



## MBD of grey prediction fuzzy-PID irrigation control technology

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### ABSTRACT

For the water and fertilizer ratio adjustment, irrigation control precision and problems and development cycle in the agricultural water–fertilizer irrigation, the control model of the combination of proportion-integral-derivative (PID) control, fuzzy control and grey prediction control were designed, and the controller design was carried out based on the model design method. It can achieve the engineering code to the embedded hardware requirements of the whole process of automation, efficiency of water and fertilizer irrigation controller, rapid development and application. PID control was based on fuzzy rules and query fuzzy matrix table to obtain parameter self-turning, then it could adjust PID parameters in real time, furthermore, joined multi-factors grey forecasting multi-variable grey model (1, n), so as to effectively predict the water requirement of the crop and achieve the precise irrigation of the system. The running results the system reduces the overshoot by 14.68% compared with the conventional PID control, and the adjustment time of the system is reduced by 86.62%. Compared with the fuzzy PID control, the overshoot is slightly increased by 1.9%, but the adjustment time is reduced by 177.71%. Meanwhile, in the water and fertilizer concentration control system, the controller is developed quickly, the code quality is high, the system response speed is good, the real time is good and stable, and the effect of water and fertilizer is greatly improved.

*Keywords:* Water fertilizer irrigation; Model-based design; Fuzzy PID control; Grey prediction control

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