A Toolbox for Efficient Parameter and Structure Variation of Time Domain Power System Simulation Models in Simulink

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Introduction

Use-Case: Model parameter & structure variation of Simulink models

Addressed scenarios:

- complex / large / “growing” Simulink models
- multiple research tasks
- collaboration of researchers on one model
- flexible uniform, group-wise or individual settings specific to task
- automation of a large number of experiments

Aim: focus on research (modelling, variation studies & analyses) rather than implementation of required tools

Phase 1 – Simulink model preparation

Example

Declare model hierarchy in existing Simulink model

Declare variants of model hierarchy elements

Decl. model parameters

Decl. signals for logging

Register elements to Toolbox (script)

Use model

major model changes:
extend as necessary

Phase 2 - Simulink model usage

Principle

- a “labelpath” efficiently addresses elements exploiting Toolbox hierarchy & element names
- address individually, e.g. '#Line 1#r1'
 - address groups, e.g. '#Line .*#r1'
 - address all anywhere '#r1'
 - elements map to superior hierarchy element

Process description

Phase 3 - Analysis of experiments

- retrieve logged signals from storage by labelpath for further processing
- routines & example scripts provided

Conclusions

Increase of research efficiency:

- quick definition of parameters, structural variants and signals to log by means of labels in Simulink block names or connection lines
- meaningful syntax for addressing elements incl. regular expressions
- unified processes for automated variation studies & result access

Applicability to other research areas

- generic approach and mechanisms
- usability with most Simulink toolboxes

Access

The authors intend to publish the Toolbox source code and documentation as free and open source software. Please visit: www.ifht.rwth-aachen.de/en/stoical