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## System Identification and Control of Rivers

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# System Identification and Control of Rivers

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**Abstract:** Here we present findings from on-going research on how to improve the management and efficiency of river operations using data based modelling and control engineering. The objectives of the river operations include minimisation of flow and water level deviations from their required set-points, on-time water deliveries to irrigators and flood risk mitigation. Due to long time delays in rivers, forecasts of flows in tributaries are required, and control strategies for rivers should be able to accommodate such forecasts. Here we propose to use system identification techniques to obtain models of the rivers which are very simple, but sufficient for control design, and a Stochastic Model Predictive Control strategy for control of a river. The control problem is formulated as a chance-constrained optimisation problem and a solution is found using a scenario approach. The developed modelling and control framework has been successfully applied, in simulations, to the upper part of Murray River in Australia. The strategy worked well and achieved the objectives identified by the river operators.

**Keywords:** *Data-based modelling; Model Predictive Control; Chance-constrained optimisation problem; Scenario approach; Flood risk mitigation*