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Fuzzy Modeling and Robust Pole Assignment Control for Difference Uncertain Systems

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Abstract: This paper deals with fuzzy modeling and robust control of nonlinear systems affected by bounded uncertainties. The proposed fuzzy model is composed of two parts: a linear uncertain part and a nonlinear one. The linear uncertain part is obtained by the nominal system linearization around some operating points. The nonlinear part is approximated by a Takagi-Sugeno fuzzy system whose parameters are estimated using the descent gradient method. A robust pole assignment called 'pole colouring' is used for the system control. This strategy of control is synthesized based only on the linear uncertain part of the decomposed model. Finally, two simulation examples are treated to illustrate the effectiveness of the proposed fuzzy modeling and control approaches.

Keywords: *uncertain nonlinear system; fuzzy modeling; Takagi-Sugeno system; linearization; robust pole assignment.*

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1 Introduction

The modeling of an uncertain nonlinear system is an important step for the system analysis and control. It consists in developing a mathematical model ensuring the required accuracy and having a useful structure. In fact, a model must reproduce correctly the dynamics of the considered system even in the presence of nonlinearities, uncertainties and perturbations. These constraints make the classical modeling methods limited. So the evolutionist techniques, such as fuzzy systems [1] and neural networks [2] are considered as potential solutions for this problem. Indeed, they are considered as universal

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