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DC Motor Parameter Identification Using Speed Step Response

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ABSTRACT

The objective of this paper is to estimate the parameters of a DC motor based on its speed response as a step voltage input is applied. A series of measurements which represent input and output data of the DC motor were taken in the lab. DC motor model was created and built into Matlab/Simulink. Off-line identification methods were used to identify the motor parameters and to develop an approximate transfer function. The parameters under consideration are the motor armature-winding resistance and inductance, back e.m.f. constant, motor torque constant, moment of inertia, and the viscous friction. The parameters were obtained using two identification methods; the MATLAB Parameter Identification Toolbox and Constraint Optimization Toolbox. In both methods, the comparison between the experimental and simulated step responses showed good agreement. The parameters of the DC motor were found to be as follows: motor armature-winding resistance = 2.937Ω , inductance = 0.040437 H, back e.m.f. constant = 0.6571 v/rad/sec, moment of inertia = 0.064744 kgm², motor torque constant = 0.6571 Nm/A, and the viscous friction coefficient = 0.04867 Nm/rad/sec.

Keywords: Parameters Identification, Constrained Parameters Optimization, ITAE PID Tuning