C415440 : MAJOR CONTROL SYSTEM

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MONCHAI ASSAWAROONGRUENGCHOT : AN APPLICATION OF NEURAL NETWORKS TO THE DIRECT ADAPTIVE COMPENSATION OF MECHANICAL MANIPULATORS

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One of the important problems faced by the position control of a mechanical manipulator is parameter variations that cause errors in position tracking. In the thesis, the control scheme is composed of a controller and an adaptive compensator. The controller determines, via the computed torque technique, the nominal torques for the manipulator. The adaptive compensator is based on the backpropagation neural networks (BNN) which learn the functions of the manipulator's error model. Then, the weights of the output layers of the resulting BNN's are adjusted such that the errors converge to the neighbourhood of zero after a period of time.

The proposed compensators are tested via digital simulations. It is found that the system performs well. Furthermore, it is also found that the transient responses of the errors can be greatly improved if rule-based selections of the learning rates are used. Finally, the proposed system is proved to be stable in-the-large in the Liapunov's sense