



Offset-Free Model Predictive Control of Open Water Channel Based on Moving Horizon Estimation

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Model predictive control (MPC) is a powerful control option which is increasingly used by operational water managers for managing water systems. The explicit consideration of constraints and multi-objective management are important features of MPC. However, due to the water loss in open water systems by seepage, leakage and evaporation a mismatch between the model and the real system will be created. These mismatch affects the performance of MPC and creates an offset from the reference set point of the water level. We present model predictive control based on moving horizon estimation (MHE-MPC) to achieve offset free control of water level for open water canals. MHE-MPC uses the past predictions of the model and the past measurements of the system to estimate unknown disturbances and the offset in the controlled water level is systematically removed. We numerically tested MHE-MPC on an accurate hydro-dynamic model of the laboratory canal UPC-PAC located in Barcelona. In addition, we also used well known disturbance modeling offset free control scheme for the same test case. Simulation experiments on a single canal reach show that MHE-MPC outperforms disturbance modeling offset free control scheme.