SLIDING-MODE-PID CONTROLLER DESIGN FOR MAGNETIC LEVITATION SYSTEM

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Tóm tắt bằng tiếng Việt:

Emission from vehicles is one of reasons causing environmental pollution and affecting to human health. Magnetic levitation (Maglev) train with high speed, comfort, low energy consumption and low emission is a good solution to solve this problem. Study about Maglev system which is presented in this paper is foundation to develop Maglev trains. The paper presents a sliding mode control (SMC) combined PID (PID-SMC) control for issues of regulation and tracking of a Maglev system with uncertainty. First, nonlinear dynamics model of magnetic levitation system is built. Second, a PID controller, whose gains are chosen suitably in order to guarantee the stable state, is applied. Next, to increase the robustness of the system and requirement of uncertainty bound in the design, a SMC controller is proposed to compensate the uncertainties of the dynamics system. All gains of sliding mode control system are generated by experimental method. Final, a composite controller consisting of a PID plus a SMC algorithm is proposed to enhance overall tracking performance. The effectiveness of controllers is verified through experiment results

Từ khóa: Magnetic levitation (Maglev); sliding mode control (SMC); PID combined; SMC; PID-SMC.

Tóm tắt bằng tiếng Anh:

Emission from vehicles is one of causes of environmental pollution and threat to human health. Magnetic levitation (Maglev) train with high speed, comfort, low energy consumption and low emission is a good solution to this problem. This paper studies Maglev system as a foundation to develop Maglev trains. The paper also presents a sliding mode control (SMC) combining PID (PID-SMC) control for issues of regulation and tracking of a Maglev system with uncertainty. First, nonlinear dynamics model of magnetic levitation system is built. Second, a PID controller, whose gains are chosen suitably in order to guarantee the stability is applied. Next, to increase the robustness of the system and requirement of uncertainty bound in the design, a SMC controller is proposed to compensate the uncertainties of the dynamics system. All gains of sliding mode control system are generated by experimental method. Finally, a composite controller consisting of a PID plus a SMC algorithm is proposed to enhance overall tracking performance. The effectiveness of controllers is verified through experiment results.

Key words: Magnetic levitation (Maglev); sliding mode control (SMC); PID combined; SMC; PID-SMC.