

# Design and implementation of an intelligent predictive controller towards vision based application

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## Abstract

*Recently, automation systems have taken a great deal of attention due to the advances in computer technology and expanding demand for such techniques in the robotics. Additionally, the usage of artificial intelligence has also been to be used in the solution of many engineering problems. Artificial neural networks (ANN) are a widely used intelligent technique on this way*

*In this study, an intelligent predictive controller is designed for 3- joint robotic manipulator towards moving object capture. Generalized predictive control (GPC) algorithm and Elman neural network are used in the controller design. The GPC algorithm, which belongs to a class of digital control methods and known as Model Based Predictive Control, require long computational time and can result in a poor control performance in robot control. To overcome this problem, an Elman network controller is designed towards vision based application. The reason of the selection of Elman neural networks among several neural network architectures is that the presence of feedback loops has a profound impact on the learning capability of the network*

*The system includes a camera, a capture card and a software including all the dynamics and kinematics equations of the 3-joint robotic manipulator is used. Low and intermediate image processing algorithms are used. In the controller design section, a traditional GPC controller is firstly designed for this robot model towards vision based application. Secondly, a training and test sets are prepared by using obtained data from the GPC controller simulations. Then, Elman neural network is trained. The aim of the design of neural network is to reduce the process time. It is also observed that the process time for Elman controller is observed much less than GPC controller's. The used algorithms and their results were given with their results in this paper.*