System Identification for a Mathematical Model of DC Motor with PI Controller

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Abstract

A mathematical model has been proposed for some system that involves a DC motor. It is important to have the best mathematical model as it will improve the performance of the system itself, especially with an existence of a controller. In this study, a DC motor with PI controller will undergo a system identification process where the concept of poles and zeros will be applied by using the MATLAB/Simulink software. Cohen-Coon tuning method also will be used in order to tune the proposed controller's parameters. Furthermore, several test were performed by varying the value of poles and zeros. Comparison will be made between the performance of DC motor PI controller with and without the system identification technique in terms of transient response characteristics. It is clear form the study that system identification is essential to ensuring that the DC motor's performance may be improved. In light of this explanation, the DC motor PI controller with three poles and no zero performs better than the others. Its rising time was 0.082s, settling time was 2.333s, peak time was 1.223s with overshoot was slightly greater at 52.14 percent, and there was no steady-state inaccuracy.

Keywords: DC motor; MATLAB/Simulink; Mathematical model; Poles and zeros; System identification; Transient response.