Abstract

This paper describes a hybrid approach to the problem of controlling flexible link manipulators in the dynamic phase of the trajectory. A flexible beam/arm is an appealing option for civil and military applications, such as space-based robot manipulators. However, flexibility brings with it unwanted oscillations and severe chattering which may even lead to an unstable system. To tackle these challenges, a novel control architecture scheme is presented. First, a neural network controller based on the robot's dynamic equation of motion is elaborated. Its aim is to produce a fast and stable control of the joint position and velocity and damp the vibration of each arm. Then, an adaptive Cerebellar Model Articulation Controller (CMAC) is implemented to balance unmodeled dynamics, enhancing the precision of the control. Efficiency of the new controller obtained is tested on a two-link flexible manipulator. Simulation results on a dynamic trajectory with a sinusoidal form show the effectiveness of the proposed control strategy.