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NOVEL SAFETY & SECURITY SYSTEM IN ELECTRIC MOTORCYCLES USING IOT

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Abstract - This project is to build a software and security system for an electric motorcycle. The features of the motorcycle include intelligent power modes, a Throttle lock, an Alarm system, GPS Tracking, and a Find My Bike feature. It ensures security for the motorcycle when it is parked. Using GPS Tracking we can track the current location of our motorcycle. In the present scenario, we do not have a proper system for safety and security for electric motorcycles. Presently theft of motorcycles is increasing day by day, so our project is a solution to the current problem. The feature Global Positioning System (GPS) will help; when our motorcycles are being stolen by providing the current location of our motorcycle. It also has a feature of an alarm system that can produce an alert to people so the people can identify and can stop the theft. The throttle control feature of the system is that it will be controlled by an artificial system according to the terrain automatically. Our application contains the details of the driver and other vehicle information like vehicle registration number. As we lock the throttle it will automatically cut the throttle and we can't move the motorcycle forward with help of the throttle system or motor control.

Key Words: safety, security, throttle, GPS, Alarm, Anti-Theft system

1. INTRODUCTION

Electric motorcycles and scooters are plug-in electric vehicles with two or three wheels. The electricity is stored on board in a rechargeable battery, which drives one or more electric motors. Electric scooters (as distinct from motorcycles) have a step-through frame. An electric motorcycle is a motorized motorcycle with an integrated electric motor used to assist propulsion. With various applications such as; user behavior monitoring and smart navigation systems, AI is playing a key role in the EV Industry. AI is extensively used in manufacturing, and assembly lines and many EV players are testing self-driving EVs to gather data, analyze and repair Electric Vehicles. The need for an advanced software and security system for electric motorcycles is a step of advancement in the motorcycle industry, which provides intelligence to the motorcycle and it advances the safety and security system for the motorcycle. IoT deals with features such as anti-theft systems, surveillance systems, and other vehicle controls. It also provides features like an Alarm system, GPS Tracking,

and throttle control. Our project is having a feature of Global Positioning System (GPS) which will help; when our motorcycles are being stolen by providing the current location of our motorcycle. it also has a feature of an alarm system which can produce a large alert to people so the people can identify the motorcycle is being taken by the wrong person and can stop theft. This also has the throttle control feature which can be controlled by a smartphone using the application developed to control the bike. This application contains the details of the driver and other vehicle information like vehicle registration number. As we lock the throttle it will automatically cut the throttle and we can't move the motorcycle forward with help of the throttle system or motor control. Currently, the electric motorcycle market is expanding fast as there is a huge hike in the price of fuels. So our system can provide safety and security for this type of motorcycle. The use of electric motorcycle should be promoted as it is also an efficient system and provide more economical stability. It can also be promoted as it is an energy-efficient and environment-friendly method of traveling while considering the vehicles that run using the burning of fuel. so our system help in this expansion

2. PROPOSED SYSTEM

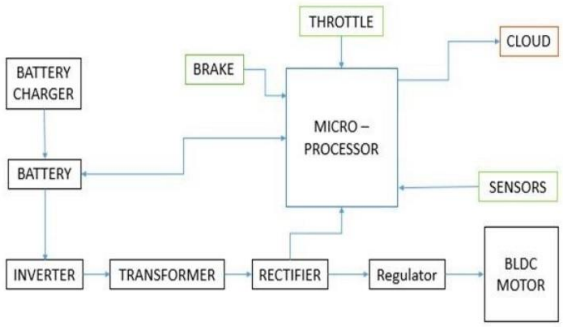

Figure 1: Block Diagram of E-Bike Security System

In the proposed system, an electric motorcycle is designed in a way that it can be remotely operated manually or autonomously and the performance and location of the motorcycle can be monitored using a mobile app

1) Remote control of the vehicle

2) Live tracking of the location of the vehicle

3) Live performance monitoring

4) Regenerative breaking

This design of speed control is using sensors. The sensors and modules used are the following.

• GPS module is used for the live location tracking of the vehicle.

• Remote controlling of the vehicle.

The microprocessor used for the control and monitoring of vehicles is Raspberry Pi 4. This processor is the heart of the motorcycle. All the features are processed in this processor. Also, the IoT features are also done here.

2.1 SENSORS AND COMPONENTS USED

2.1.1RASPBERRY PI

Raspberry Pi is an affordable compute module. It uses an ARM-based microprocessor. It is a single board computed. It has above 26 General Purpose Input-Output (GPIO)pins. Because of its low cost, modularity, and open design, it is widely used

2.1.2 ARDUINO

Arduino is an open-source platform for embedded system development, IoT, and automation systems. It has both analog and digital pins for input and outputs. It uses c and c++ languages for programming. It is programmed using Arduino IDE software.

2.1.3 GPS MODULE

GPS module is used for obtaining the GPS location of the system. It gives the output in the format of NMEA. In this system, the GPS module is used to find the location of the motorcycle and store it in the database.

2.1.4 GYROSCOPE AND ACCELEROMETER SENSOR

A gyroscope is used to find the orientation of the motorcycle. An accelerometer sensor is used to find the proper acceleration of the motorcycle. It is used in aircraft and naval machines. A gyroscope can also find the angular velocity.

2.1.5 RELAYS

Relays are electronic devices that would be called electronically controlled switches. They are called so because when an electric current is applied they mimic the action of a switch. They use an electromagnetic solenoid for switching. They come in different current ratings. These solenoids are energized by a signal.

2.1.6 METHODOLOGY

BLDC motor is used as the motor of the electric bike. The microprocessor used for the control and monitoring of vehicles is Rasberry Pi 4. This processor is the heart of the bike. All the AI features are processed in this processor. Also, the IoT features are also done here.The main components of an intelligent electric bike are Bldcmotor, motor controller, microprocessor, cloud storage, and battery.

Bldc motor is used to run the vehicle which is controlled by a motor controller. The motor has a six-phase variable frequency inverter circuit and a microcontroller with some PID controls. The hall sensor in the motor is used to give feedback to the controller so that the pic control can give pwn signals to the six-phase inverter to rotate the motor. The controller also gets input from throttle breaks and other sensors and modules. The signals are also considered for the rotation of the vehicle.

The microprocessor also gives control signals to the motor control for automatic and remote-based control. The communication between the microprocessor and the motor controller is bidirectional the processor uses the information from the controller for better monitoring while the motor controller uses the information from the microprocessor for speed control. The microprocessors are also connected to a camera and it also runs a machine learning model for object avoidance and automatic braking. This is done using the frames captured from the camera module.

Cloud storage is used to store data both from the vehicle and user and make them accessible to each other. A real-time cloud base database called firebase is used here to store data. The data from the storage system can be monitored using a mandatory app and can be edited using the same. This is how the remote monitoring and control of the vehicles is done. set of relays are used to control various elements of the vehicle including the motor, headlamps, blinkers, high-level brakes etc.

A lithium-ion battery pack is used to power all the devices in the vehicles including motor, micr0processor, etc. various buck converters are used at different stages to reduce the voltage as the microprocessor needs 5V while the headlamps and others need 12v. The voltage requirement of the motor is much higher.

3. CONCLUSION

Electric Motorcycle is a motorcycle that runs on an electric motor and incorporates security and safety and has zero-emission and very much low travel cost per km. Regenerative braking can be used to improve the efficiency of energy management. This Motorcycle can provide live tracking and location of the motorcycle remote control the motorcycle. This can also provide live tracking and alarm system, which further can be used for safety and security. The bike can be controlled using a mobile application we developed which contains the details of the vehicle, lock status, and live location tracking feature.

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