URN etd-0407109-183707-493
Author xuan-meng Shi
Author's Email Address No Public.
Statistics This thesis had been viewed 47 times. Download 89 times.
Department
Year 2006
Semester 1
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title Applications of Sliding Mode Control Algorithm for Precision Servo-Motion-Control Systems
Date of Defense 0000-00-00
Page Count 65

Keyword
sliding mode control
robustness
motion control

Abstract
For precision motion control systems, PID control algorithm cannot effectively compensate the control errors resulted from the non-linear phenomena such as friction, backlash, and hysteresis. On the other way, learning control algorithm may have better performance but it requires huge hardware and software resources. Furthermore, it still has excessive errors around transient situation as system parameters change. In addition, the nonlinear phenomenon of friction, backlash, and hysteresis will vary under different application environments. Hence, in this research, a robust sliding mode control algorithm is developed for a single-axis motion control system by using the DSP motion control board. As a result, the developed sliding mode control algorithm can effectively reduce the control errors due to the friction, backlash, and hysteresis.
For sliding mode control algorithms, the chattering phenomenon will result in the high-frequent resonance. In this research, a sliding layer is used to improve the chattering problems. However, the sliding layer will reduce the control accuracy and increase motion errors as well. In order to improve the control accuracy and avoid the chattering at the same time, it is necessary to obtain the optimum values of control parameters, which are the system bandwidth, the thickness of sliding layer, and the convergence parameter. Traditionally, it is not straightforward to obtain the optimum values of these control parameters. In this research, it has been shown that the control errors and chattering are very sensitive to the system bandwidth. Hence, an auto-tuning algorithm for the system bandwidth under the conditions of fixed sliding layer thickness and convergence parameter are established. Consequently, the closed-loop system has maximum bandwidth and minimum control errors without chattering. The results have been verified by experimental works.
Advisory Committee - advisor

Files etd-0407109-183707-493-003.pdf
etd-0407109-183707-493-001.pdf
etd-0407109-183707-493-002.pdf

indicate access worldwide
Date of Submission 2007-01-31