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ABSTRACT

This paper applies a model predictive controller (MPC) to an automatic water canal with sensors and actuators controlled by a PLC network (programmable logic controller), and supervised by a SCADA system (supervisory control and data acquisition). This canal is composed by a set of distributed subsystems that control the water level in each canal pool, constrained by discharge gates (control variables) and water off-takes (disturbances). All local controllers are available through an industrial network managed by the SCADA system, where the centralized predictive controller runs.

In this paper a complete new platform connecting the SCADA supervisory system and the MATLAB software (named SCADA–MATLAB platform) is built, in order to provide the usual SCADA systems with the ability to handle complex control algorithms. The developed MPC-model presents a novelty in the control of irrigation canals as it allows the use of industrial PLCs to implement high complex controllers, through the new developed SCADA–MATLAB platform.

Experimental results demonstrate the reliability and effectiveness of the proposed strategy in real-life typical situations, including gate malfunctioning and extreme water off-take conditions.