ENHANCED ELECTRIC PROPULSION AND STABILITY CONTROL IN TWO-WHEELED VEHICLES

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Introduction/ background

To combat air pollution and address climate change, our project presents a novel method to sustainable mobility through the production of electric bikes with zero emissions. By using clean energy sources, these bikes put conservation of the environment first. Our main goal is to apply cutting-edge control technologies that maximize battery life, increase range, and control temperature while maintaining daily usability. To improve self-sufficiency and preserve energy, we develop the first regenerative braking system. Self-stability features are one example of an innovation that promises safety and a smooth riding experience. Elevate EV safety standards with several redundancy procedures and a complex cluster system that offers real-time insights for informed riding.

Objective

The objective of the project is to build an Electric two-wheel vehicle achieving all the system that is more improvised and has the following features: -

1. **Sustainable Transportation: Innovative Zero-Emission Electric Bikes:** To develop an electric bike that benefits the environment by emitting zero tailpipe emissions, reducing air pollution, and combating climate change. They are more energy-efficient than traditional vehicles. Assuming the energy needed to power this drive is generated from a clean source.
2. **Advanced Control for Extended Battery Life, Range and Temperature:** Our primary goal in developing a sophisticated control system to improve electric bike efficiency is to extend battery life and improve overall range. We aim to maximize energy efficiency through innovative engineering, making electric bikes more reliable and practical for daily use.
3. **To develop a mild regenerative system to extend the life of the battery:** Developing an innovative approach, we aim to utilize regenerative braking to power auxiliary systems on the electric bike. This not only enhances energy efficiency but also contributes to a more sustainable and self-sufficient riding experience.
4. **To attain self-stability which maintains the bike in a perfect balance:** Our goal is to introduce a novel self-stability feature that ensures the electric bike always maintains perfect balance. This advancement not only improves safety but also provides riders with an unrivaled and effortless riding experience.

5. **To enhance the safety of EV by adding multiple redundancy protocols:** We are implementing multiple redundancy protocols to strengthen the security of electric vehicles as part of our commitment to safety. This approach ensures a dependable and fail-safe system, improving overall EV safety standards.
6. **Cluster:** Processing data from all sensors and presenting it on the cluster simplifies the rider's understanding of crucial parameters for a safe journey.

Methodology

We build a dynamic propulsion system by carefully integrating key parts, including a sturdy 2KW Brushless DC (BLDC) Motor, a 60V lithium-ion battery, and a Battery Management System (BMS). By effectively capturing and storing motor energy, our ground-breaking regenerative braking system can potentially save up to 360W of power and improve sustainability. In addition, a self-stabilizing system that priorities rider comfort and safety in a variety of conditions is powered by a servo motor and tracked by sensors. High-voltage fuses and twin kill switches are examples of integrated safety elements that improve overall safety standards and enable quick reactions in an emergency. Our dedication to developing an electric bike that is exceptional in terms of efficiency, sustainability, and rider safety is demonstrated by our all-encompassing approach.

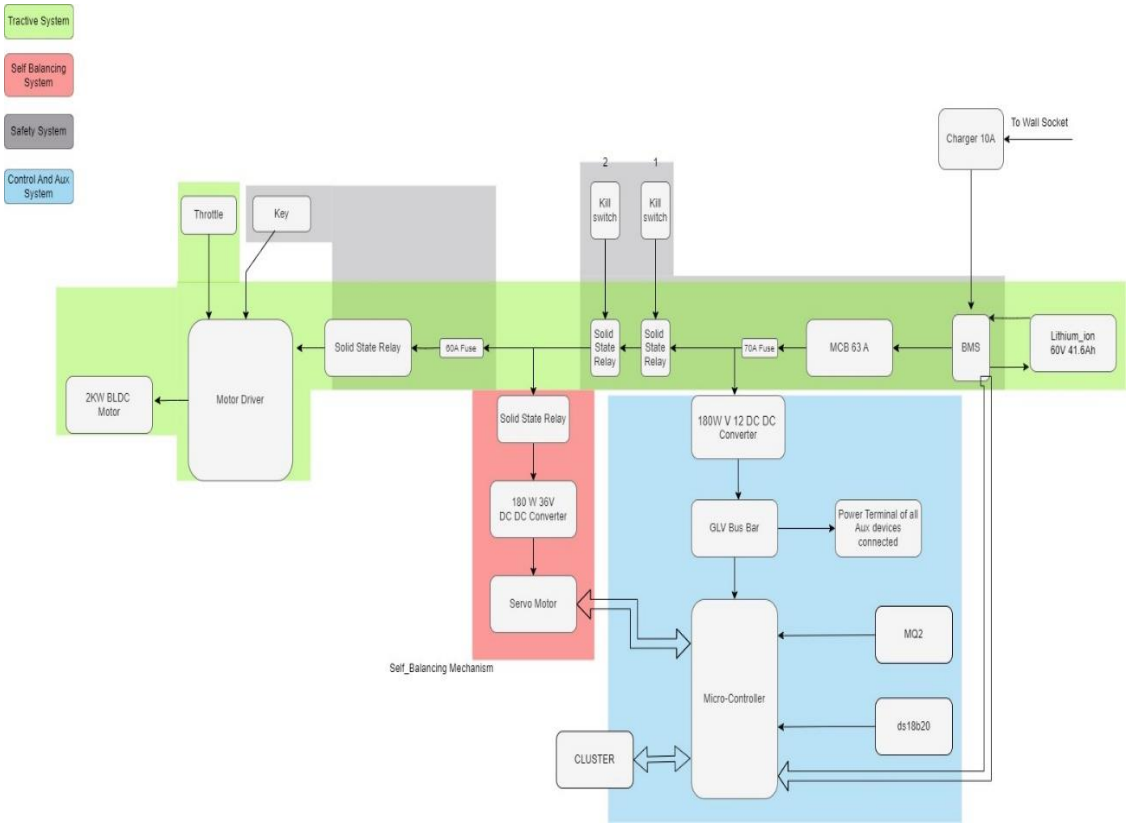

Figure.1. Block Diagram

Results and Conclusion

Figure.2. Hardware Implementation

Figure.2. shows the hardware implementation, the system is powered by a 50V lithium-ion battery with a 41Ah capacity. A Battery Management System (BMS) controls its charging and protects it from damage. The BMS connects to a solid-state relay (SSR) that turns the battery on and off. It also supplies two DC-DC converters: one steps down voltage to 12V DC for a motor driver powering a 2KW BLDC motor, and the other provides 36V DC to auxiliary devices. An overload protection system (OLV bus bar) might cut power in case of excess current.

Scope for future work

The future of electric bikes looks promising. Imagine being able to call upon your ready-to-ride, unlocked e-bike using your phone. By giving back extra power, V2G technology may even enable e-bikes to contribute to a greener grid. Advanced cluster control, which allows bikes to communicate and change positions in groups, is one characteristic that cyclists may notice. Professional racing teams may possibly benefit from this technology. Future e-bikes may also have sophisticated stability control systems, which would increase cycling accessibility for those with physical restrictions. We can anticipate many more features that make e-bikes an accessible, eco-friendly, and inclusive mode of transportation as technology develop