LABORATOIRE D'ELECTROTECHNIQUE ET D'ELECTRONIQUE DE PUISSANCE DE LILLE

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— Electrical motor reduced model implementation in circuit simulator —

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Context

In the electrical engineering field and more generally in electrical industry, the numerical simulation allows to obtain very accurate information about a system behavior at an early stage of development. Indeed, testing an industrial electrical device can sometimes be harmful for itself, or very expensive to set-up. However, the computational cost maybe very important with finite element method, for instance, because of a high number of unknowns, or strong nonlinearities in the system. In order to reduce the computational time and, thus, achieve competitive industrialization time, Model Order Reduction methods have been recently developed [1]. Finite element computations build a reduced model for material under investigation. Some results have been obtained with electrical rotating machines and transformer reduced model implementation in circuit simulator (like EMTP-RV [2]) have been performed.

Objective

In order to use advanced electrical machine models in circuit software, the Model Order Reduction method is a smart solution. The aim of this work is to implement an electrical rotating machine reduced model in a circuit software. With such an approach local information (flux densities Joule losses) will be easily available with an electrical modelling.

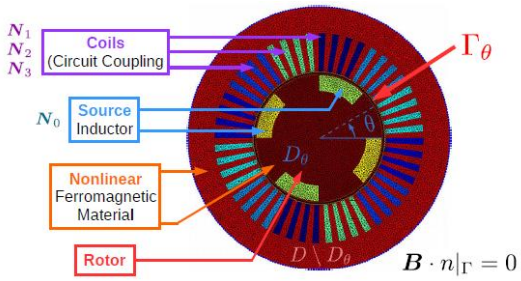

Figure 1: Finite Element Model for an electrical machine

Work steps

1- Finite Element Modelling of a rotating machine example
2- Application of Model Order Reduction to this machine
3- Implementation in circuit software
4- Results comparison between finite element model and reduced model (accuracy and computation time)

Key word

Model Order Reduction, Finite Element Method, Circuit Simulation

References

[1] L. Montier, T. Henneron, S. Clénet, and B. Goursaud « Robust Model Order Reduction of an Electrical Machine at Startup through Reduction Error Estimation » Int. J. Numer. Model. 0000; 00:1–19, December 2017
[2] http://emtp-software.com/

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