INTEGRATED HELMET FOR SAFETY AND ACCIDENT DETECTION USING IOT

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ABSTRACT- *Increasing road accidents in our country most of which are caused due to negligence of not wearing helmet, drunk driving and exceeding the speed limit which may lead to demise and serious wounds due to absence of medical care given to an injured person at proper time. This prompts us to contemplate about building a system which guarantees the well-being of biker, by making it compulsory to wear the helmet by the traveler to avoid head injuries that may lead to instant death, avert drunk driving scenario by trialing the breath of the rider prior to ride, and also to furnish correct medical treatment, if met with a mishap by informing the concerned human being with the site details.*

Keywords: Arduino Uno, Alcohol Sensor, Accelerometer, GSM, GPS

1. INTRODUCTION

It is familiar activity that junior age group prefers bikes and mopeds over passenger car. The traveler keeps away wearing the helmet for any particular reason. Furthermore, over speeding and drunk driving have become ordinary matter. Due to lack of concentration and contravention of traffic regulations are followed, issues stated overhead are avoided and their consequences are reduced. The plan of developing this work advances from our social responsibility regarding the public. In many mishaps that take place, there is a tremendous dropping of life. Numerous people pass away on road every year that take place due to bike mishaps. There are several reasons for mishaps such as not having sufficient potential to ride, faulty two wheelers, drunk driving, etc. But the leading cause was the lack of helmet on the person which guides to instant death due to brain injury. So, it is significant that there must be a provision to reduce the after-effects of these mishaps. Nevertheless, the main objective of our work is to make it compulsory for the rider to wear a helmet throughout the ride, to stop drunk driving scenario and give accurate medical attention when met with mishap by notifying the concerned people which will provide solutions to other crucial matters for accidents.

2. LITERATURE REVIEW

To overcome accidents, in this system there are two conditions to be satisfy by helmet to start the vehicle. First, it checks whether the rider is wearing a helmet or not. It is detected by using an IR sensor. Second, there should not be an alcohol content in rider's breath. It can be observed by using gas sensor. It will be present in helmet. When the rider is extremely consumed the alcohol, the gas sensor will sense the rider's breath to detect the quantity of alcohol content. Third, when a rider meets with an accident, if the accident is crucial then the sensor will recognize the vehicle's state and the person's locality will be sent to close by hospitals through GPS to the main server of the hospital. If the accident is small, the preset button in the vehicle should be press by the rider. This tells that the rider is not harmed, and the vehicle will start.

Advantage: The exactness and accuracy are high, which indicate that the system is precise in recognizing accidents. Location based ambulance is booked manually.

Disadvantage: Accident beyond the specified range cannot be recognize. [2]

This system gives information about whether the rider is wearing the helmet or not, whether the rider drunken or not and also, he met with an accident it gives an information about location where he met with an accident through GSM module to mobile numbers family members, so GSM technology is used to give the information by sending SMS. The vibration sensor is placed in the helmet such that it detects vibrations of the helmet. When the rider crashes, the helmet hits the ground and the vibration sensor detects the vibrations that are created when the helmet hits the ground and then the microcontroller detect the accident occurrence and it will send an SMS containing information about the accident and location of accident using GSM and GPS modules. Alcohol sensor sense the alcoholic content whether the rider drunken or not, if he drunken bike will not start showing as alcohol detected on LCD display. Use of pressure sensor, gives whether the rider is wearing the helmet or not. If he is not wearing the helmet again bike will not start and intimate to rider to wear the helmet.

Advantage: In this work, the smart helmet working is demonstrated which makes the motorcycle driving safer. It uses GSM and GPS technology. Sensors are placed at different places of helmet, so when the rider crashes and the helmet hits the ground, the sensor senses and sends the signal to the microcontroller. The controller extracts GPS data and then use GSM module to send message to predefined number.

Disadvantage: Inefficient detection of accident, when an accident occurs there is no proper way to detect an accident. [4]

Smart helmet is an innovative way of designing a helmet for safety purpose using the latest and trending technology, IoT. Motorcycle engine will start only when the rider wears the helmet and buckles the belt of the helmet. This will reduce the impact of accidents. In case if the rider is drunk, alcohol sensor detects the alcohol content and stops the rider from starting the vehicle. In case of emergency, SOS message will be sent to the concerned person selected by the user through the Blynk app. The core element of the model is the arduino board which controls and manages all the functions performed by the other components of the model. The instructions to the components are given through arduino programming language. The Gas sensor MQ3 has high sensitivity to alcohol and sends signal to stop the vehicle. This module provides both digital and analog output. SOS message can be sent when rider meets with an accident. This is being achieved using android app, sensors, Wi-Fi and Cloud. Cloud sends the data to the concerned person through Wi-fi. The android app analyzes data and performs specific actions.

Advantage: In this system, when the rider wears the helmet and puts on the belt of the helmet,

pressure sensor senses the pressure of the helmet and allows the vehicle to start.

Alcohol sensor checks whether the rider is drunk or not. If alcohol content is detected then it doesn't allow the rider to start the vehicle.

Disadvantage: Inefficient use of Accelerometer, that is even if the helmet tilts it detects it has accident and sends the notification to registered contact. [5]

Bike riding is made safer by using a type of protective headgear known as smart helmet. This solves three main issues such as not wearing helmet, drink and drive scenario and unable detection of accident. The first issue is solved by using Force Sensing Sensor that detects whether the rider is wearing the helmet or not. If rider is wearing the helmet, then ignition will start otherwise the ignition will not turn on. The presence of alcohol is detected by MQ-3 alcohol sensor, which when exceeds permissible limit will not turn on ignition. If alcohol is detected in breath, then it will be displayed on LCD screen and the registered person will be notified with location. The accident detection is made possible by accelerometer. When rider meets with an accident, it will be displayed on LCD screen and message will be sent to authorized contact along with current geographical location. RF module is used for signal transmission between helmet

unit and bike unit. The main motto is to safeguard bike rider by providing a protection system in the helmet.

Advantages: Accident detection in remote area made easy and medical services to be provided in short interval.

Disadvantage: Intimation of accident made to police station instead of hospital. [6]

3. PROPOSED SYSTEM

This paper reports the prototype of the integrated helmet using IOT, which make sure the safety and security of the bike rider. Here the system is accountable for the following functionalities.

- The system will not permit the rider to start the vehicle, if the biker is not wearing the helmet.
- It senses the consumption of alcohol, if the biker has consumed alcohol, the bike engine will not turn ON.
- When bike rider met with an accident it senses and sends the notification to the registered contact with a location information.

4. SYSTEM DESIGN

This system comprises of two sections:

- ❖ Helmet Section
- ❖ Bike Section

4.1 Helmet Section

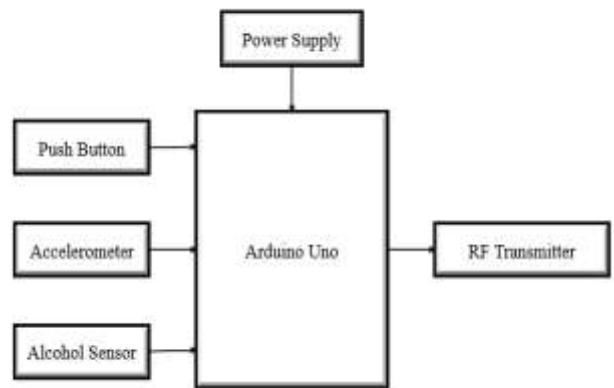This section comprises of push button, alcohol sensor, accelerometer, Microcontroller, RF transmitter.

Figure 1. Helmet Section

➢ **Accelerometer :**

Accelerometer is an integrated circuit that is attached to measure the acceleration with respect to the object where the accelerometer is attached. Accelerometer placed in helmet is used for accident detection and can be detected by tilting of the helmet with respect to the ground.
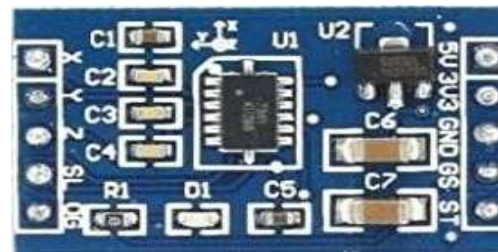

Figure 2. Accelerometer (MMA 7361)

➤ **Alcohol Sensor (MQ-03) :**

The Alcohol sensor detects the presence of alcohol content gas concentration from 0.05 mg/L to 10 mg/L. It gives both digital and analog output and a fast response is given by this low cost semiconductor sensor and is highly sensitive to alcohol.

Figure 3. Alcohol Sensor (MQ-03)

4.2 Bike Section

This section comprises of RF Receiver, Microcontroller, Wi-Fi Module, GPS Module, GSM and Relay
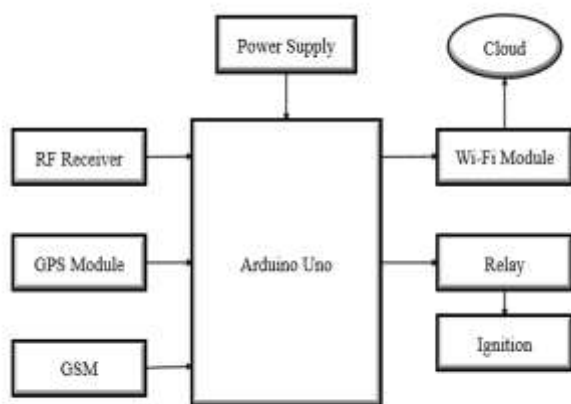

Figure 4. Bike Section

➤ **GPS :**

The Global Positioning System (GPS) is a space-based satellite navigation system that provides the location and time information in all weathers, anywhere on or near the earth. The GPS program provides critical capabilities to military, civil and commercial users around the world. In addition, GPS is the backbone of modernizing the global air traffic system.

Figure 5. GPS

➤ **GSM :**

It comprises of sim card port where the sim has to be inserted and mobile operator need to be used to operate the GSM Modem to communicate through mobile network. GSM Modem is used to send messages by using internet connectivity to the number that is already registered in this system.

Figure 6. GSM Modem (sim900)

➢ **Relay :**

Relay is a switch which is operated electrically. It consists of a set of input terminals and operating control terminals. The input terminals are used for a single or multiple control signals. In multiple contact forms, the switch may have any number of contacts such as make contacts, break contacts, or combination of make and break contacts thereof.

Figure 7. Relay

➢ **Arduino Microcontroller (P89V51RD2) :**

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs like light on a sensor .We can tell the board what to do by sending a set of instructions to the microcontroller on the board. To do so we use the Arduino programming language (based on wiring) and the Arduino Software IDE (based on processing). We are choosing Arduino because, it has inbuilt ADC (Analog to Digital Converter) and more features compared to the other microcontrollers. The flash program supports the parallel programming and serial system programming.

Figure 8. P89V51RD2 Arduino
Microcontroller

5. IMPLEMENTATION

The implementation of this system gives an extremely inexpensive and effectual accident detection.

❖ **Helmet Section**

The push button is pressed when the rider wears the helmet. The existence of alcohol in rider's breath is measured by the alcohol sensor. Tilting of helmet is measured by the accelerometer. These components output will act as the input for microcontroller integrated in the helmet. The data is then processed by the microcontroller and send it to bike section via RF Transmitter.
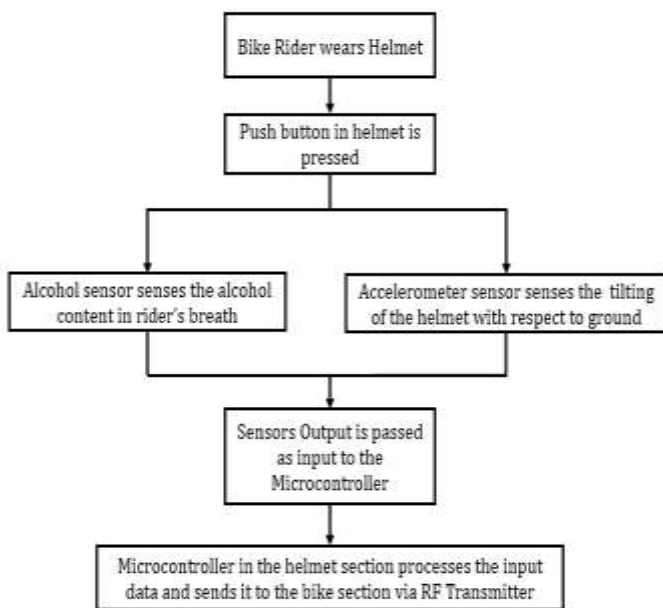

Figure 9. Flow Chart of Helmet Section

❖ **Bike Section**

The data sent by the RF Transmitter is received by the RF Receiver and is transmitted to the microcontroller in the bike section. According to the output of the helmet section, Bike section microcontroller.

To start the bike ignition, there are two conditions:

• Rider should wear the helmet, the push button in the helmet will be pressed when the rider wear the helmet. This button confirms wearing of helmet.

• Rider should not be alcoholic.

If these two conditions are met, the bike ignition will start.

When the push button is pressed, the tilting of helmet with respect to ground as zero is measured by the accelerometer which means that an accident has occurred. Instantly registered contact will receive the accident notification along with location details using GSM. Immediate medical care can be provided by them and also they can inform about the mishap to the police station. If rider has met with a minor accident, then the rider can abort the accident notification sent to the number that is registered.
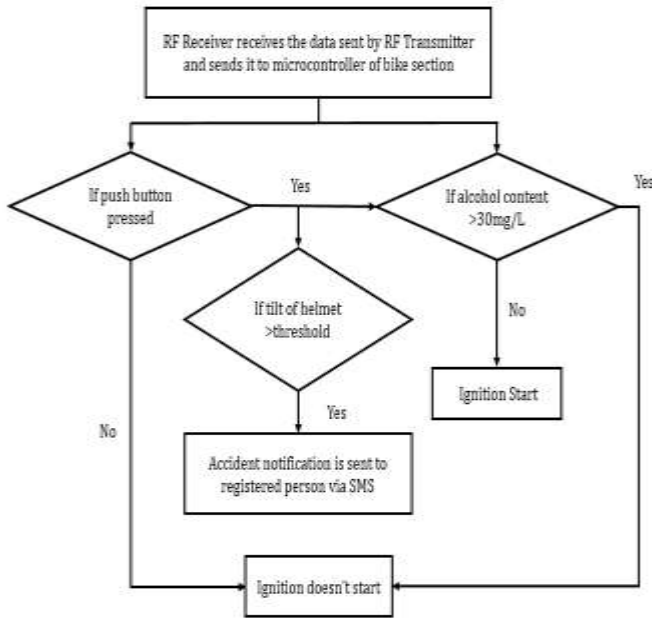
Figure 10. Flow Chart of Bike Section

6. RESULT

Figure 11. Prototype of Proposed Helmet

The biker wearing the helmet is made sure by this system. The signal to microcontroller is given by the push button integrated in the helmet, indicating biker has worn the helmet. The ignition of engine will not turn ON until the signal from the push button is received by the bike section. The ignition of the bike will turn OFF if the biker removes the helmet during the ride.

The presence of alcohol in the rider's breath is detected by the alcohol sensor, the bike ignition will not turn ON if the alcohol content is detected. According to the results, the system could identify the existence of alcohol in the rider's breath 225 times out of 250 times.

The results show the system was able to detect accident 275 times out of 290 times in which 15 were false positives that is an accuracy of 94.82% was reached and sends the notification with the correct coordinates 96.72% (266/275) of the times. This accident detection result is based on the tilting of the helmet. The real-time notification of accident status is shown in the figure 12. This notification will show the exact location of the accident.

Figure 12. Accident Notification with exact location via SMS

7. CONCLUSION AND FUTURE WORK

The system designed lay out safety and decreases the later consequences of the mishap, alerting regarding the accident will issue well timed supervision and treatments to the sufferer lowering the critical impacts on the human. By implementing such mechanism in two-wheeler, deaths due to driving under influence of alcohol and other road fatalities can be minimized to large extent. The alcohol detection will put a stop to drunk driving scenario and the effects of drunk driving to public and biker himself. Monitoring the speed of the vehicle will avert over speeding, rash driving and disobeying of traffic guidelines.

In future this intelligent system can be fabricated in a compact size so that it is globally acceptable to notify No entry and No parking areas. The fingerprint authorization can be used that prevents vehicle theft and provides security. We can implement various bioelectric sensors on the helmet to measure various activities of the rider. 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.

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