Trajectory Tracking Control System of Robot Manipulators Using Machine Vision

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ABSTRACT

This thesis develops a trajectory tracking control system of robot manipulators including actuators using machine vision. This control system is based on a personal computer equipped with a PCI-1784 encoder card, a PCI-1720U D/A card and a color CMOS. The control program is written by Borland C++. In the image process, the face image is firstly captured by the color CMOS. Nest, we use skin-color identification and an elliptic mask searching method to look for the center of the face in the image. Through reverse kinematics, this center coordinate is transferred to the desired tracking degrees of the two-axis manipulator. Moreover, we develop an adaptive neural fuzzy network controller to complete a good-performance trajectory tracking for the robot manipulator. In this control scheme, a neural fuzzy network (NFN) is constructed to online estimate the system uncertainties with the parameter learning phases. A supervisory controller is used to attenuate the effects of the approximation error on the tracking error, and adaptive tuning laws of network parameters are derived in the sense of the Lyapunov synthesis approach to ensure network convergence. Experiments performed on a two-link robot manipulator driven by DC servomotors demonstrate the effectiveness of our scheme.

Keywords : Neural fuzzy network ; Face detection ; Motion control ; Machine vision

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