

DYNAMIC MODELING AND CONTROL IN JOINT SPACE OF A SINGLE
FLEXIBLE LINK MANIPULATOR USING PARTICLE SWARM
OPTIMIZATION ALGORITHM

Author: *Bien Xuan Duong, My Anh Chu, Lac Van Duong, Nghia Khanh Truong*

*Military Technical Academy; xuanbien82@yahoo.com
Hanoi University of Science and Technology*

Abstract:

In this article, the nonlinear dynamic modeling and tip control methodology for a single flexible link manipulator are presented. In Lagrange approach, the nonlinear modeling is built based on finite element method (FEM) so that the elastic displacements effects of elements of the whole dynamic system can be included. The PID controller is designed in joint space with parameters which are optimized by Particle Swarm Optimization (PSO) algorithm. The research results play an essential role in modeling and analysis for the design and control of real industrial flexible manipulators. The control quality in PSO is better than in auto tuning mode for single flexible link manipulators. The results can be a foundation for selection of reasonable controllers and optimization algorithm while control designing for manipulators with serial flexible links.

Key words: Dynamic modeling; Manipulator; Flexible link; Control; Particle swarm optimization.