



Water Prediction and Control Technologies for Large-scale Water Systems

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A number of control techniques have been used in the field of operational water management over recent decades. Among these techniques, the ones that utilize prediction to anticipate near-future problems, such as Model Predictive Control (MPC), have shown the most promising results. Constraints handling and multi-objective management can be explicitly taken into account in MPC. To control large-scale systems, several extensions to standard MPC have been proposed. Firstly, Proper Orthogonal Decomposition (POD-MPC) has been applied to reduce the order the states and computational time. Secondly, a tree-based scheme (TB-MPC) has been proposed to cope with uncertainties of the prediction that are inherently parts of large scale systems. Thirdly, a distributed scheme (DMPC) has been proposed to deal with multiple regions and multiple goals in a computationally tractable way. Simulation experiments on the Dutch water system illustrate that tree-based distributed MPC outperforms feedback control, feedforward control and conventional MPC.

Keywords: Model Predictive Control; Proper Orthogonal Decomposition; tree-based control; distributed control; Large Scale Systems;