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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

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

$$\boldsymbol{e}_y = C \boldsymbol{e}$$
(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

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

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

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

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

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

 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.