JOHANNES KEPLER UNIVERSITY LINZ

Johannes Kepler University Linz
Institute of Numerical Mathematics
Univ.-Prof. Dr. Herbert Egger

INSTITUTE OF NUMERICAL MATHEMATICS

Talk announcement

Eva-Maria Haslhofer
(NuMa)

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Parameter estimation in lumped-parameter thermal networks

Accurate models of heat transfer in electric machines are essential to ensure that critical temperature limits are not exceeded. A very efficient way to estimate and predict the temperature distribution are lumped parameter thermal networks (LPTNs). These are low-dimensional systems of differential equations that describe temperature changes. To build up such networks, the system is divided into different subdomains with similar thermal behavior. Each subdomain is characterized by its thermal capacity and conductivity, which describes the ability to store heat and transfer it to its neighbors. We are interested in these parameters and want to estimate them for given temperature measurements. Therefore, we introduce the forward operator, state equation and the sensitivity equation which allow us to evaluate a cost functional and its derivative. To get optimal parameters, we minimize the cost functional with the projected Levenberg-Marquardt algorithm, a minimization algorithm for constrained problems. We then demonstrate the viability of the approach by finding good capacity and conductivity parameters for temperature measurement data of a specific machine.