

## Fuzzy Logic Control for Flexible Joint Manipulator: An Experimental Implementation

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**Abstract :** This study presents an intelligent control algorithm for a flexible robotic arm. Fuzzy control is used to control the motion of the arm to maintain the arm tip at the desired position while reducing vibration and increasing the system speed of response. The Fuzzy controller (FC) is based on adding the tip angular position to the arm deflection angle and using their sum as a feedback signal to the control algorithm. This reduces the complexity of the FC in terms of the input variables, number of membership functions, fuzzy rules, and control structure. Also, the design of the fuzzy controller is model-free and uses only our knowledge about the system. To show the efficacy of the FC, the control algorithm is implemented on the flexible joint manipulator (FJM) developed by Quanser. The results show that the proposed control method is effective in terms of response time, overshoot, and vibration amplitude.

**Keywords :** fuzzy logic control, model-free control, flexible joint manipulators, nonlinear control

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