

Multivariable Robust PID Control for a PEMFC System

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Abstract

This paper proposes robust proportional-integral-derivative (PID) control for a proton exchange membrane fuel cell (PEMFC) system. We model a PEMFC as a multivariable system, and apply identification techniques to obtain the system's transfer function matrices, where system variations and disturbances are regarded as uncertainties. Because robust control can cope with system uncertainties and disturbances, it has been successfully applied to improve the stability, performance, and efficiency of PEMFC systems in previous studies. However, the resulting robust controllers might be too complicated for hardware implementation. On the other hand, PID control has been widely applicable to engineering practices because of its simple structure, but it lacks stability analysis for systems with uncertainties. Therefore, by combining the merits of robust control and PID control, we design robust PID controllers for the PEMFC system. Based on evaluation of stability, performance, and efficiencies, the proposed robust PID controllers are shown to be effective.