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STATE FEEDBACK CONTROLLER DESIGN VIA T-S FUZZY MODEL

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Abstract

In this paper, a state feedback controller is designed for a non-linear system using a technique in which, the fuzzy model consists of a set of linear fuzzy local models, combined to get overall fuzzy inference mechanism. This approach utilizes a certain type of fuzzy systems that are based on Takagi-Sugeno (T-S) fuzzy models to approximate nonlinear systems. A fuzzy inference mechanism is designed by the integration of these local models to give overall fuzzy model of the system. The proposed control algorithm employs the fuzzy controller that was designed by considering the linear state feedback controller for each of the fuzzy local model. Individual firing strength amongst that of different rules is used for the design of gain matrix of state feedback controller. The output of the FLC, which is a function of the degrees of membership of the fuzzy rules, is made by weighted average defuzzification method. In this paper, sufficient condition for the stability of T-S fuzzy system is investigated for the non-linear system which has complex stability analysis by obtaining a common positive definite matrix P that would satisfy a set of Lyapunov inequalities. To show the effectiveness of the proposed technique, inverted pendulum, a well known non-linear system is used.