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Abstract
This thesis is to investigate the possibility of making an ideal trajectory planning for single flexible beam's point-to-point motion control, so there is almost no flexural vibration after the positioning motion is completed. First, Hamilton's principle is used to derive the simple flexure model's governing equations and boundary conditions without considering the gravity effect. Then, the partial differential equations are nondimensionalized, and transformed into the state space form of the rigid body motion and two vibration mode's motion using the assumed-mode method. Meanwhile the mode shapes and natural frequencies of the two vibration modes are calculated for simulation. This thesis proposes a trajectory planning approach based on the mirror effect. Velocity profiles of T-curve, S-curve and cosine curve are tracked using a PD controller. The simulation results demonstrate the effectiveness of the mirrored trajectories in vibration suppression.
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