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Battery Management System with Safety Features

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Abstract: *The increasing demand for electric vehicles and renewable energy storage systems necessitates advanced Battery Management Systems (BMS) to enhance battery performance, longevity, and safety. This project introduces a comprehensive BMS designed to efficiently manage lithium-ion battery packs by integrating hardware and software components to monitor and control cell voltage, temperature, and state of charge. Key safety features, including overcharge and over-discharge protection, thermal management, and a robust fault detection mechanism, are implemented to prevent hazardous conditions and ensure battery longevity. The system employs sophisticated cell-balancing algorithms, real-time data logging, and advanced communication protocols for remote monitoring and proactive maintenance. Experimental results validate the BMS's effectiveness in maintaining battery health, maximizing energy storage capacity, and providing a safe operating environment, underscoring its potential to significantly impact the advancement of safe and efficient energy storage solutions across various applications.*

Keywords: Battery Management System, lithium-ion, safety features, cell balancing, energy storage