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Abstract

An automatic tuning algorithm for speed control of separately-excited DC motors with DC chopper drive is proposed. The use of frequency response technique to estimate the parameters necessary for tuning is emphasized. The tuning is automatically performed as follows. As the motor is at a standstill, the frequency response test is carried out to estimate the armature resistance and inductance of the motor. Then the speed is gradually increased until it is in the vicinity of the desired speed. The frequency response test is done again to obtain the parameters relating the mechanical time constant. These parameters are used for tuning the PI controllers in both the current loop and the speed loop.

The proposed algorithm is implemented on a PC and tested on a motor driven by an IGBT DC chopper. The parameters estimated by this method are fairly accurate as verified by comparing simulation results with experimental results. These results are obtained from both the open loop testing, when no control is attempted and closed loop testing, when the PI controllers are in both loops. The advantage of the frequency response technique is that it provides the parameters of the system near the operating point. As a consequence, the closed loop system designed by using these parameters gives a predictable control performance.



Committee Chairperson.