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Thermal Management in Electric and Hybrid Vehicle

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Rapid increase of electrification in vehicles requires batteries which are sensitive to temperature change. In order to increase a lifetime and the efficiency, the battery needs to operate at well-defined temperature levels. In comparison with a battery, the electric motor operates at different temperature level and the power electronics operates at another temperature level. The temperature and the humidity in the passenger cabin must assure a high level of comfort. This requires an air-conditioning system, which again operates at different temperature level. Multiple levels of operational temperatures require an effective thermal management of the overall vehicle. The thermal management must also assure that components operate at high efficiency, which provides the best trade-off between the mileage and the passenger comfort. Since thermal processes are nonlinear in nature, the thermal management is a complex process. To cope with nonlinearities and the complexity, advanced model based predictive paradigms must be utilised. In this talk, the advanced approaches used in thermal management will be presented. The nonlinear control of some of components will be shown and the optimisation techniques for increase of energy efficiency of thermal cycles in electric and hybrid vehicles will be discussed.

Biography

Gregor Gregorčič received the degree in electrical engineering and computer science from the University of Maribor, Slovenia, in 1998 and the Ph.D. degree in electrical engineering from the University College Cork, Cork, Ireland, in 2004. At present, he is a team leader of the Modelling and Advanced Control Group at qpunkt in Graz, Austria. His research area covers model-based predictive control systems, system identification as well as applications of local model networks and neuro/fuzzy systems for nonlinear modeling and control. His current research is concentrated on development of advanced control strategies applied to complex thermal systems in the automotive industry.

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