2010 Proceedings of the 2010 IEEE Multi-conference on Systems and Control

Robust PID Control of 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 system uncertainties. In previous studies, robust control has been successfully applied to improve the stability, performance, and efficiency of a PEMFC system. However, the resulting robust controllers can be complicated. On the other hand, PID control has been widely applicable to engineering practices because of its simple structure, though it lacks stability analysis for systems with uncertainties. Therefore, combining the merits of robust control and PID control, we design robust PID controllers to regulate hydrogen and air flow rates of a PEMFC system. From the discussion of stability, performance, and efficiency, the proposed robust PID controllers are shown to be effective.