

Device parameter variation



Set device parameter variation

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Henry Gras, 2017-05-01 09:28:00

1 Introduction

Device parameter variation are setup to run parametric and Monte Carlos simulations where several parameters are varied. The parametric analysis is started from a Parameter Sweep supervisor.

2 Description

From the 'Set device parameter variation' window, **Variation Sets** are defined. A Variation Set regroups several parameter variations. When a Variation Set is called by a Parameter Sweep Supervisor, all the parameters of the Variation Set are varied simultaneously at each simulation run.

For example, in Figure 1, a Variation Set called RL_parametric regroups the parameter variations of the resistance and the inductance. The resistance is varied from 1ohm to 5ohm with steps of 1ohm. The inductance has a similar variation which is not shown in this figure. If this Variation Set is called by a Parameter Sweep Supervisor device (see Figure 2), 5 simulations are run. For each simulation, both the resistance and the inductance values are varied according to their variation laws.

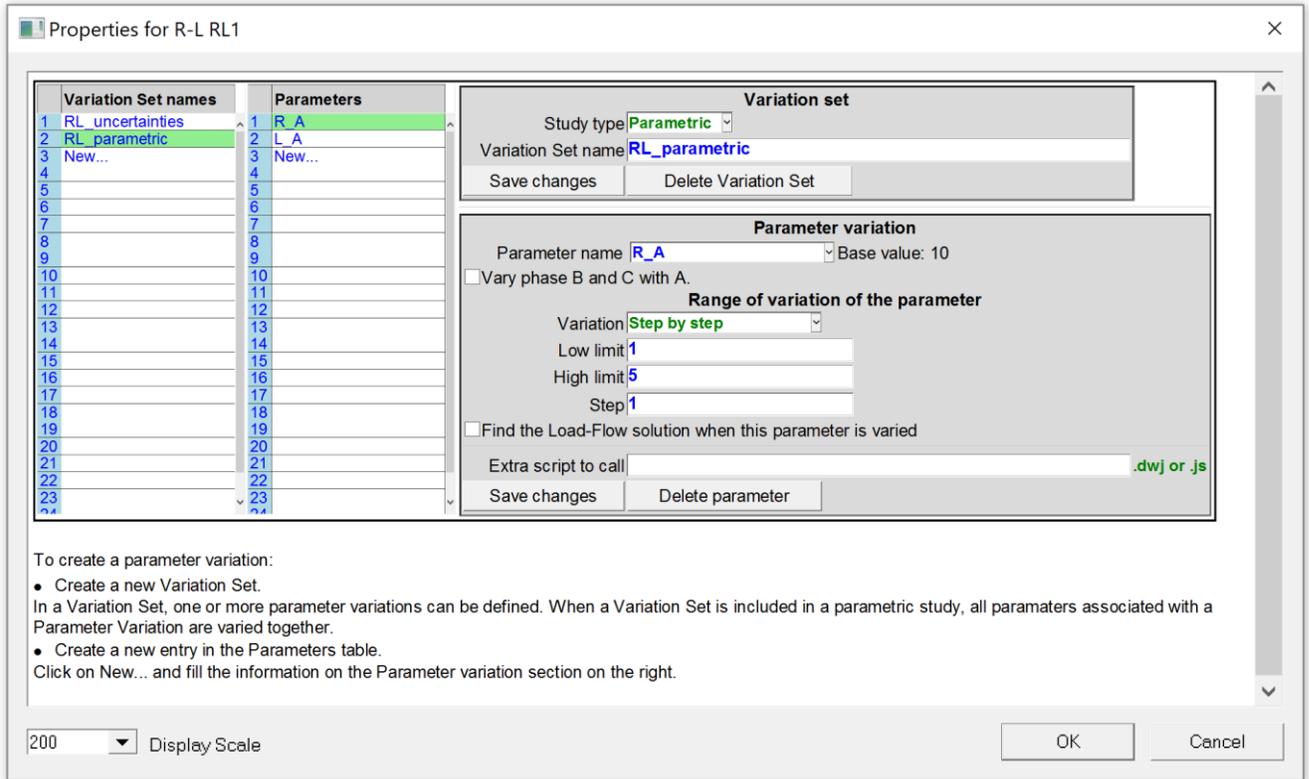


Figure 1: example of Variation Sets defined for an RL device

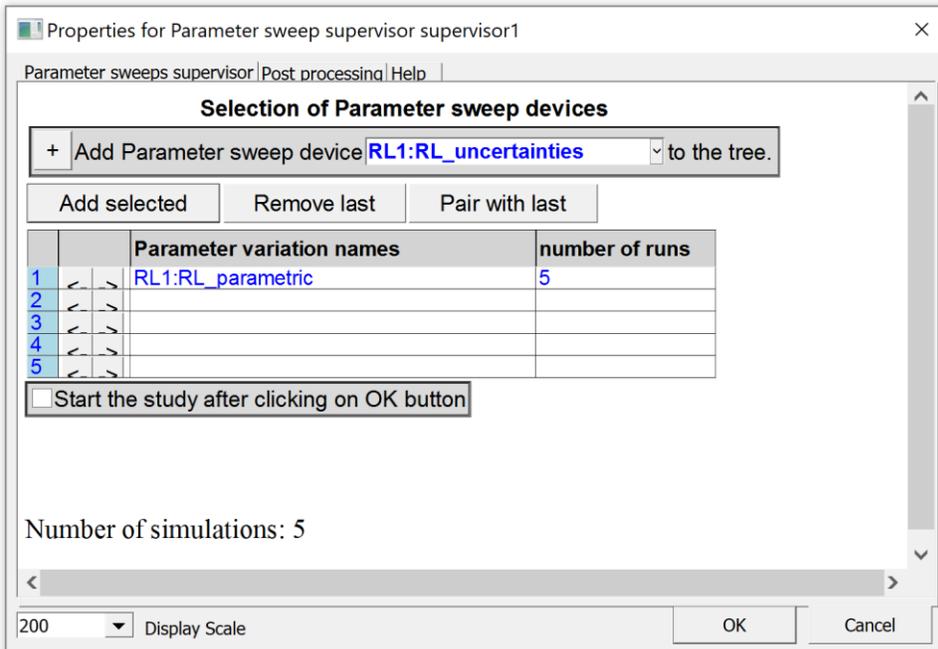


Figure 2: Variation Set RL_parametric called in a Parameter Sweep Supervisor

If the inductance and resistance values were to be varied encapsulated, which means, for each value of resistance, all the inductances values would be simulated, and therefore, the total number of simulation would be $5 \times 5 = 25$, then the parameter variation must be defined in two different Variation Sets which are encapsulated in a Parameter Sweep Supervisor.

More information can be found in the Parameter Sweep Supervisor documentation.

To define a new Variation Set, click on New... in the Variation Set names table.

To add a new Parameter Variation, click on New... in the Parameters table, then fill the Parameter Variation data section

3 Parameter variation

The **Parameter name** is the same as the associated attribute of the device object. The definition of this object is documented in the script written in the device Script.Open.Dev attribute.

The parameter can be varied:

- **Step-by-step.** In that case, the parameter value is increased step-by-step from **Low-limit** to the **High limit**.
- **Pre-defined.** In that case, the values for each run are written in a table.
- **Statistically:** using one of the statistical laws available.

According to the type of variation, a Load-Flow solution can be found before each loop starts. This option may be necessary if the variation applies to a parameter which has an impact on load-flow results. For examples:

- A Load-flow bus parameter
- A PQ load power parameter
- The inclusion or exclusion of a device
- ...

Parameter sweeps are applicable for studies in Time Domain only.

A script (**Extra script to call**) which is called right before the Load-Flow solution is found and the Time domain simulation starts can also be defined. It allows the user to write customized scripts which can be used either for data pre-processing or results post-processing.

The global variable Global_currentValue equals to the parameter value for the current iteration is available in the script. Global_currentValue can be updated in the user-defined script in order to modify the current iteration parameter value.

The global variable Global_runAgain is available and true while the full parameter variation simulations are not completed. Global_runAgain can be set to false in the user-defined script in order to stop the variation process.

The global variable Global_reset is available and true when all the simulations are completed. It allows to build a reset function in the user-defined script.

Warning: When the process is started, the only way to stop it is to kill the EMTPopt.exe and EMTPWorks process in the Windows Task Manager. Always save your design before starting a process.