the tree.
- **Remove last**: remove the batch process at the bottom of the tree.
- **Pair with last:** pair the selected single-parameter variation device with the last one added to the tree.

- **Start the study after clicking on OK button**: When the parameter variation selection and coordination is finished, check this box, it will start the process. It is recommended to always save the design before starting a process.
- **Save design before starting the analysis**: save the design at the beginning of the process. This is to avoid any lost in case an error occurs during the parametric study.

Post processing Tab

- **Save simulation waveforms:** If set to none, there is no post-processing. The user has to define the post processing in a script.
  - If all is selected, all waveforms are saved in the _pj folder and renamed as follow designName_runNumber.m (.mda)

  Where:
  - designName is the name of the .ecf design.
  - runNumber is the run number of this simulation. The parameter values for this run number are summarized in the *designName_+supervisorName_* parameter_values.csv report.

  A list of scopes can be selected and are automatically plotted for the different values taken by the parameter.
  - If only specified is selected, the user specifies the name of the scopes to save. The format is explained in the mask. The post-process is also performed on the input Test.

Post-process options:

- **Save Min and Max**: Save the minimum and maximum values of each signal selected. The minimum and maximum of each simulation are saved in the file located in the same folder as the design and named MINMAX.csv

  The minimum and maximum are searched in the time range defined by Observation start time and Observation stop time. If both are zero, the full time-range of the simulation is scanned.
- **Save as ASCII format**: save the selected scopes and the input Test under ASCII format, in a folder named ASCII located inside the _pj folder. The name of the result file of each scope is: scopeName_ runNumber.txt
- **Save as MAT format**: save the selected scopes and the input Test under MAT format, in a folder named MAT located inside the _pj folder. The name of the result file of each scope is: scopeName_ runNumber.mat
- **Save as CSV format**: save the selected scopes and the input Test under CSV (Comma-Separated Values) format, in a folder named CSV located inside the _pj folder. The name of the result file of each scope is: scopeName_ runNumber.csv.