Precision Positioning Control of a Gantry Stage Based on Iterative Learning Control

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ABSTRACT

The iterative learning control (ILC) is designed to improve the system performance by iterative operations and it is used to modify the contour tracking error of a gantry stage by PD-type learning algorithm. For the contouring control of the gantry stage, there are two categories in the closed-loop control architecture and they are semi-closed loop control and fully-closed loop control. Semi-closed loop control only uses the encoder feedback of the motors and there exists gap problems due to the ball-screw mechanism. Fully-closed loop control uses the position feedback of the stage and it can compensate the gap problem. In this thesis, the iterative learning control (ILC) is integrated with the fully-closed-loop control to achieve precision tracking tasks. Besides, P-type learning and PD-typed learning algorithms are applied to achieve the repetitive tracking tasks and compare the resulting error from the semi-closed loop control. From the experimental results, it can be validated that the PD-type learning control is the best one and eliminate the gap problem successfully.

Keywords : fully-closed loop control, iterative learning control, gantry stage, contour tracking

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