

A Piecewise Affine PI Controller for Buck Converter Generated DC Motor

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Abstract:

This paper proposes a new Piecewise Affine Proportional-Integral (PA-PI) controller for angular velocity tracking of a buck converter generated dc motor. A Safe Experimentation Dynamics (SED) algorithm is employed as a data-driven optimization tool to find the optimal PA-PI controller parameters such that the integral square of error and input are reduced. The essential feature of the PA-PI controller is that the parameters of proportional and integral gains are adaptive to the error variations according to the Piecewise Affine (PA) function. Moreover, the proposed PA function is expected to provide better control accuracy than the other existing variable structure PID controller. In order to verify the effectiveness of the PA-PI controller, a widely known buck converter generated dc motor is considered. The performances of the proposed controller are observed in terms of the integral square of error and input, and the responses of the angular velocity and duty ration input. The simulation results verify that the proposed PA-PI controller yields higher control accuracy than the other existing controllers of buck converter generated dc motor.

Keywords: Piecewise Affine; Proportional-Integral; Safe Experimentation Dynamics