DC Brushless Motor Drive System for Stringing Machine

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ABSTRACT

This research develops a digital embedded DC brushless motor drive system for stringing machine. Based on Microchip dsPIC30F2010 microprocessor, the software is designed to integrate an interface circuit, a force measurement circuit and a motor driver. A robust force control law is derived to overcome the disturbance resulted from the stiffness variation of the different strings. The proposed control scheme obtains a precision force accuracy for the various stringing processes, and also solve the motor current oscillation problem. A three-phase MOSFET bridge and hall-effect position sensors are designed for PWM motor control. A protection circuit is designed to suffer a big stringing current over 3 A, and overcome the back emf caused by an instantly shutting down the motor. Using many build-in functions in the microcontroller, the software is developed to replace the external circuits, including A/D, PWM generators, decoded circuits of encoders and noise-rejected circuits. The embedded system is an all-digital design to simplify the electrical circuit for the DC brushless motor drive system. Finally, experiments performed on a practice stringing machine demonstrate the effectiveness of the proposed control methodology.

Keywords : DC brushless motor drive、force control、embedded control、robust control

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