

Implementation of a Multi-Level Power Electronic Inverter Library in Modelica

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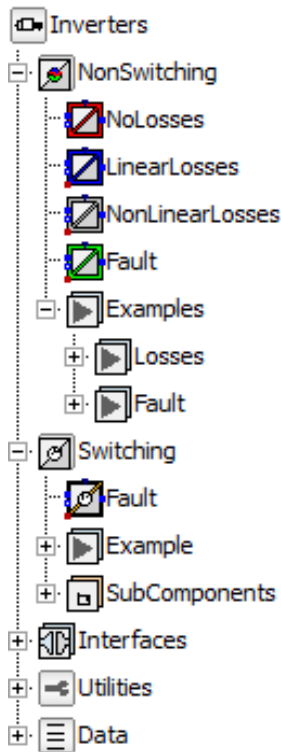


Figure 1: Structure of the presented library.

This paper presents a newly developed Power Electronic Inverter library implemented in Modelica. The library utilises a multi-level approach with increasing model complexity at progressively higher levels. All levels are fully interchangeable so as to provide a flexible library able to be utilised for investigation at single or multiple levels of complexity.

The library, simply named `Inverters`, provides the ability to include losses, analyse thermal response and introduce fault conditions into the modelling environment. It also gives the user multiple interchangeable models of the Power Electronic Inverter in order to allow analysis at multiple levels of complexity. The `Inverters` library presented here forms part of an overall `Actuator` library developed as part of `Actuation 2015` [1]. For an overview of the entire `Actuator` library please see [2]. However the purpose of this paper is to give in-depth detail on the multi-level modelling of the Power Electronic Inverter.

The structure of the `Inverters` library is shown in Figure 1. A central feature of this `Inverters` library is that each modelling level is fully replaceable with one another. In order for each modelling level to be fully interchangeable a common interface is used for all 5 modelling levels. As a result the user can simply and easily investigate system responses under differing conditions and at varying levels of complexity

Within this interchangeable multi-level approach, there are two key attributes which are implemented into this new library. The first is the ability to include losses between the input and output of the Power Electronic Inverter. This is implemented so that the losses are included irrespective of the direction of power flow. Secondly, this library also provides the ability to trigger single or multiple open and short circuit faults within the Inverter. The library therefore provides an extremely useful tool able to compare system response under a variety of operational scenarios.

References

- [1] Funded under the frame of the European Union Seventh Framework Program (FP7) <http://www.actuation2015.eu/>
- [1] Van der Linden, F., Schlegel, C., Christmann, M., Regula, G., Hill, C.I., Giangrande, P., Mare, J.C., Egaña, I. "Implementation of a Modelica Library for Simulation of Electromechanical Actuators for Aircraft and Helicopters." *Proceedings of the 10th International Modelica Conference*. 2014.