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Erratum to “Adaptive observers for TS fuzzy systems with unknown polynomial inputs” [Fuzzy Sets and Systems 161 (2010) 2043–2065]*

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Erratum to “Adaptive observers for TS fuzzy systems with unknown polynomial inputs” [Fuzzy Sets and Systems 161 (2010) 2043–2065]

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Abstract

The description of the error dynamics (30) in our paper [1] contains an omission that leads to some bounds used in the conditions of Theorem 8 and Corollary 2 in the paper to be incorrectly defined. In what follows, the correct error dynamics and the corresponding conditions are given.

Instead of (30) in [1], the error dynamics¹ are actually given by

$$\begin{aligned} \dot{e} &= \sum_{i=1}^m w_i(\mathbf{z})[(A_i - L_i C + M_i A_{\delta i})e + M_i(\bar{A}_{\delta i}\hat{\mathbf{x}} + \bar{B}_{\delta i}\mathbf{u} + \bar{\theta}_i)] \\ e_y &= C e \end{aligned} \quad (1)$$

which leads to μ_{\max} in Theorem 8 being given by $\mu_{\max} \leq \max_i \|M_i A_{\delta i}\|$, instead of $\mu_{\max} \leq \max_i \|A_{\delta i}\|$ as stated in [1].

Similarly, the correct error system (36) is given by

$$\begin{aligned} \dot{e} &= \sum_{i=1}^m w_i(\hat{\mathbf{z}})[(A_i - L_i C + M_i A_{\delta i})e + M_i(\bar{A}_{\delta i}\hat{\mathbf{x}} + \bar{B}_{\delta i}\mathbf{u} + \bar{\theta}_i)] \\ &\quad + \sum_{i=1}^m (w_i(\mathbf{z}) - w_i(\hat{\mathbf{z}})) \cdot (A_i \mathbf{x} + B_i \mathbf{u} + M_i(A_{\delta i} \mathbf{x} + B_{\delta i} \mathbf{u} + \theta_i)) \\ e_y &= C e \end{aligned} \quad (2)$$

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¹In [1], the first M_i in the sum was omitted.

and as a consequence the last condition of Corollary 2 in [1] is

$$\begin{pmatrix} Q - \bar{\mu}I & \sqrt{2}P \\ \sqrt{2}P & I \end{pmatrix} > 0 \quad (3)$$

where $\bar{\mu} = \max_i \|M_i A_{\delta i}\|^2 + \mu^2$, i.e., the sum of the squared bounds of the two vanishing disturbances. In [1] only the disturbance arising from the observer-model mismatch was considered.

Note that thanks to the M_i considered in the example of [1], with $\|M_i\| = 1$, the change in the conditions does not affect the numerical results.

References

- [1] Zs. Lendek, J. Lauber, T. M. Guerra, R. Babuška, B. De Schutter, Adaptive observers for TS fuzzy systems with unknown polynomial inputs, *Fuzzy Sets and Systems* 161 (15) (2010) 2043–2065.