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Talk announcement

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Parameter estimation in lumped-parameter thermal networks (LPTNs)

Modeling heat transfer in electric machines is essential to ensure that they do not exceed critical temperature limits. One way to estimate and predict the temperature distribution is lumped parameter thermal networks (LPTNs). To build up such networks, the system is divided into different elements. It is assumed that on one element the thermal behavior is similar and the temperature is constant. Each thermal element is characterized by its thermal capacity and thermal conductivity, which describes the ability to store heat and transfer it to its neighbors. With the finite volume method, we derive the thermal network equations, an ordinary differential equation system for the change in temperature. Then we will set up the thermal network equations for an LPTN of an asynchronous motor. We are interested in these equations' parameters (thermal capacity and thermal conductivity) and want to estimate them. Therefore, we introduce the state equation, sensitivity equation and the cost functional in the framework of optimal control and calculus of variations. To get optimal parameters, we want to minimize the cost functional with the minimization algorithms Gauss-Newton and Levenberg-Marquardt. As a numerical experiment, we will derive optimal parameters for temperature measurement data of the asynchronous motor.