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ELECTRIC BICYCLE USING SOLAR

Misba Shikalgar[*1], Pragati Patil[*2], Shreyash Inamdar[*3], Ms. Supriya S. Karadge[*4]

[*1,2,3]Student, Dept. Of Electronics & Telecommunication, Dr. J. J. Magdum College Of Engineering, Jaysingpur, Maharashtra, India.

[*4]Assistant Professor, Dept. Of Electronics & Telecommunication, Dr. J. J. Magdum College Of Engineering, Jaysingpur, Maharashtra, India.

ABSTRACT

An abstract An electric bicycle is a sustainable way to enhance the bike's range and reduce reliance on traditional charging methods. This design of the bicycle uses solar panels to convert sunlight into electricity, which charges the bike's battery. Because solar charging offers benefits such as: Environmentally friendly: It reduces carbon emissions compared to vehicles with internal combustion engines. Cost-saving: Solar energy is free, which can significantly reduce electricity costs. However, its effectiveness depends on sunlight availability, and the charging process is generally slower compared to traditional methods. Solar bikes can be used for short-distance traveling. In areas with limited sunlight or during cloudy days, the solar panel may not generate enough power to fully charge the battery.

I. INTRODUCTION

The An electric bicycle is a sustainable way to enhance the bike's range and reduce reliance on traditional charging methods. This design of the bicycle uses solar panels to convert sunlight into electricity, which charges the bike's battery. Because solar charging offers benefits such as: Environmentally friendly: It reduces carbon emissions compared to vehicles with internal combustion engines. Cost-saving: Solar energy is free, which can significantly reduce electricity costs. However, its effectiveness depends on sunlight availability, and the charging process is generally slower compared to traditional methods. Solar bikes can be used for short-distance traveling. In areas with limited sunlight or during cloudy days, the solar panel may not generate enough power to fully charge the battery. Therefore, the charging process is generally slower than traditional methods. A solar-powered electric bicycle combines the advantages of renewable energy with the convenience of modern transportation.

This innovative system addresses the growing need for environmentally friendly mobility, especially in rapidly expanding metropolitan areas. At its core, the bicycle features a lightweight solar panel, which can be mounted directly onto the bike or placed at a dedicated charging station. The solar panel captures sunlight and converts it into electrical energy, which is stored in a battery, such as a lithium-ion or lead-acid type. This stored energy powers the motor, allowing the bicycle to function efficiently without relying on traditional energy sources. The electric motor, typically a mid-drive design, enhances pedaling efficiency by reducing the effort required from the rider.

This makes it ideal for urban commuting, longer journeys, or navigating hilly terrains. Additionally, the system is designed to optimize energy use by combining the renewable input from the solar panel with the stored energy in the battery, ensuring a consistent and reliable performance. By integrating renewable energy technology, the solar-powered electric bicycle represents a step forward in creating sustainable, clean, and cost-effective transportation solutions for everyday.

The Solar-Powered Electric Bicycle project aims to develop a cost-effective and energy-efficient e-bike powered by solar energy. This innovative design integrates solar panels to harness sunlight, a charge controller to regulate power flow, and a battery pack for energy storage, ensuring continuous operation. The bicycle is equipped with an electric motor controlled by a motor controller, enabling both throttle and pedal-assist functionality for optimal performance. Additionally, smart features such as GPS tracking, tire pressure monitoring, and a digital display enhance safety, navigation, and real-time monitoring of battery status and speed. The system also incorporates regenerative braking, converting kinetic energy into electrical power to improve efficiency. By leveraging solar charging, the project aims to reduce dependence on conventional charging methods, making the e-bike a sustainable, affordable, and user-friendly alternative for urban and rural mobility.

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II. METHODOLOGY

Methodology for designing and implementing a solar powered electric bicycle involves multiple stages, including planning, designing, component selection testing.

- First problem is identifying efficient transportation, and focusing on creating a low cost sustainable solution. A lithium-ion or LifePo4 battery is chosen based motor's power requirement
- Ensuring a balance between weight and energy storage
- Motor selection depends on factor such as load capacity with hub motor or mid- drive motor being the primary options.
- Features, such as a GPS tracker , Tire pressure monitoring system, Breaking and IOT – Based energy monitoring , to improve bicycle's functionality.
- Software and microcontroller-based energy management system are programmed.
- After integration, testing is performed to analyze battery time, power output.
- Load and tests determine the system overall performance, while data logging refine energy consumption
- Based on result, optimizing placement of panel, efficiency of battery etc.
- Field testing in real-world condition. Gathering user feedback for further improvements finally ,The design is implemented for real world testing

III. MODELING AND ANALYSIS

A solar-powered electric bicycle flowchart represents the process of capturing solar energy, converting it into electrical power, storing it, and using it to drive the motor and other features. Below is a detailed description.

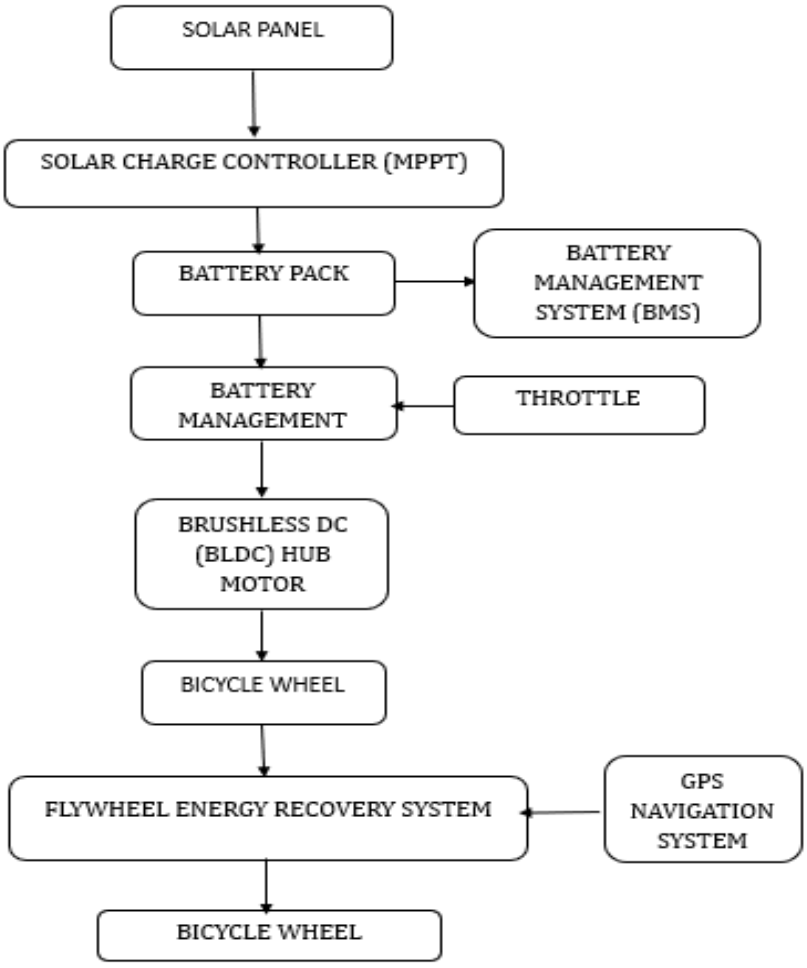

Figure 1: Block Diagram.

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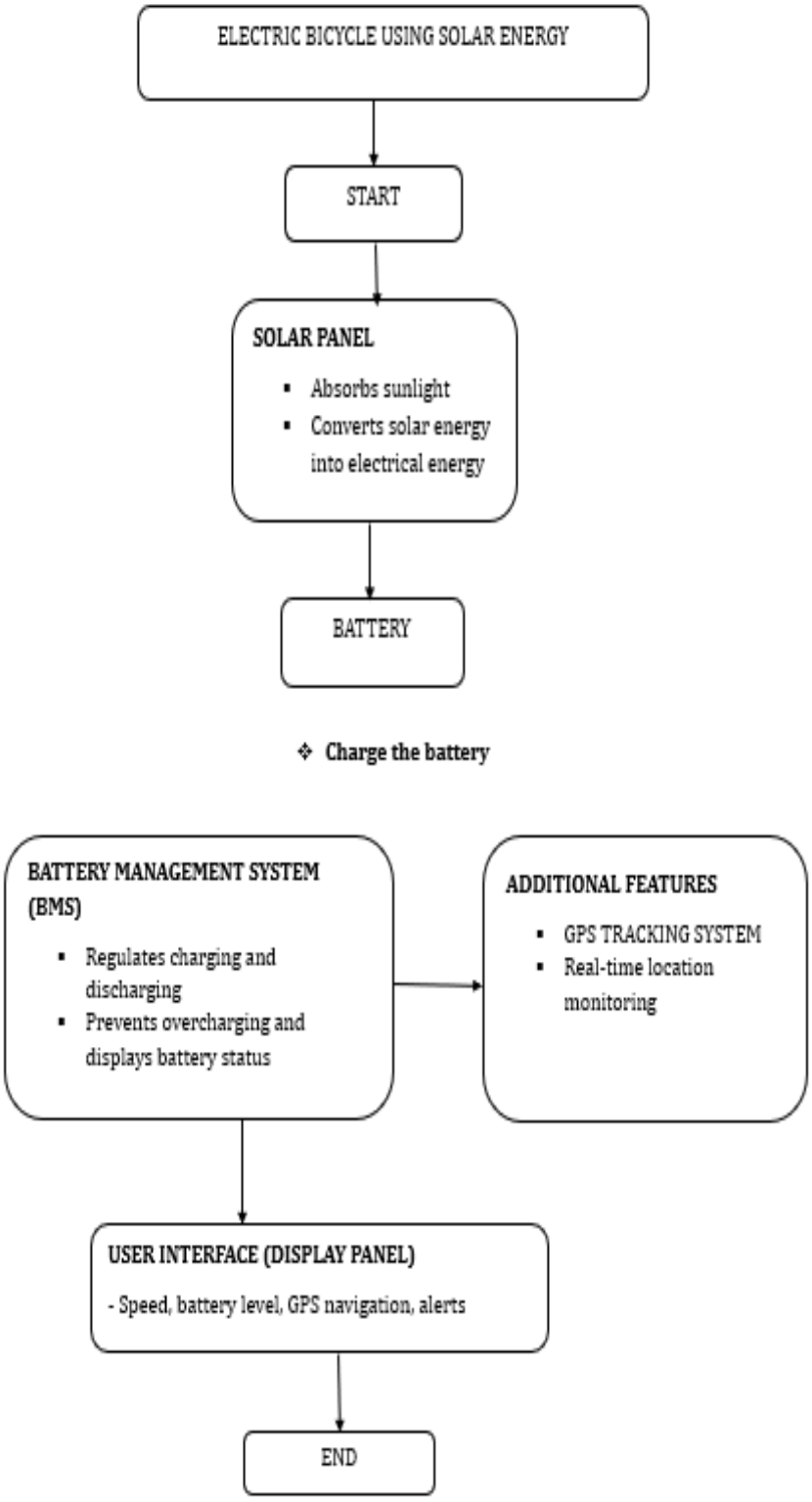

Figure2: Flowchart.

IV. RESULTS AND DISCUSSION

The results This bicycle which is electric bicycle using Solar is successfully developed and tested under various condition. In real world testing the bicycle achieved d top speed of 30km/h, and the motor efficiency remain stable over all, the result confirm that the Solar electric bicycle is ecofriendly transportation, use. Bicycle is ecofriendly easy to use.

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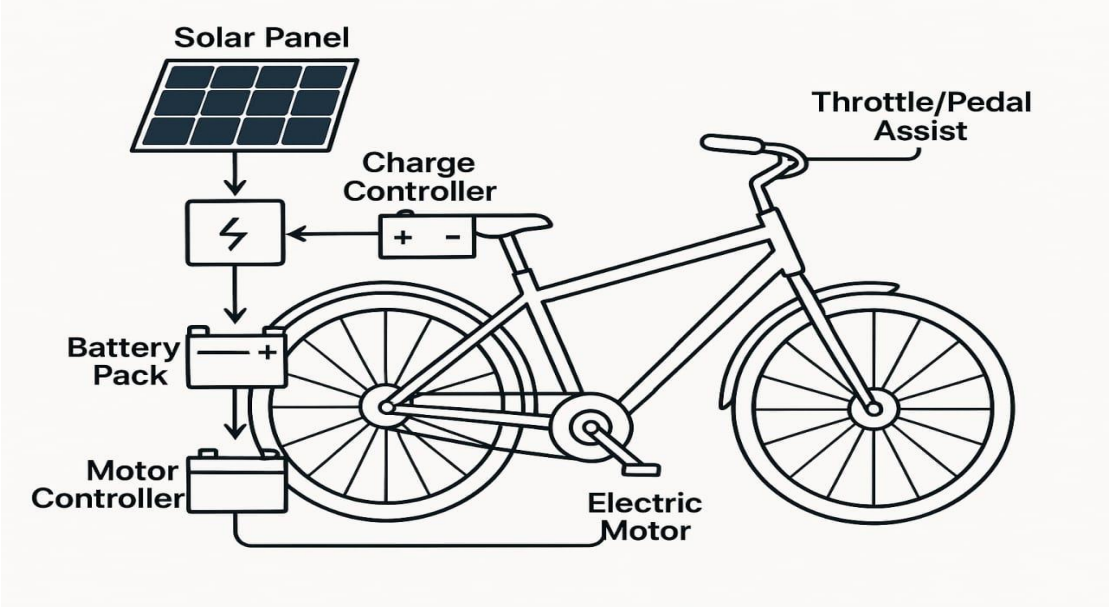

Figure 3: Electric Bicycle Using Solar

V. CONCLUSION

Solar electric bicycle is the project that highlights the benefits low cost for eco-friendly transportation. The real-world testing confirmed effectively extend the solar charging con effectively the bicycle's range while Conventional electricity source.

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