Model predictive functional control based on PID and PIPD using extended non-minimal state space: application to molten carbon fuel cell plants

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The performance of proportional-integral-derivative (PID) and proportional-integral-proportional-derivative (PI-PD) controllers depend on their tuning parameters. In this study, the optimal tuning parameters are identified using the extended non-minimal state space model predictive functional control (ENMSSPFC) scheme and are applied numerically in the operation of the molten carbonate fuel cell (MCFC) plant. ENMSS, which consists of the state variables and the tracking error, improve PID and PIPD control so that simple structure and better performance can be provided. Numerical simulations are carried out to assess the set point tracking performance as well as disturbance rejection performance.