Modeling and Positioning Control of Piezo-actuated Stage with Genetic Algorithm

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ABSTRACT

In this thesis, the positioning and tracking task of the piezo-actuated stage is studied. For the piezo-actuators, its precision usually degrades due to hysteresis and creep effects. Therefore, the hysteresis nonlinearity should be modeled and compensated by the feedforward control. On the other hand, the creep effect is usually can be eliminated by the feedback control. In this paper, the hysteresis nonlinearity is modeled by using Bouc-Wen model and the parameters of hysteresis model are identified by applying the Genetic Algorithm, which is utilized to find the optimal modeling parameters. Moreover, to improve the positioning precision of the PZT positioning stage, a PI feedback control scheme with the feedforward controller combined the hysteresis observer is proposed. In the experiments, the X-Y piezo-actuated stage is used to track the contouring tracking tasks and to validate the proposed method.

Keywords : Genetic Algorithm, Hysteresis, Observer, Feedforward

Table of Contents

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