Speed Control of Electric Vehicles Using Adaptive PID Controller

ABSTRACT:

Electric vehicles (EVs) are broadly utilizing for their High Efficiency, high torque, low volume and gained significant attention due to their potential for reducing carbon emissions and reliance on fossil fuels. To maximize the performance and efficiency of EVs, precise speed control is crucial. This analysis presents the design and implementation of an Adaptive Proportional-Integral-Derivative (PID) controller for the speed regulation of an Electric Vehicle using MATLAB Simulink. The proposed Adaptive PID controller aims to enhance the performance of traditional PID controllers by dynamically adjusting its parameters based on the system's characteristics. The adaptation mechanism allows the controller to automatically tune its gains to optimize the closed-loop system's response, ensuring robust and efficient speed control across a range of operating conditions. The Adaptive PID controller is then designed to regulate the speed of the Electric Vehicle by adjusting the control signals in real-time. This Research will demonstrate the effectiveness of the Adaptive PID controller in achieving precise and rapid speed control of the Electric Vehicle. This analysis highlights the fast time response in terms of transient response, settling time, and disturbance rejection. The adaptive nature of the controller ensures robust operation in the face of parameter variations and uncertainties in the motor system. This research contributes to the understanding of control strategies for electric vehicles, which is crucial for achieving energy-efficient and reliable electric transportation. The findings can be used to enhance the design and implementation of speed control systems in electric vehicles, ultimately promoting their adoption and sustainability in the automotive industry.

KEYWORDS: Electric Vehicles, Speed Control, Adaptive PID Controller, MATLAB Simulation, Control System Design.

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