

A Fictitious Reference Iterative Tuning Method for Buck Converter-Powered DC Motor Control System

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Abstract:

This paper presents a model-free optimization algorithm for a PID controller based on Fictitious Reference Iterative Tuning and Simulated Kalman Filter. The modeling of a buck converted-powered DC motor system is first provided to form the basis of data collection and fictitious reference signal derivation. The supplied model is however not a necessity in the scope of this work but is provided for the purpose of performance comparison. A cost function is formulated based on the minimization of error between the output response of the desired model with the output response of the closed-loop system. Simulation analyses using Matlab Software have been conducted for results validation and verification. Furthermore, a performance comparison between the proposed method and a model-based controller design has been carried out. From the numerical example, it shows that the system with the tuned PID controller exhibited a better angular velocity trajectory tracking compared to the system with the state feedback controller with integral gain.

Keywords : Fictitious Reference; Model-Free; Simulated Kalman Filter; Controller Tuning; PID Control

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