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Multivariable Fixed-Order Robust Control for a PEMFC System

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Abstract

This paper applies fixed- order multivariable robust control strategies to a proton exchange membrane fuel cell (PEMFC) system. In previous studies, robust control was applied to guarantee system stability and to reduce hydrogen consumption for a PEMFC system. We noted that for standard robust control design, the order of resulting H_∞ controllers is constrained by the plants and weighting functions. However, for hardware implementation, controllers with lower orders are preferable in terms of computing efforts and cost. Therefore, in this paper we model the PEMFC as multivariable transfer matrices, and then apply three fixed- order robust control algorithms to design controllers with specified orders for a PEMFC. Finally, the designed controllers are implemented to regulate the air and hydrogen flow rates. From the experimental results, fixed- order robust control is deemed effective in supplying steady power and reducing fuel consumption.