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Design and Development of Real-Time Optimal Energy Management System for Hybrid Electric Vehicles

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Abstract : This paper describes a strategy to develop an energy management system (EMS) for a charge-sustaining power-split hybrid electric vehicle. This kind of hybrid electric vehicles (HEVs) benefit from the advantages of both parallel and series architecture. However, it gets relatively more complicated to manage power flow between the battery and the engine optimally. The applied strategy in this paper is based on nonlinear model predictive control approach. First of all, an appropriate control-oriented model which was accurate enough and simple was derived. Towards utilization of this controller in real-time, the problem was solved off-line for a vast area of reference signals and initial conditions and stored the computed manipulated variables inside look-up tables. Look-up tables take a little amount of memory. Also, the computational load dramatically decreased, because to find required manipulated variables the controller just needed a simple interpolation between tables.

Keywords : hybrid electric vehicles, energy management system, nonlinear model predictive control, real-time
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