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Multivariable Robust Control for a 500W Self-Humidified PEMFC System

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Abstract

This paper illustrates the integration and control of a 500 W self-humidified proton exchange membrane fuel cell (PEMFC) system. From the system point of view, the PEMFC can be regarded as a two-input-two-output system with the inputs of hydrogen and oxygen, and the outputs of cell voltage and current. By identification techniques, we find transfer functions of the PEMFC system at different operating points, and treat the un-modeled dynamics as system uncertainties. In this way, robust control strategies can be applied to stabilize the system and to increase the system performance. This paper describes the design of a standard H_∞ robust controller for stabilizing the PEMFC system, and further applies fixed-order robust control and robust PID control algorithms for controller simplification. Finally, the system performance and efficiency are experimentally verified. The results show the effectiveness of these controllers.