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# Adaptive Fuzzy Control Algorithms

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In past few years a great progress has been achieved in the area of adaptive control of nonlinear systems. Since a general solution of the corresponding problems is usually hard to find an approximation by fuzzy systems offers sometimes a feasible way to deal with them. Whereas Mamdani fuzzy systems adopt in most cases the sliding mode control approach or are combined with neural networks, adaptive control of Takagi-Sugeno (TS) fuzzy systems relies mostly on Lyapunov approach. The usual choice for Lyapunov function is a quadratic one, however piecewise quadratic or fuzzy Lyapunov functions that are used outside the adaptive framework offer a great potential for improving the current results. Although control of TS fuzzy systems typically utilizes Parallel Distributed Compensation (PDC), a non-PDC concept can be useful in some cases. All the mentioned approaches lead to Linear Matrix Inequalities solved by convex programming techniques. The idea of using polynomial models in the consequents of rules of TS systems instead of linear ones, which was published recently, would probably open many possibilities of achieving new results in control of TS fuzzy systems. Using polynomial Lyapunov functions for those models leads to increasingly popular Sum of squares (SOS) techniques solved by semidefinite programming.

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