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Improved stability criteria for time-varying delayed T-S fuzzy systems via delay partitioning approach. (English) [Zbl 1237.93156](#)

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Summary: This paper focuses on the stability analysis for uncertain Takagi–Sugeno (T–S) fuzzy systems with interval time-varying delay. The uncertainties of system parameter matrices are assumed to be time-varying and norm-bounded. Some new Lyapunov–Krasovskii functionals (LKFs) are constructed by nonuniformly dividing the whole delay interval into multiple segments and choosing different Lyapunov functionals to different segments in the LKFs. By employing these LKFs, some new delay-derivative-dependent stability criteria are established for the nominal and uncertain T–S fuzzy systems in a convex way. These stability criteria are derived that depend on both the upper and lower bounds of the time derivative of the delay. By employing the new delay partitioning approach, the obtained stability criteria are stated in terms of Linear Matrix Inequalities (LMIs). They are equivalent or less conservative while involving less decision variables than the existing results. Finally, numerical examples are given to illustrate the effectiveness and reduced conservatism of the proposed results.

MSC:

[93D20](#) Asymptotic stability in control theory

[93C42](#) Fuzzy control/observation systems

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Keywords:

[uncertain system](#); [T-S fuzzy system](#); [delay-derivative-dependent stability](#); [interval time-varying delay](#); [linear matrix inequality \(LMI\)](#)

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