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Robust Control of a Two-Axis Piezoelectric Nano-Positioning Stage

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Abstract

This paper applies robust control to a two-axis piezoelectric nano-positioning stage. As technology develops, the precision requirement for positioning platforms is becoming increasingly stringent. Since a traditional mechanical transmission structure cannot achieve high precision, a piezoelectric actuator is usually applied to drive the mechanism because of its high resolution, high accuracy, and large driving force. However, the non-linear dynamic characteristics of piezoelectric materials, such as hysteresis, might degrade system performance. Therefore, in the present study, we model a piezoelectric stage as a linear system, and regard the nonlinear factors as system uncertainties. We then apply robust control strategies to guarantee system stability and performance. Lastly, the designed controllers are implemented for experimental verification. The results demonstrate the effectiveness of these robust controllers.