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Local and Optimal Coordinated Ramp Metering for Freeway Networks

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Abstract:

In this article a nonlinear model predictive control approach to the problem of coordinated ramp metering is presented. The previously designed optimal control tool Advanced Motorway Optimal Control (AMOC) is used within the framework of a hierarchical control structure which consists of three basic layers: the estimation/prediction layer, the optimization layer, and the direct control layer. More emphasis is given to the last two layers where the control actions on a network-wide and on a local level, respectively, are decided. The hierarchical control strategy combines AMOC's coordinated ramp metering control with local feedback Asservissement LInéaire d'Entré Autoroutière (ALINEA) control in an efficient way. Simulation investigations for the Amsterdam ring-road are reported whereby the results are compared with those obtained by applying ALINEA as a stand-alone strategy. It is shown that the proposed control scheme is efficient, fair, and real-time feasible.

Keywords:

Intelligent Transportation Systems, Ramp Metering, Traffic Management, Traffic Control, Freeways

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