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Smart Helmet Using IoT

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Abstract— IOT has enabled us to connect our day to day devices in a network for a sole purpose to exchange data. Today a number of countries have made it mandatory to wear helmet while riding. In this paper, we propose to build a smart helmet system that can be installed on a bike and enforces that the biker first wears the helmet and also the sensors detect alcohol in breath of the biker and bike does not start in case the biker has not worn the helmet or is drunk. The implementation of this system is proposed to be done using NodeMCU which is an open-source firmware and development kit that helps to prototype or build IoT product. We use firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266.

Keywords—IOT , Pressure Sensor, Tilt sensor, ***GPS*** , Smart Helmet, Wearable Technology

I. INTRODUCTION

Today we all talk about Internet of Things and how it is changing our lives. IOT is creating a new world, a measurable world,in which people are able to manage their assets in better ways, and now they are able to take better informed decisions about what they need to do or what they want. This new world brings in many practical improvements such as convenience, health and safety in our lives. According to surveys,one death occurs in every four minutes in India due to road accidents. Out of total road accidents, 25% accounts for two wheeler accidents. According to recent study 98.5% bikers who died didn't wear a helmet. Hence police department has made it mandatory to wear helmet while riding. Riders face many problems on the go such as unable to take calls, unable to see maps for navigation purposes etc. While having these helmets as a safety measure is a boon, we add more features to it to make it smart. Smart Helmet is an innovative way of building a helmet with latest technologies.
The prime emphasis of this paper is to force the rider to wear the helmet. The number of motor cycle riders are increasing rapidly in our country, and from the road accidents which involves two wheelers it is quite evident that most of the riders suffered injuries to the head which led to fatal casualties. The best way of handling this issue is to force the riders to wear the helmet so that the extent of impact is reduced. In this paper, we propose building a model which can be implemented by installing it on a bike which works with the helmet which will be worn by the rider.

II. RELATED WORK

Nowadays people prefer riding two-wheelers over four-wheelers because it is more convenient for people to ride two-wheelers in traffic. A survey shows that majority of the riders avoid wearing helmet without any particular reason .The reasons for accidents to occur are speeding, rash driving, drunk driving. And also lack of experience and ignorance of traffic rules. The accidents lead to minor injuries or they can be life threatening. These life threatening accidents can be avoided just by a simple step, i.e wearing a helmet and it can save many lives. So we are making use of the technology to avoid the problems mentioned above and minimize their effects by making it manadatory for the rider to wear a helmet. So the idea for the project "Smart Helmet" came from our sense of moral responsibility towards the society and the citizens.

In [1], the authors have specially developed as to improve the safety of the motorcycle's rider. The objective of this project is to study and understand the concept of RF transmitter and RF receiver circuit. The project uses ARM7, GSM and GPS module. The project also uses buzzer for indication purpose. This project is only concentrated on only one specific purpose that is an accident. Whenever the accident will occur then accident spot will be note down and information will send out on the noted mobile number.
The major disadvantage of this project is they are not using any display device for showing the current status. Also the cost of helmet is still high since helmet is designed for only one purpose.

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In [3], authors have designed for reducing the head injuries occurring during the accidents and also reducing the number of accidents using the ultrasonic RADAR in this system. As it is a protective headgear, death rate can be reduced. They use IR transmitter, IR receiver and also HT12E(Encoder), HT12D(Decoder).

Two-wheeler have high rate of accidents than cars or trucks and buses. The aim of smart helmet is to Provide Safety to the bike rider. With the help of Proper Switch Mounted in helmet the two-wheeler would not start without helmet so safety of rider is assured and if accident has occurred our system will give information to the ambulance about the accident, so they can take certain measures to save the life of the person who meet with an accident. It is developed using Arduino. We place sensors in different sides of helmet which is connected to Arduino board. So when the bike rider crashes sensors sense and the Arduino extract GPS location data using the GPS which is interfaced with Arduino. When the sensor data exceeds maximum limit of pressure then GSM module automatically sends message to ambulance, police and family members. In case of minor injuries, the rider can stop sending of message by the SMS sending stop switch.

III. METHODOLOGY

A. HARDWARE INTERFACE

NodeMCU is an open-source firmware and development kit that helps you to prototype or build IoT product. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266.

Novel Features of our system are -

1. Open-source
2. Interactive
3. Programmable
4. Low cost
5. Simple and Smart
6. WI-FI enabled

B. COMMUNICATION INTERFACE

GPS or Global Positioning System is a satellite navigation system that furnishes location and time information in all climate conditions to the user. GPS is used for navigation in planes, ships, cars and trucks also. The system gives critical abilities to military and civilian users around the globe. GPS provides continuous real time, 3-dimensional positioning, navigation and timing worldwide.Any any instant of time, there are at least 4 GPS satellites in line of sight to a receiver on the earth. Each of these GPS satellites send information about its position and the current time to the GPS receiver at fixed regular instants of time. These information are transmitted to the receiver in the form of signal which are then intercepted by the receiver devices. These signal are radio signals that travels with the speed of light. The distance between a GPS receiver and the satellite is calculated by finding the difference between the time the signal was send from GPS satellite and the time the GPS receiver received the signal.Once the receiver receives the signal from at least three satellites, the receiver then points its location using trilateration process. A GPS requires at least 3 satellites to calculate 2-D position(latitude and longitude on a map). In this case, the GPS receiver assumes that it is located at mean sea level. However, it requires at least 4 satellites to find receivers 3-D position(latitude, longitude and altitude).

C. GRAPHICAL USER INTERFACE BLYNK APP

Blynk is a new platform that allows you to quickly build interfaces for controlling and monitoring your hardware projects from your iOS and Android device. After downloading the Blynk app, you can create a project dashboard and arrange buttons, sliders, graphs, and other widgets onto the screen. Using the widgets, you can turn pins on and off or display data from sensors. There are likely hundreds of tutorials that make the hardware part pretty easy, but building the software interface is still difficult. With Blynk, though, the software side is even easier than the hardware. Currently, Blynk supports most Arduino boards, Raspberry Pi models, NodeMCU ,the ESP8266, Particle Core, and a handful of other common microcontrollers and single-board computers, and more are being added over time. Arduino Wi-Fi and Ethernet shields are supported, though you can also control devices plugged into a computer's USB port as well.

D. DIAGRAMS

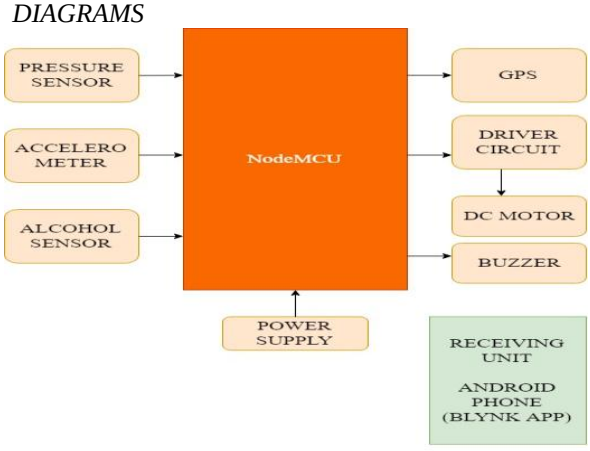

Fig 1. Block Diagram

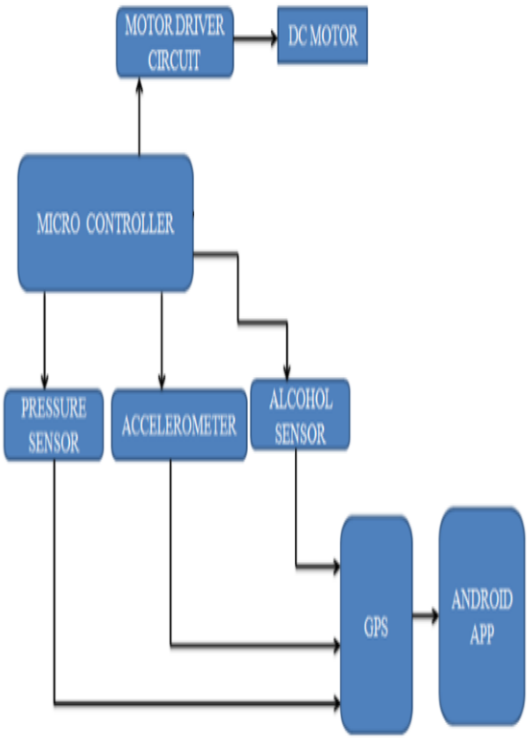

Fig 2.Overview of the working.

E. WORKING

In this system NodeMCU is used. The driver circuit is used to depict the behaviour of vehicle motor. When the system is switched on, LED will be ON indicating that power is supplied to the circuit.

Pressure sensor is used to detect whether helmet is worn or not. If the rider wears the helmet the motor starts (vehicle starts) if that's not the case the motor does not start and notification that helmet is not worn is received in the BLYNK app.

The accelerometer will be placed in the helmet so that it can detect tilts in the helmet. Whenever an accident occurs and rider crashes,there are tilts in the helmet due to the crash which are detected by the accelerometer and then the microcontroller detect the accident occurrence and it then sends the information about the accident and its location using GPS modules to the BLYNK app and the buzzer will be on .

Alcohol sensor detects the whether the rider is drunk. If the rider is drunk the vehicle stops and notification that helmet is not worn is received in the BLYNK app.

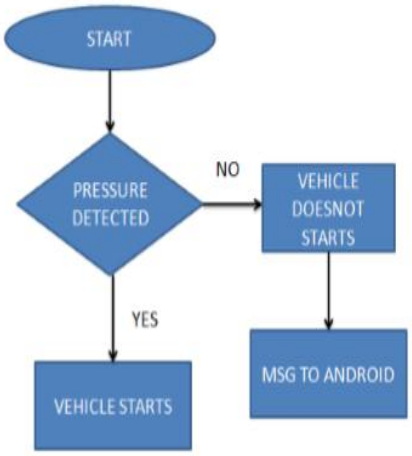

Fig 3. Pressure Sensor Dataflow Diagram.

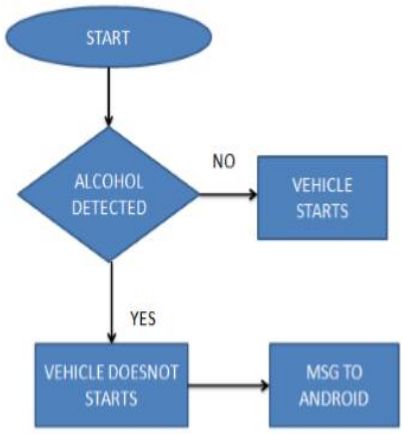

Fig 4. Alcohol Sensor Dataflow Diagram.

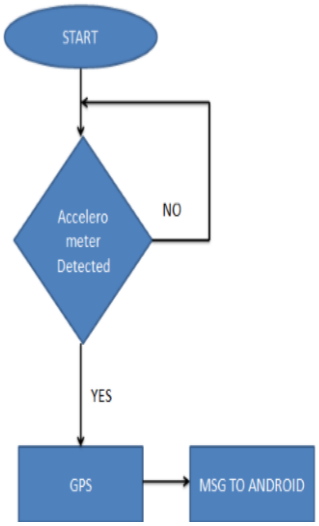

Fig 5. Accelerometer Dataflow Diagram.

Table 1. Number of Deaths in India in Road Accidents involving Bikes/Two Wheelers

Year	Number of Deaths due to Road Accidents involving Bikes/Two Wheelers
2010	23000
2011	36000
2012	30000
2013	29000
2014	31000
2015	40000
2016	50000
2017	47000
2018	46000

Table 2. How the proposed project will help bring down the fatalities due to accidents

Causes of Accident	How Proposed Project can prevent it
Fatal Injuries to head	Enforcing to wear the helmet will prevent this
Drunken Driving	Alcohol Sensors in the helmet will prevent the bike from starting if Alcohol is detected in the breath of the rider.
Over Speeding	Accelerometer will prevent the speed to be above a threshold
Loss of Correct Direction	GPS module will guide the rider to correct path

IV. RESULTS & ANALYSIS

It is imperative the use of proposed system will lead to reduction in the number of accidental injuries and fatalities due to them because of the security imposed by the smart sensors and controls in the helmet.

V. CONCLUSION AND FUTURE SCOPE

The Smart Helmet ensures the safety of the rider, by making it making it mandatory for the rider to wear the helmet and it also helps in reducing drunk driving cases. So if the rider is not wearing the helmet or is drunk ,the system makes sure that bike doesnt start.In cases of accident,the location of the rider is notified to emergency contact. This ensures that the victims get proper and prompt medical attention, if met with an accident. Going forward, the model can also be used to detect the presence of drugs in the driver's body, and can also be used to provide the driver protection in case an accident occurs.

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