



EV Regenerative Braking System using Scilab Xcos

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Abstract

Electric vehicles are becoming increasingly important due to their energy efficiency and environmental benefits. One major challenge in electric vehicles is the loss of kinetic energy during braking. This case study focuses on the modeling and simulation of an intelligent regenerative braking system for a generic electric vehicle using Scilab Xcos. The main objective of the project is to recover energy normally lost during braking and convert it into reusable electrical energy to improve battery efficiency.

The proposed system includes vehicle speed dynamics, brake input, regenerative braking torque generation, and a battery charging mechanism. A closed-loop PI controller is used to regulate braking force and provide controlled vehicle deceleration. During braking, the electric motor operates in generator mode and converts mechanical energy into electrical energy, which is directed back to the battery. The performance of the system is evaluated using graphical analysis such as vehicle speed response, braking torque characteristics, battery charging behavior, and energy recovery efficiency. The simulation demonstrates how regenerative braking can improve energy utilization and enhance the overall efficiency of electric vehicles.

1. References

1. Energy-Regenerative Braking Control of Electric Vehicles Using Three-Phase BLDC Motors, Research Paper, 2014.

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2. Regenerative Braking Systems in Electric Vehicles: Review and Control Strategies, Energies Journal, 2025.

Link: [Regenerative Braking Systems in Electric Vehicles: A Comprehensive Review of Design, Control Strategies, and Efficiency Challenges](#)