Observer synthesis for the T-S fuzzy system with uncertainty and output disturbance

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Abstract

The paper proposes a novel fuzzy observer synthesis for the Takagi－Sugeno (T－S) fuzzy system with uncertainty and output disturbance. First, an augmented fuzzy model is built by integrating the system state and the output disturbance into a new variable. Then, based on Lyapunov theory and LMIs tools, two main theorems are derived for particular and general cases of fuzzy systems, respectively. In each main theorem, three key conditions are proposed, under which the fuzzy observer is synthesized to estimate the system state and the output disturbance simultaneously. According to the main theorems, a methodical procedure for the fuzzy observer synthesis is also provided. Finally, the effectiveness of the observer is demonstrated by a numerical example.

Keyword：Augmented model, fuzzy system models, linear matrix inequalities (LMIs), state observer, uncertainty and disturbance