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Precision Robust Control for a Three Dimensional PZT Stage

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Abstract

This paper applies robust control to a three dimensional piezoelectric transducer (PZT) stage. PZT stages are usually applied for precision positioning. However, their nonlinear characteristics, such as hysteresis, might degrade system performance. Therefore, we applied robust control strategies to identify their system dynamics as linear transfer function matrices and regard their nonlinearities as system uncertainties which are treated by robust methodologies. The designed controllers are shown to achieve a root mean square error of less than 5nm (18nrad) for the linear (rotational) movement. Based on the experimental results, the proposed control methods are deemed effective in achieving nano-positioning control.