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IoT: Smart Helmet for Bike Rider

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Abstract: Road accidents are increasing in our country, most of them are caused due to negligence of not wearing the helmet, drink and drive and over speeding which many leads to death or severe injuries due to lack of medical treatments provided to the injured person at right time. This motivates us to think about making a system which ensures the safety of biker, by making it mandatory to wear the helmet by the rider to prevent head injuries that may lead to immediate death, prevent drink and drive scenario by testing the breath of the rider before the ride, prevent over speeding and rash riding by alerting the rider and also to provide proper medical attention, if met with an accident by notifying the concerned person with the location details.
Keyword: Accident, Helmet, Medical Treatment, Testing.

I. INTRODUCTION

It is a well-known fact that young generation prefers bikes and motorcycle over four-wheeler. The riders avoid wearing helmet without any specific reason. Moreover, over speeding and drink and drive have become common issues. Due to the lack of experience or focus and violation of traffic rules, this leads to accidents. So, with the help of technology we made sure that traffic rules are followed, problems mentioned above are avoided and their effects are minimized. The idea of developing this work comes from our social responsibility towards society. In many accidents that occur, there is a huge loss of life. Many people die on roads every year that occur due to bike accidents. There are various reasons for accidents such as not having adequate ability to drive, defective two wheelers, rash driving, drink and drive, etc. But the main reason was the absence of helmet on the person which leads to immediate death due to brain damage. Therefore, it is important that there should be a facility to minimize the after effects of these accidents [1]. However, the main goal of our work is to make it mandatory for the rider to wear a helmet during the ride, to prevent drink and drive scenario and over speeding or rash riding by motorcyclists and also provide proper medical attention when met with accident by alerting the concerned person which will provide solutions to other major issues for accidents [2].

II. AN OVERVIEW

A. Existing System

A wireless telecommunication, and is connected to a smart phone. The prototype uses sensors to detect a crash or accidents and the communication hardware is used to automatically dial a predefined emergency contact. The other existing system is to control the speed in which the biker is going in. The helmet is fixed with all the components and sensors that read the status of the bike rider and accordingly instruct the rider to reduce or increase the speed based on the sensor value. Along with the speed limit sensors, the helmet also checks if the rider is drunk and driving. If the rider is drunk then the ignition of the bike is avoided and hence not letting the rider to ride the bike [3]

B. Proposed System

The proposed system consists of two units, helmet and vehicle. Vehicle is controlled via signals from helmet unit. The helmet unit has sensor module to monitor whether helmet is worn or not, alcohol detection, all connected to Radio Frequency (RF) transmitter [4].

The vehicle unit has RF receiver. Based on RF signal received the vehicle starts and stops automatically. And every status is uploaded to database via GSM. In case of helmet lost the vehicle is ignited via android application. A piezoelectric sensor is used here to detect the accident which works on the principle of piezoelectricity. In this system Analog pin reads the data from this sensor and converts 0-5 volts into 0-1023 divisions from the internal ADC. If the sensors output is stronger than a certain threshold, then the micro-controller reads it as a crash [5].

The registered person will get the notification then he can request for the location and picture for more clarification. Then they can provide the immediate medical requirement and they can also inform about the incident to the police station. If the accident is minor then the rider can abort the accident notification to the registered number.

III. CONSTRUCTION

A. Helmet Section

When the rider has worn the helmet, the hair sensor measures the presence of hairs in the helmet. Alcohol sensor measures the presence of alcohol in rider's breath. Accelerometer measures tilting of the helmet. The output of these components will act as input for micro-controller which is on the helmet [6][7]. The micro-controller processes the data and sends it to the bike section using RF transmitter.
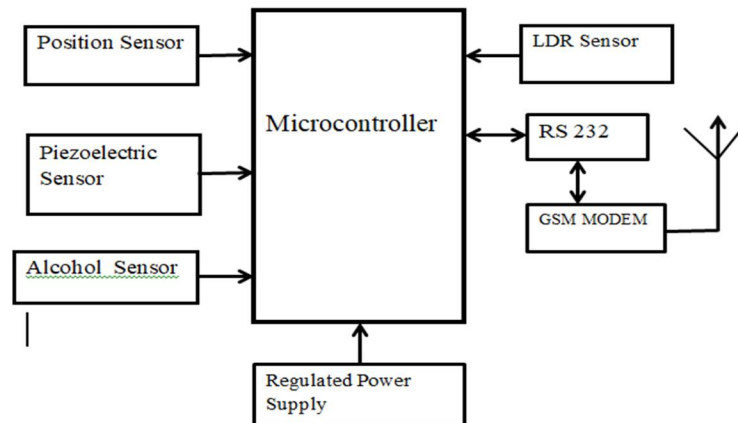

Fig 1 Block Diagram of Safety Helmet

B. Basic Components Used
1) *NodeMCU ESP8266*

Fig 2. NodeMCU ESP8266

NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.

2) *Alcohol Sensor*

Fig 3 Alcohol Sensor

It is a gas sensor which detects the presence of alcohol content gas concentration from 0.05 mg/L to 10 mg/L. it is an high sensitive to alcohol and a low cost semiconductor sensor which provides fast response and gives both digital and analog output.

3) *LED*

Fig 4 LED

It is used to show that our system is started or not, to indicate something.

4) *GSM Modem*

Fig 5 GSM Modem

It consists of a sim card port where the sim has to be inserted and can be operated using a mobile operator where to communicate through mobile network. It is used by internet connectivity to send and receive the messages.

C. *Bike Section*

RF receiver receives the data and the data is transmitted to the micro-controller. Micro-controller makes the decision according to the output of the helmet section. There are two conditions to start bike ignition:
1) Push button should be pressed when a rider wears the helmet.
2) Rider should not be alcoholic.
When the output of helmet section matches these two conditions, then the bike ignition will start. If rider exceeds the threshold speed, then rider will get alert message to slow down the speed [8][9].
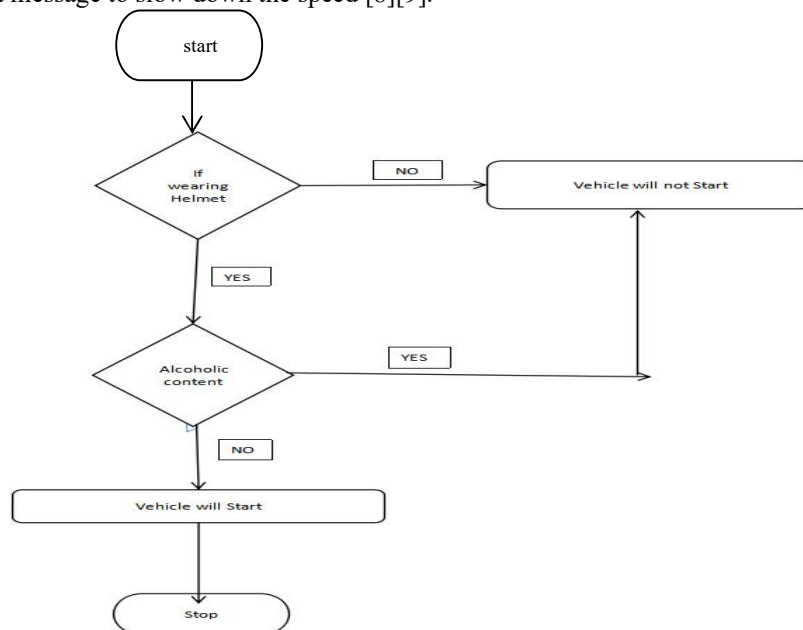

Fig 6 Work flow

The flowchart shown in Fig. 6 explains the work flow of the system. If the rider wears the helmet and the alcohol is not detected in the riders' breath by alcohol sensor the bike will start otherwise it will not start.
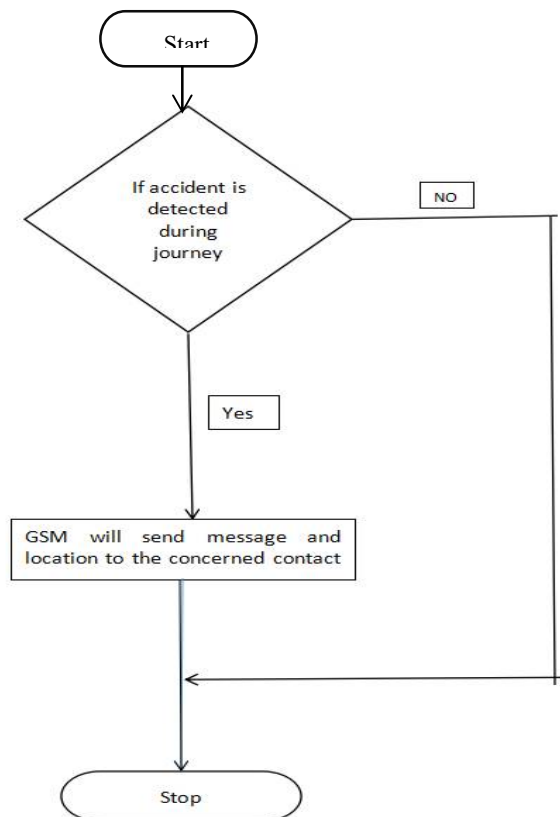

Fig 7 Accident detection work flow

The flowchart shown in Fig. 7 explains the work flow of the accident detection If the rider come across the accident during journey GSM will send message and location to the preferred contact number. This will help the rider to get proper medical treatment within time and helmet prevents the rider from causing head injury.
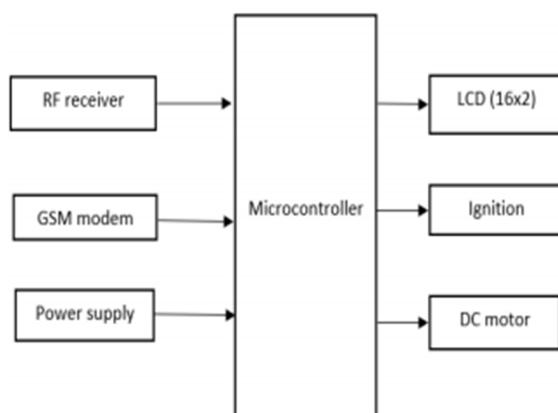

Fig 8 Block diagram

The block diagram shown in Fig. 8 explains the work flow of the system. The rider wears the helmet. When the helmet is worn, and no alcohol is detected by the alcohol sensor in the rider's breath, the bike will start. This is the ignition part of the system. All these sensor outputs are sent as input to the micro-controller. The micro-controller processes the data and sends it to the module on the bike via RF module consisting of RF receiver. The receiver sends the data to the micro-controller on the bike module [10].

If the IR sensor is LOW, it implies that the helmet is worn and hence the bike will run smoothly else it will not allow the bike to start. If alcohol concentration is more than the threshold, it will not allow the bike to start else the bike will run smoothly.

If the tilt of the bike and the helmet is zero with respect to ground then it will send a message to the preferred contact number.
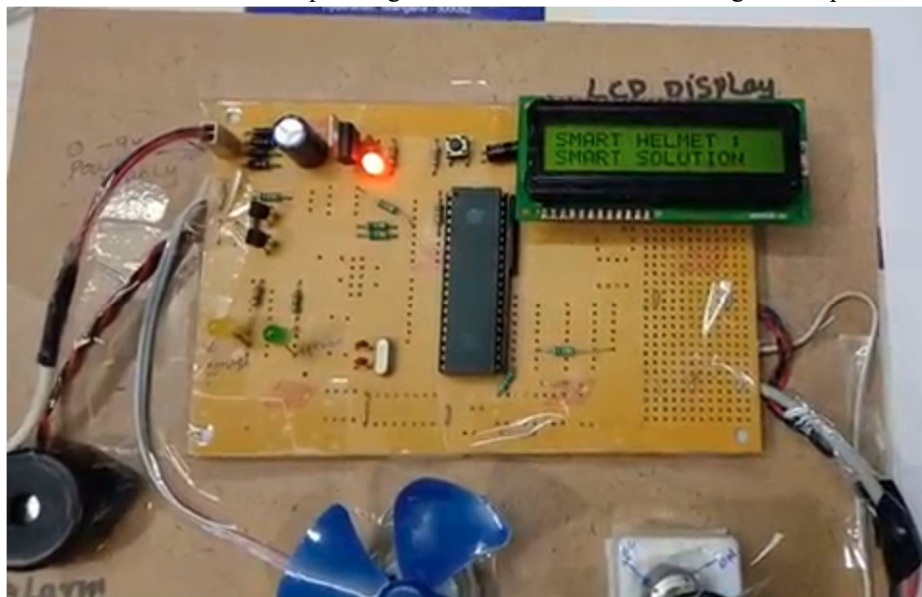

Fig 9 Circuit Diagram

IV. ADVANTAGES

A. A safe two wheeler journey is possible which would decrease the head injuries throughout accidents caused from the absence of helmet.

B. Additionally reduce the accident rate due to drink and drive.

C. Once biker gets practice to wear helmet it reduces much burden of traffic police to monitor bike riders.

V. FUTURE SCOPE

A. This model can be equipped with a camera mounted to the helmet where entire video will be recorded and it will be stored in the data storage of the helmet, videos can be accessed wirelessly so that helmet will act like a BLACK BOX containing all data.

B. A piezoelectric sensor is used here to detect the accident which works on the principle of piezoelectricity. In this system Analog pin reads the data from this sensor and converts 0-5 volts into 0-1023 divisions from the internal ADC. If the sensors output is stronger than a certain threshold, then the microcontroller reads it as a crash.

C. The registered person will get the notification then he can request for the location and picture for more clarification. Then they can provide the immediate medical requirement and they can also inform about the incident to the police station. If the accident is minor then the rider can abort the accident notification to the registered number.

D. It can be used for passing message from the one vehicle to another vehicle by using wireless transmitter.

VI. CONCLUSION

Safety Helmet ensures the safety of the bike rider, by making it necessary to wear helmet, and ensures that the rider hasn't consumed any alcohol. If any of these prime safety rules are violated, the system will prevent the rider from starting the bike. The system also helps in efficient handling of the aftermath of accidents by sending a message with the location of the rider to the preferred contact number. The system designed provides safety and reduces the after effects of the accident, notifying about the accident will provide timely care and treatments to the victim reducing the severe impacts on the person. This ensures that the victims get proper and prompt medical attention, if met with an accident.

The alcohol detection will prevent drink and drive scenario and the effects of drink and driving to public and the rider himself. Android application built for the system will ensure the smooth functioning of the system. Speed monitoring of the vehicle will prevent over speeding rash riding and violation of traffic rules.

VII. ACKNOWLEDGEMENT

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