

Sirichai Nithi-uthai 2008: Control of a One-Link Flexible-Joint Robot Using Backstepping Intelligent Control. Master of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Mr. Withit Chatlatanagulchai, Ph.D. 62 pages.

Flexible-joint robot manipulator is a manipulator that has flexibility at its joint to prevent damage from unintentional collision and impact. Having flexibility at its joint, the mathematical model of the manipulator is complicated and is in the nonlinear form. Finding this mathematical model from physical laws is difficult and requires many assumptions. As a result, the mathematical model is inaccurate and does not match the actual robot dynamic well. The control design from this inaccurate model has less efficiency.

This research presents control system design of a flexible-joint robot manipulator using backstepping intelligent method. Using backstepping structure and neural networks to approximate plant functions, the mathematical model from the physical laws, which is difficult to obtain accurately, is not required. This method can also be applied to other systems that are complicated, whose models are difficult to obtain accurately.

Simulation result of applying the backstepping intelligent method are compared with that of applying the backstepping method designed from exact model. The comparison shows that the backstepping method delivers better performance than the backstepping intelligent method because the design was performed on the exact model. However, actual experiments show the contrast. The backstepping intelligent method delivers better performance in actual experiments due to the fact that the model does not match the actual system perfectly.

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