The Application of Precision Positioning Table with Filtered Sliding Mode Control

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ABSTRACT

This study is focused on the design problem for precision positioning system. For experimental requirements, the XY table system with the ball-screw driven mechanism was implemented for investigations. The PC-based control architecture, due to their open and flexible architecture, is applied to implement and validate the proposed control algorithm. Friction is one of the most significant sources of nonlinear disturbance for the motion control which caused by the relative motion of different contact surface at very low velocity. The nonlinear component of friction such as static friction and Coulomb friction should be overcome so that the tracking error will be eliminated. The experiments are divided into two parts. The first focuses on the precision positioning tasks and the second is the contour tracking tasks. The precision position experiments utilize the disturbance observer and sliding mode controller to achieve the precision positioning without feedforward compensation with friction model. The tracking problems are compensated by using the friction model combined with the high-gain observer to estimate velocity, which resists unnecessary disturbances by adding disturbance observer and filtered sliding mode controller.

Keywords : Precision position、Friction、Disturbance observer、 Sliding mode controller、High-gain observer

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