

Improving Efficiency of Electric Vehicles: An Energy Management Approach Utilizing Fuzzy Logic

Muthuvel Raj Suyambu¹ and Pawan Kumar Vishwakarma²

BESS Projects, Energy Vault, California, USA¹

Independent Researcher²

raj.suyambu@energyvault.com and PKV98205@outlook.com

Abstract: The idea behind it is as simple as the development of electric vehicles (EVs) necessitates addressing their disadvantages like lower range, suboptimal acceleration, and battery durability. Typical EMSs usually have issues of versatility and ability to update and control instantly, which are critical for enhancing the efficiency of the EV. This research examines ways in which fuzzy logic-based control systems could enhance energy control in EVs, specifically, emphasising battery and ultracapacitor technology. Specifically, rule-based control and model predictive control, which are traditional EMS techniques, lack the needed flexibility and real-time dynamic computation. Unlike this, the fuzzy logic system is more flexible and adaptive to the situations of real-life driving conditions. Thus, within the framework of this research, fuzzy logic is used to design and test sophisticated EMS solutions that improve energy management, integrate renewable sources of energy, and increase vehicle efficiency. The study shows how adopted fuzzy logic trove drawbacks of conventional approaches in the way of better decision-making and performance. This approach provides working knowledge on how to engineer and construct fuzzy logic control systems and involves issues to do with fuzzification, the rule base, inference and defuzzification. The study advances the capabilities of current electric vehicles by exploring and developing more efficient and dependable energy management systems

Keywords: Electric Vehicles, Energy Management System (EMS), Fuzzy Logic, Hybrid Power Sources, Model Predictive Control.