

**DESIGN AND ANALYSIS OF THE ELECTRICAL SYSTEM FOR A
PARALLEL HYBRID GO-KART : BATTERY MANAGEMENT SYSTEM**

By

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

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ABSTRACT

Design and Analysis of the Electrical System for a Parallel Hybrid Go-Kart: Battery Management System

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The global shift toward sustainable transportation has accelerated the development of alternative propulsion systems, making small-scale platforms like parallel Mild Hybrid Electric Vehicle (MHEV) go-karts ideal for practical engineering research. However, high transient loads in these hybrid powertrains often cause severe voltage sag and localized thermal compounding in budget 18650 Lithium-Ion cells, leading to inaccurate telemetry and potential thermal failure. To address this, this research develops a cost-effective 48V 13S6P battery architecture integrating a galvanically isolated active thermal management system and an Arduino-based Coulomb Counting algorithm for precise State of Charge (SOC) tracking. Empirical testing under dynamic loads confirms that this open-source architecture successfully sustains system voltage above the 39.0V critical cut-off during maximum torque-fill events, while the custom telemetry achieved a 96.62% accuracy match compared to commercial ECU benchmarks. In conclusion, this budget-friendly hybrid energy architecture successfully prevents thermal runaway and bypasses severe voltage fluctuations, providing a highly accurate, stable, and scalable power management system for small-scale electric vehicles.

Keywords: State of Charge (SOC), Real-Time Telemetry ,Parallel Hybrid Architecture,Battery Management System (BMS)



DEDICATION

I dedicate this work to God, my Lord and Savior.

I dedicate this work to my family, who have supported me throughout my life.

I dedicate this work to my friends who have always helped me throughout my work.

I dedicate this work to the country I love, Indonesia.



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