

Variable structure system with sliding mode controller

Abstract

This paper describes the application of sliding mode variable structure control (SMVSC) concept for DC motor position control. A mathematical procedure for determining the values of the gains of variable structure system (VSS) controller (α , β) and the slope of switching line (c) are mentioned and obtained mathematically but optimized values, also, achieved by using MATLAB/Simulink design optimization toolbox - signal constraint by applying gradient descent optimization method. The proposed control scheme is derived, simulated and tested thoroughly by using MATLAB/Simulink package software Ver. 7.10/Version 7.5 (R2010a) respectively. The control-system schematics are given and sample results are shown for three types of controllers (Proportional (P), three terms PID and sliding mode variable structure controllers). The SMVSC simulation should be of interest to design engineers who wish to demonstrate and investigate sophisticated position-control methods and their applications. This simulation may also serve as a basis for further applications of SMVSC in other engineering fields.

Keywords

DC motor; MATLAB/Simulink; Sliding mode; Variable structure control/system