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A Review Paper on Embedded E-Bike

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Abstract - *E-bike is an electric and power-assisted bike which is one of the fastest-growing technologies of the bicycle industry. This bicycle uses an electric motor to help you along. So you can ride it like a normal bicycle, but with less effort. The electric bicycle is a project that can encourage both cleaner technology and a reduction in reliance on oil. Our research entails developing an Embedded E-bike to influence the behaviour of urban target groups, manifested in their decision to replace conventionally fuelled vehicles with E-bikes. People from target groups will not only help the project achieve its objectives, but they will also be able to demonstrate measurable effects in terms of CO2 emission reduction and energy savings by adopting E-bikes into urban transportation. The goal of executing this project is to provide a low-cost, more efficient embedded E-bike system with numerous aspects such as GPS tracking, heart rate monitoring, recharging, a speed display screen, and collision detection for a better user experience.*

Key Words: Embedded System, E-bike, Low Cost, GPS Tracking, Object Detection

1. INTRODUCTION

The price of crude oil has escalated significantly in recent years, and there appears to be no going back. The electric bicycle is a project that can encourage both cleaner technology and a reduction in oil dependency. As an alternative to typically fossil-fuelled cars, the E-Bike project promotes clean and energy efficient vehicles for passenger transport among commercial and public organisations such as corporations, public administration, and individuals in metropolitan areas. The project's initiatives are aimed at making e-bikes a low-cost and efficient mode of transportation. As a result, the initiative seeks to alter the behaviour of target groups in metropolitan areas, as evidenced by their decision to replace conventionally powered cars with E-bikes. Overall, we expect that the actions indicated by our study would move urban delivery transit away from fossil fuel delivery vehicles and toward E-bike vehicles, therefore not just reducing noise and pollution in urban areas but as well to reduce congestion and save energy.

2. LITERATURE REVIEW

2.1 Design and analysis of Hub Dynamo for Electric Vehicle, Manoj K. Jadhav, ICACCT 2018

The purpose of this research is to build a variable-speed permanent magnet hub generator. This dynamo is suitable for providing power to a drive hub from the motion of an e-bike. A hub dynamo features a rotatable hub housing and a spinning hub axel. Bearings are positioned around the axel of the hub. This hub dynamo has the capacity to command a generator with a coil attached to the hub axel and output wires connected to the magnet. This dynamo spins at the same rate as the e-bike and provides us with electricity. That energy is utilized to power our e-bikes' batteries. As an outcome, we'll be able to improve things.

2.2 Design of a Free Energy Generator using Gravity Wheel & Dynamo, M.Tanveer Riaz, and ICECE 2021

The goal of this work is to provide a free software system analysis and design. Arrangement of dynamo and gravity wheel/flywheel energy generators. This research provides a method for producing energy. It is called "free" because we are not compelled to pay anything if certain conditions are satisfied. Because of the friction, the lost energy is used to power the dynamo. The generation of free energy, which will be utilized to power the system. A single-phase electric motor is used as additional electrical equipment. It is used to power the mechanical arrangement of the pulley drive as well as the belt, causing the shaft on which the wheel is placed to revolve. Because of the remarkable mechanism of this design, it is feasible to obtain more substantial electrical power. This is accomplished through the employment of a flywheel. The flywheel is connected to the rigging train to generate free energy. The design testing findings show that this vitality alternative is appropriate and not dependent on weather conditions.

2.3 Design and implementation of an accurate real-time GPS tracking system, Abdallah Dafallah, IEEE-2014

This article describes a real-time tracking system that is precise and dependable by utilizing GPS (global positioning system) and GSM (global system for mobile communication) services. The technology determines a device's location and transmits it to the website. The GPS data from the device is sent to a JavaScript file, and the map is shown on the website using Google Maps API.

2.4 Energy Efficient and Reliable Transport of Data in Cloud-Based IoT, Al-Kadhim, IEEE-2019

This paper presents several strategies to ensure energy-efficient and reliable transport of data in the IoT. The system is represented as a cloud-based IoT integration system, with the user application running on the cloud and requesting data gathering. Sensors in IoT devices collect data, with IoT devices having certain features (functionality and location) and connecting to the cloud via gateways.

2.5 Transport Services within the IoT Ecosystem using Localization Parameters, Dimitrios Kallergis, IEEE-2016

The concept of the Internet of Things (IoT) ecosystem is presented in this article. There is a need to connect networks of sensors and smart items in such a way that they can intelligently interact. An architecture for an Autonomous Vehicles prototype within the IoT ecosystem is proposed. The GPS-enabled device is located indoors at the time frame a request is placed, hence, the GPS signal can be low or poor, and the users. The position estimation of passengers and vehicles can be made through a combination of the GPS data and the Wi-Fi receiver's position estimation, as a more accurate outdoors method and as an alternative to low GPS signaling indoors**.**

2.6 Design approach for electric bikes using battery and super capacitor for performance improvement, Nikhil Hatwar, IEEE-2013

The market for electric bicycles, scooters, and bikes is expanding. E-bike brands are proliferating in the local market. A rear wheel BLDC (Brushless DC) hub motor, a lead acid battery pack, a light weight chassis, and a controller are almost always included. The vehicle has an average speed of 30-50km/hr and a range of 70km per charge. Another disadvantage is the long charging time of 6-8 hours and the battery pack's limited lifespan of roughly 2 years. Taking these constraints into account, the authors are changing the present design of an electric bike to provide greater performance through the use of a hybrid system of battery and super capacitor. In this work, the authors attempted to overcome the shortcomings noticed in e-bike operations and provided the findings of their experiments. Super-capacitor modules are utilized to supply the high current necessary during beginning and acceleration, thus extending the battery's lifespan. To charge the battery/super capacitor, a secondary source, such as regenerative braking or a tiny solar panel module, might be installed on board.

2.7 Design and Implementation of Smart Electric Bike Eco-Friendly, Rahul, 2019

We are concerned about the increasing demand for energy throughout the world, which motivates us to shift to renewable energy sources. There are several methods for saving energy in various areas. Our primary concentration is on the car industry, where we are converting outdated gasoline bikes to electric bikes. We employ an electrical motor (BLDC motor) instead of a combustion engine in these electric bikes because it produces less pollution, requires less maintenance, and produces less noise. The chemical energy stored in the rechargeable battery packs is used by these bikes. This article is about the design and development of an electric bike that uses electricity as its major energy source. There is a distribution for charging the battery emitting it from the main system.

2.8 Design and Fabrication of an Electric Bike A, Karthi, 2018

The primary goal of this research is to provide an accurate picture by bridging the numerous sources of energy available to humanity. Traveling is highly important for humans in today's sophisticated society in order to progress. And in order to achieve so, he should travel as little as possible. This project describes the Electric Bike, which is powered by a battery and hence provides voltage to the motor. This project entails the design and construction of an electric bike that uses electricity as its major energy source. The electrical power created, which is utilized to power the bike, can provide greater fuel efficiency, higher performance, and less pollution than traditional vehicles.

2.9 Evaluation of a Bicycle-Mounted Ultrasonic Distance Sensor for Monitoring Road Surface Condition, K. Nishii, 2015

The paper discusses the design and functioning of an obstacle detecting device. Obstacle detection is a method used to identify any obstacle that may restrict the vehicle's path. The suggested system detects barriers and automatically rotates left or right using ultrasonic sensors and an Arduino. The primary goal is to secure the car and protect the driver's safety. It is primarily beneficial for parking spots.

2.10 Smart e-bike monitoring system, Frauke, 2015

The smart e-bike monitoring system (SEMS) is a platform for collecting use data from electrically assisted bikes in real time (also called peddles or e-bikes). It is self-sufficient (runs on the bike battery), reproducible (open source and open hardware), scalable (various fleet sizes), and adaptable (sensors may be added), allowing it to be utilized for further research and development. In real time, the system monitors location (GPS), rider control data (amount of assistance), and other configurable sensor input. The SEMS data feeds an online interface for data analysis, viewing personal data, and sharing on social media. All sensors must provide very precise data.

3. PROPOSED SYSTEM

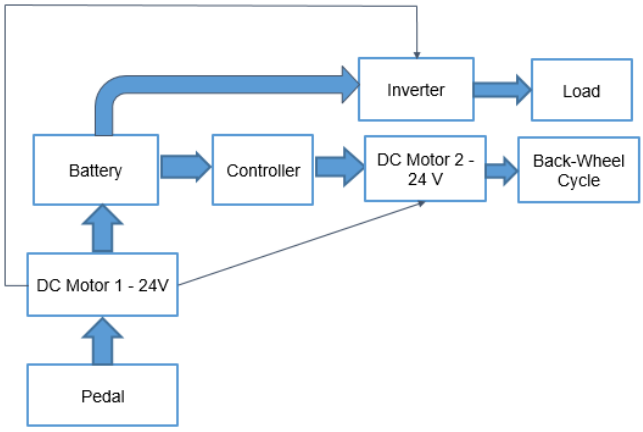

Fig -1: Block Diagram of the proposed system

We are proposing a system where we can reuse the energy generated while pedaling the bicycle. In the above block diagram, when we are pedaling, the DC Motor-1 will generate some energy and that energy will be fed to the battery. Using this energy the battery will get charge. The battery will provide energy to the DC Motor-2 and it will run like E-Bike. The DC Motor-1 will provide Energy to DC Motor-2 in the absence of battery and this will run the normal cycle. The Battery will provide the energy to the inverter and inverter will convert DC to AC Energy.

4. CONCLUSION

In this research, we have described various techniques to design and implement an Electrical Bike. The paper gives a brief analysis of how one can modify a normal bicycle into efficient embedded e-bike system with a variety of functions like GPS tracking, heart rate monitoring, recharging, and speed display using various techniques.

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