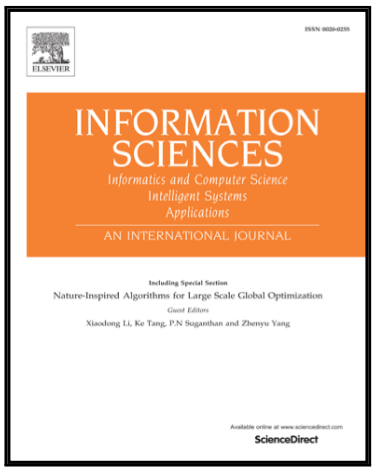

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Abstract

This paper presents a command-filter-based adaptive fuzzy control method to solve stochastic disturbances and input saturation problems for induction motors (IMs) drive systems. Firstly, the fuzzy logic systems (FLSs) are employed to cope with the stochastic nonlinear functions in IMs drive systems. Secondly, the quartic Lyapunov function is selected as the stochastic Lyapunov function and the adaptive backstepping method is used to design controllers. Then the command filtering technology is utilized to deal with the explosion of complexity in conventional backstepping, and the filtering error is eliminated by the designed compensating signal. Finally, the effectiveness and superiority of the proposed method are demonstrated by simulation results.

Keywords: Adaptive fuzzy control, Backstepping, Induction motors, Stochastic nonlinear systems.

1. Introduction

Recently, induction motors (IMs) have been widely used in industrial field due to its advantages of simplicity, reliability and competitive price. However, the difficulties of multivariable, highly nonlinear and strong coupling make it a challenging problem to control the IMs efficiently [15, 19]. In order to solve these problems, many scholars have proposed various advanced control strategies, for instance, adaptive control, sliding mode control, robust control and so on [1, 3, 43]. Through these efforts, significant progress has been made and a better performance of IMs has been obtained.