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Hierarchical nonlinear model-predictive ramp metering control for freeway networks

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Abstract: A nonlinear rolling-horizon model-predictive hierarchical coordinated ramp metering scheme is presented. The hierarchical control structure consists of three layers: the estimation/prediction layer, the optimization layer and the direct control layer. The second layer incorporates the previously designed optimal control tool AMOC while the local feedback strategy ALINEA is used in the third layer. Simulation results are presented for the Amsterdam ring-road. It is shown that control of all on-ramps including freeway intersections leads to the optimal utilization of the available infrastructure.