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Battery Management System for Electric Vehicles

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Abstract: The integration of battery management with automation plays a crucial role in optimizing electric vehicle (EV) operations. This paper presents an advanced Battery Management System (BMS) designed to monitor and control key battery parameters, including voltage, current, temperature, and state of charge, in real-time. The system leverages embedded technology with the ESP32, enabling seamless data acquisition and automated control mechanisms for enhanced battery performance and safety [2]. This integration enhances user interaction by providing real-time insights and intelligent control over the battery's health, ensuring improved efficiency, reliability, and longevity [4]. Additionally, the system aids in cost reduction by preventing battery failures, optimizing charging cycles, and supporting informed decision-making [3]. The paper discusses the technical architecture and key benefits of implementing this system in electric vehicles. Furthermore, various applications of this technology are explored, including its role in energy management, safety enhancements, and sustainable transportation [5]. The findings highlight the potential of embedded-driven battery management systems in transforming EV operations by improving performance, ensuring safety compliance, and extending battery life [1].

Keywords: Battery Management System (BMS), ESP32, Lithium-ion Battery, Embedded Systems, Power Management, Thermal Management



