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Performance Assessment of BLDC Motor Drives Under ANN and PID Control Strategies: A Review

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Abstract: *Brushless DC (BLDC) motors are widely utilized in electric vehicles, robotics, and industrial automation owing to their high efficiency, compact structure, and precise controllability. The dynamic performance of BLDC drives, however, largely depends on the effectiveness of the control strategy employed. Conventional Proportional–Integral–Derivative (PID) controllers are simple to implement but often face limitations such as sensitivity to parameter variations, nonlinearities, and load disturbances. On the other hand, Artificial Neural Networks (ANN) offer an adaptive and intelligent control approach capable of handling system nonlinearities and improving robustness. This paper presents a comprehensive performance assessment of BLDC motor drives under ANN and PID control strategies. The study evaluates speed response, torque characteristics, overshoot, settling time, and steady-state error through simulation results. Comparative analysis demonstrates that while PID provides satisfactory performance under nominal conditions, ANN-based control exhibits superior adaptability, reduced overshoot, and faster dynamic response under varying load and parameter disturbances. The findings highlight the potential of ANN as an effective alternative to conventional PID control in achieving high-performance BLDC motor operation.*

Keywords: BLDC Motor Drives, PID Control, Artificial Neural Networks (ANN), Intelligent Control, Performance Assessment, Dynamic Response, Comparative Analysis

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