

عنوان مقاله:

Optimized Adaptive Combined Hierarchical Sliding Mode Controller Design for a Class of Uncertain Under-actuated Time-Varying Systems

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خلاصه مقاله:

This paper proposes an optimized adaptive combined hierarchical sliding mode controller (ACHSMC) for a class of under-actuated time-varying systems in presence of uncertainties and noise. For this purpose, the un-modeled dynamics and friction force are modeled as additive and multiplicative uncertainties, respectively. A combined hierarchical sliding mode controller (CHSMC) is designed using two layers of sliding manifolds. Then, the controller is adapted by considering a time-varying coefficient of the second layer sliding manifold of CHSMC system. The stability of this controller is approved by Lyapunov theorem. Finally, this method is performed on an under-actuated crane model that has two subsystems: trolley and payload can be controlled by a single input signal and the first layer sliding manifold parameter of ACHSMC is optimized by genetic algorithm (GA) to save energy of input signal. The simulation results show the stability and robust performance of the proposed controller against input noise and additive and multiplicative uncertainties and time varying parameters of the system compared to CHSMC method.

کلمات کلیدی:

Optimized adaptive controller, Combined hierarchical sliding mode controller, Under-actuated time varying system, Additive and multiplicative uncertainty, genetic algorithm

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