Dynamic structure fuzzy neural networks for robust adaptive control of robot manipulators

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ABSTRACT

Robotic manipulators are systems with high nonlinearities that are often unknown and time varying, and they also have to suffer from various uncertainties in their dynamics. This thesis proposes a dynamic structure neural-fuzzy network (DSNFN) to address trajectory-tracking Control of robot manipulators. The DSNFN is used to model complex processes. Based on this DSNFN, a robust controller is designed to compensate for structured and unstructured uncertainties. In the DSNFN, the number of rule nodes can be either increased or descreased over time, and the adaptation laws is the sense of a projection algorithm are derived for tuning all network parameters. A hybrid controller that integrates an adaptive control and a sliding control through a modulation function is developed to guarantee the convergence and stability of the control system. The experimental setup consists of a host computer, an encoder card, a D/A card and a two-axises robot. Simulations and experiments are performed to demonstrate the effectiveness of the proposed scheme.

Keywords : neural fuzzy network、robot control、nonlinear systems、adaptive control.

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