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Article

Sliding-Mode Speed Control of PMSM with Fuzzy-Logic Chattering Minimization—Design and Implementation

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Abstract: In this paper a Sliding Mode Control scheme (SMC) applied to the Permanent Magnet Synchronous Motor (PMSM) speed control is designed and improved. A Fuzzy logic algorithm is added to mitigate chattering caused by discontinuous term in steady states, and to ensure good performances of the controller in transient states. The proposed Fuzzy-SMC performance is tested in simulation and experimental results are obtained using eZdsp F28335.

Keywords: Magnet Synchronous Motor (PMSM); speed control; sliding mode control; fuzzy logic algorithm; vector control; simulation; experimental validation

1. Introduction

Numerical PMSM control drives are extremely improved by the development of calculators, especially digital signal processors (DSPs). Consequently, nonlinear control methods are introduced to improve control performances for systems with different undesirable disturbances and uncertainties *i.e.*, adaptive control [1], robust control [2], direct torque control [3], intelligent control [4] and sliding mode control (SMC) [5]. This last technique is applied in many control fields [6,7] in addition to sensorless control.