CONTROL SIMULATION USING MODEL PREDICTIVE CONTROL AND PD-FEEDBACK COMPENSATOR FOR A FLEXIBLE CANTILEVER BEAM WITH SYSTEM IDENTIFICATION MODELLING

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ABSTRACT

Vibration is generally means as a movement back and forth periodically through the center of equilibrium. It has been much research done in controlling vibration. The variety of control system algorithms have also been widely used in vibration control, including the PI, PD, PID, feedback controller, and Predictive Control (MPC). Each of the many such algorithms have advantages and disadvantages. One of the advantages of the MPC algorithm is able to predict the dynamic behavior of the system in the future.

In this research, the robot arm is modeled as a flexible cantilever beam, which uses a piezoelectric as a damper actuator. Modeling is conducted by system identification with open-loop test to obtain the transfer function with the personal computer, data acquisition cards and Labview software. After getting the system model, then the MPC algorithm and the feedback compensator is simulated into the system using Matlab.

Modeling has been performed by the output error (OE) model which has a fitness value of 80.72%. The model is used to tune both MPC and feedback compensator control system parameter. For MPC algorithm, Prediction horizon was set to 54 and control horizon was set to 2 while for the feedback compensator, K_f value is 0.5. From the simulation, it is concluded that the MPC algorithm and the feedback compensator
work properly to meet the design specifications of the control system. MPC algorithm can reduce the settling time to be 2.15 seconds, while the feedback compensator can reduce the settling time to be 3.04 seconds. It’s also concluded that the MPC algorithm is better than the feedback compensator algorithm in reducing the settling time of the system.

**Keywords:** Flexible Cantilever Beam, Labview, Matlab, MPC, Feedback Compensator, Data Acquisition, Identification System.