ADAPTIVE FUZZY-BASED MIXED $H_2/H_\infty$ TRACKING CONTROL DESIGN IN UNCERTAIN ROBOTIC SYSTEMS

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ABSTRACT

In this study, an adaptive fuzzy-based mixed $H_2/H_\infty$ tracking control design is developed in robotic systems under unknown or uncertain plant parameters and external disturbances. The mixed $H_2/H_\infty$ control design has the advantage of both $H_2$ optimal control performance and $H_\infty$ robust control performance and the fuzzy adaptive control scheme is used to compensate for the plant uncertainties. By virtue of the skew-symmetric property in the robotic systems and adequate choice of state variable transformation, sufficient conditions are developed for the adaptive fuzzy-based mixed $H_2/H_\infty$ tracking control problems in terms of a pair of coupled algebraic equations instead of a pair of coupled differential equations. The proposed methods are simple and the coupled algebraic equations can be solved analytically. Simulation results indicate that the desired performance of the proposed adaptive fuzzy-based mixed $H_2/H_\infty$ tracking control schemes for the uncertain robotic systems can be achieved.

KeyWords: Adaptive fuzzy control, mixed $H_2/H_\infty$ tracking control, and uncertain robotic systems.