The Iterative Learning Control of Hydraulic Cylinder Position Control System

曾偉誠、陳志鏗

E-mail: 9612398@mail.dyu.edu.tw

ABSTRACT

The iterative learning control (ILC) learns the unknown information from repeated control operation and can be used as the modification experience for the future control. Hence, ILC controller can make the system tracking error converge to a small region within a limited number of learning trials. This thesis considers the position control problem of a single-rod hydraulic cylinder with proportional valve. We derive its nonlinear mathematical model. However, the accurate system parameters are not easy to find and can''t be used for the controller design directly. Therefore in this study, we use system identification method to estimate the linear system model, and use two-dimensional theory to design ILC controller for the position tracking control of the hydraulic cylinder. We used PID controller and ILC controller in the computer simulation and experiment implementation. The results are analyzed and compared for each controller. Experimental results indicate that ILC controller can effectively handle repetitive trajectory tracking problem, especially in transient response that traditional control method can''t appropriate solve. Therefore, in this application, the control performance of ILC is better than the traditional PID controller.

Keywords : Proportional valve ; Hydraulic cylinder ; Iterative learning control(ILC) ; Two-dimensional system ; PID control ; System identification

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