Adaptive observer design for the uncertain Takagi-Sugeno fuzzy system with output disturbance

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Abstract

The paper proposes an adaptive fuzzy observer for the uncertain T-S fuzzy system with output disturbance. First, an augmented fuzzy model is built by integrating the system state and the output disturbance together as new variables. Then, the desired adaptive fuzzy observer is designed to estimate the unavailable system state and the unknown output disturbance simultaneously. Based on Lyapunov theory and LMIs tools, two main conditions are derived under which the fuzzy observer is designed. Finally, the procedure of the observer design is summarized and the effectiveness of the designed observer is demonstrated with a numerical example.

Keyword：Augmented model, linear matrix inequalities (LMIs), nonlinear system, state observer, Takagi-Sugeno