DESIGN AND DEVELOPMENT OF AUTO POWER CONVERSION OF EV TWO-WHEELER

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Keywords:

Hybrid vehicles, ESP32 microcontroller, Power distribution, Battery system, Real-time monitoring, Energy efficiency, Smooth transitions, User-friendly interface.

Introduction:

The integration of Hybrid Electric Vehicles (HEVs) into automotive engineering stands as a milestone, merging internal combustion engines with electric motors to bolster fuel efficiency and cut emissions. However, managing power distribution between these sources, particularly during low battery levels, poses challenges. In response, our paper proposes a pioneering control system utilizing an ESP32 microcontroller as the central unit. This system adeptly toggles between electric and fuel propulsion modes based on preset thresholds, optimizing vehicle efficiency and ensuring uninterrupted operation.

Building upon existing research, our work emphasizes real-time monitoring and visual feedback mechanisms to enhance user experience and reliability. By addressing these hurdles, we aim to advance hybrid vehicle technology, fostering broader adoption and contributing to a more sustainable automotive landscape. Moreover, we detail our specific contributions within the realm of hybrid two-wheelers, underscoring the practical application of our proposed control system in this context.

Objectives:

The objectives of this project are:

1. Design an auto control system, which switches from battery system to petrol system and vice versa.
2. Monitoring battery level.
3. Monitoring fuel level.

Methodology:

The proposed methodology entails the utilization of an ESP32 microcontroller as the central control unit, orchestrating the operation of peripheral components to seamlessly switch between battery and petrol systems based on predefined thresholds.

Firstly, the system initializes all sensors, including the voltage sensor for monitoring battery status and the level sensor for monitoring fuel levels, along with the relay module for control switching. Upon initialization, the ESP32 continuously receives updates from these sensors regarding battery and fuel levels.

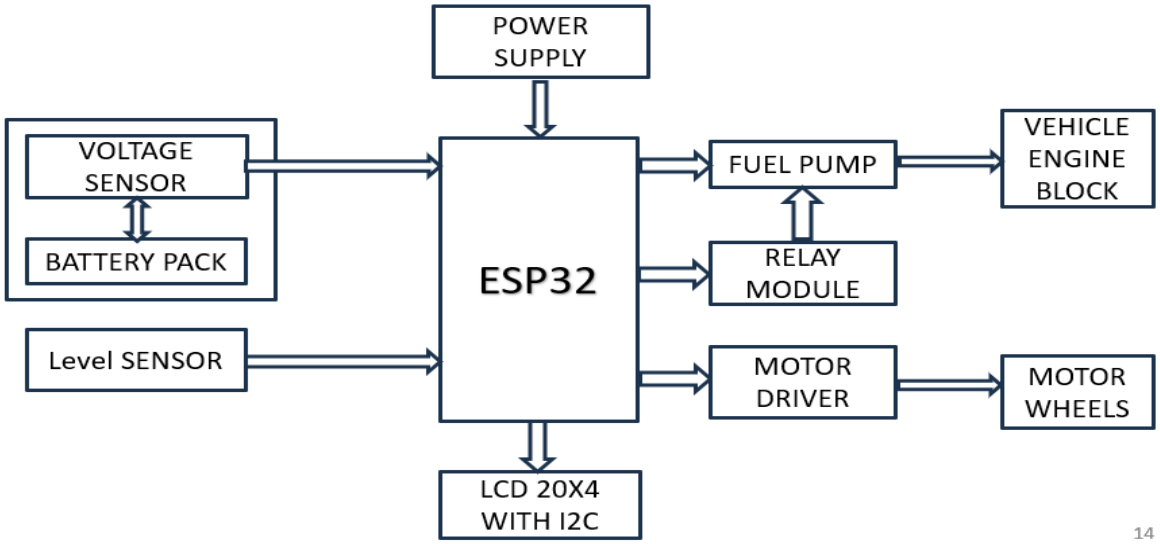

Fig 1: Block diagram of Hybrid Power system of two-wheeler

When the battery level drops below 20%, signified by the voltage sensor, the ESP32 triggers the relay module to switch control from the motor drive to the fuel pump. This initiates the flow of fuel to the vehicle engine, ensuring continuous motion. Subsequently, the fuel tank capacity is assessed, and if it falls below 20%, a notification is displayed on the LCD screen prompting refueling.

Conversely, if the battery level exceeds 20%, the ESP32 maintains control over the motor drive, propelling the vehicle using electric power. The process continues uninterrupted until the battery level drops below the predetermined threshold.

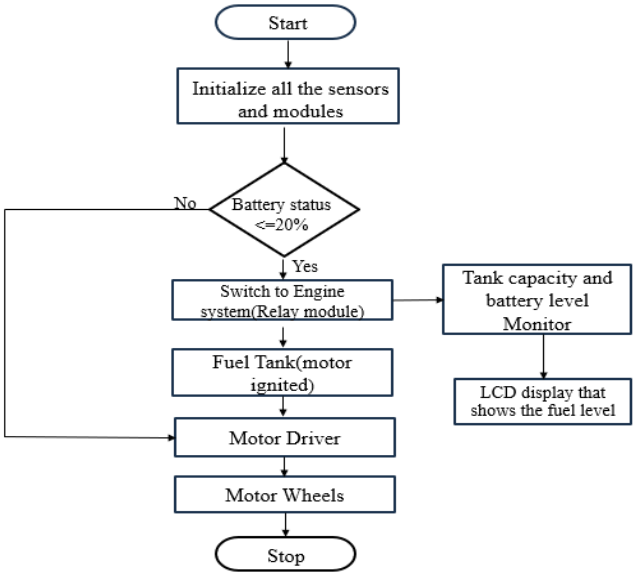

Fig 2: Flowchart of the Hybrid Power system of two-wheeler

Throughout the operation, real-time instructions and status updates are relayed to the user via the LCD screen, enhancing user monitoring and interaction. This iterative process ensures the efficient and reliable operation of the hybrid vehicle, seamlessly transitioning between power sources to maintain continuous motion while optimizing energy usage.

Conclusion:

The implementation of the proposed control system utilizing the ESP32 microcontroller has yielded promising results, demonstrating its efficacy in seamlessly managing power distribution between the battery and petrol systems in hybrid vehicles

Fig:1 System in battery mode monitoring the battery level

Fig 1, the system operates in battery mode, monitoring the battery level using voltage sensors, ensuring efficient energy utilization for electric propulsion

Fig:2 Switching from battery to petrol mode

Fig 2 illustrates the seamless transition from battery to petrol mode, ensuring continuous mobility and user convenience during longer journeys or low battery conditions

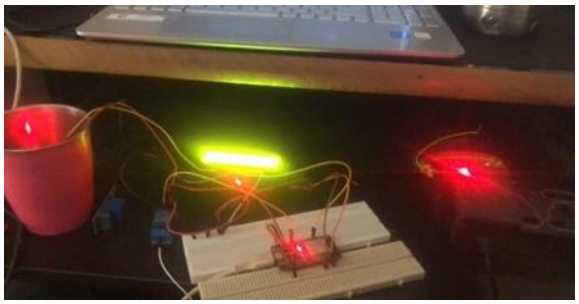

Fig :3 Hybrid Power system of two-wheeler

Fig 3 depicts the hybrid power system of the two-wheeler, showcasing the harmonious fusion of electric and petrol propulsion for optimized energy utilization and versatile riding experience

Fig :4 Switching from petrol to battery mode

Fig 4 showcases the smooth switching from petrol to battery mode, leveraging the ESP32's intelligent control logic to ensure dependable and balanced energy usage for efficient urban commuting and extended mobility.

Overall, the envisioned outcome is a technologically advanced, sustainable, and versatile two- wheeler transportation solution that caters to the diverse needs of riders, offering an efficient and dependable commute option.

Scope for future work:

In future, enhancing the proposed hybrid vehicle control system could involve integrating advanced machine learning algorithms to predict energy usage patterns accurately. Incorporating renewable energy sources like solar panels and regenerative braking systems would further optimize efficiency and reduce reliance on conventional fuels. Expanding monitoring capabilities to include parameters such as temperature and vehicle speed could offer deeper insights into performance and enable more precise control adjustments. Exploring wireless communication protocols for data transmission could streamline system complexity and improve scalability. Field trials under diverse conditions would validate system robustness and reliability. Collaboration with automotive manufacturers to integrate the system into commercial vehicles could expedite market adoption. Developing user-friendly

interfaces and mobile applications for remote monitoring and control would enhance user experience. Continued research into battery and electric motor technology advancements is essential for improving energy storage, charging efficiency, and overall system performance, ensuring hybrid vehicles remain at the forefront of sustainable transportation solutions.