INTELLIGENT HELMET BASED ON WEB COMMUNICATION AND IOT TECHNOLOGY FOR SAFE DRIVING

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ABSTRACT

Now a day we’re seeing a lot of two-wheeler road crashes that lead to death. Despite the fact that helmets are available everywhere, people do not wear them for safety, the key explanation for serious head injury is. The main goal of the paper is to ensure that the public wears helmets for protection while riding. The wireless smart helmet enables the rider to drive safely by monitoring the ignition of the vehicle when there are positive parameters. It’s capable of testing “Estimated alcohol content in blood (EACB)”, if the driver wears the helmet and is not drunk and also alerts the health care systems in case of accidents. This serves the purpose of reducing the road accident numbers.

Keywords: Arduino Uno, IOT Sensors, nRF module, MIT App Inventor.

I. INTRODUCTION

The intense interest in the different brand of vehicles is should be also in their safety measures. By wearing the helmet, they can survey severe head injuries. Nearly 1.30 million people die due to road accidents every year. But still most of the people do not wear helmets. This product will insist the rider to wear a helmet. This product consists of various sensors and their parameters from which the vehicle gets ignited. The helmet section contains a microcontroller instilled to collect the parameters from Flex sensor, IR sensor and Alcohol MQ3 sensor. And the vehicle unit has microcontroller which will collect information of helmet section and also vibration sensor parameter while accident occurs. These all parameters will be displayed on the Mobile App. So this paper exhibits the function of system which has a sensor to detect wearing helmet which transmits the signal via an RF transmitter. The signal is received and that is detected by the nodemcu and with the aid of MIT APP Inventor we can complete the whole operation.

This product is preferred to secure and protect us from head injuries. In this device the IR sensor detects whether rider is wearing the helmet. The flex sensor detects whether rider put on the helmet properly. At last alcohol sensor detects whether rider has drunken or not.

These parameters will be transferred to vehicle unit through nRF module. When all the parameters are positive then the vehicle gets ignited. These parameters will be displayed in the Mobile App. If any of the parameters is negative, we will be able to see in the App. These are transferred through the Bluetooth module. An additional feature that our paper holds is accident detection. When the rider meets with an accident, the location will be transmitted to near health care centers.

II. METHODOLOGY

LITERATURE SURVEY:

Mohd Khairul Afiq MohdRasli [1] created the paper that is specially developed as to improve the protection of the motorcycle’s rider. Motorcyclist will be alerted when the speed is too high. To detects the speed and his
head, a force sensing device and a BLDC fan are fixed. Only after the rider buckled the helmet, the motorcycle’s engine will turn on. A LED will blink if the motor speed goes past 100 km/hour.

Sudharsana Vijayan [2] provides the smart Helmet, to check whether the person is putting on the helmet and has not consumed alcohol while driving. A transmitter at the helmet and the receiver at the bike are installed, and a switch is used to make sure the wearing of helmet on the head the engine will not ignite if any of the two conditions are breached. The presence of alcohol and placing of helmet on the head are monitored with sensors. The data transfer is done through RF decoder.

Sivakumar, Dhivya [3] provides the systems that have been implemented are utilizing various sensors namely vibration sensor, FSR sensor and sensor for alcohol and. also, the microcontrollers such as zigbee and Arduino. In some papers GSM & GPS techniques are used for finding out the road accidents and locating the address. They arrive at the conclusion that implementation of smart helmet will result in safer riding. The ignition of the two wheeler occurs, on the condition of fulfilling preset criteria.

Jennifer William [4] provided the system using Arduino Uno development kit with RF transmitter and RF receiver. The bike will not turn on unless the rider wears helmet. An alcohol sensor is attached in the helmet to detect the alcohol breath. Though the system looks similar to the previously developed devices, the factors that make the product standout from the rest its usage of currently available techniques.

Gowtham, P [5]—An Efficient Monitoring of Real Time Traffic Clearance for an Emergency Service Vehicle Using IOT International Journal for parallel programming. In a recent survey, thousands of people are losing their lives on account of the delayed emergency services. The number can be cut down by timely emergency service by avoiding the unnecessary time delay in case of traffic jams during the emergency. By forewarning the signal at the earliest with data transmission, precious time will be saved and passage for the ambulance can be created.

Anuj Singh, Flansha Jain, Mr. Neeraj Kumar, Karan, Shreyanshu Kumar Jena [6] proposed to device a smart helmet to improve the road safety in order to save lives by immediately alerting the authorities high speed accident becomes very fatal if the driver does not put on a helmet. A helmet saves a person from impact during accident. Smart helmets with special facilities are provided to make it better than normal helmets. Various devices are used to make it function better.

Impana, H.C. and Hamsaveni, M. and Chethana, H.T [7] conducted a survey to find out how to avoid accident with the utilization of smart helmet by examining different available technologies. Two wheelers encounter more accidents compared to others. Wearing helmets and riding vehicles without, consuming alcohol are primary causes. This survey examines various related techniques. It helps us to understand emerging IOT technology in a better way.

Wang, C.; Kim, Y.; Kim, D.G.; Lee, S.H.; Min, S.D. [8] aimed to find out how to detect near fall incidents while coming down the stairs with load. They found out smart helmet and smart shoes significantly improve the performance. Safety of the workers is the primary concern in construction field. If neglected, it has its ramifications. The results points out that proposed smart helmet and smart shoes offer better performance in terms of weight-shifting patterns on the head. The results of this study may be helpful in detecting near falls.

Alkhader, A.S.; Saikia, M.J.; Driscoll, B.; Mankodiya, K. [9] proposed to design a helmet based smart textile pressure sensor to find out the concussion and explained their characteristics. A concussion has become a severe public health problem in the United States. Sports activities are major sources of concussions; Recently, many have started studying concussions and explained their characteristics.

Chen, S., Cui, H., Tang, M [10] conducted a systematic review to find out significance differences in number of bike injuries while implementing bike share program. It was conducted to assess the injury rates of bike share programs and the helmet utilization status in bike share programs. There is a notable decline in bike injuries with the implementation of bike share programs.

S. Bhuvaneswari and R. Saranya [11] tried to identify and examine the adoption of wearable smart helmet technology to reduce the fatal injuries to head due to alcohol consumption. The unimaginable increase of urban...
motorcycle road deaths has led to hazardous issues in existing traffic management systems. Besides, this study evaluated the existing practices of smart helmet usage and issues. This will surely open doors for many more such inventions

**Jeon, Hyeon Gyu; Lee, Kun Chang** [12] Conducted a study to establish the connection between emotional attitude of people while they smoke and when they stopped smoking. They designed a study to establish the connection between emotional attitudes smokers and their use of a smoking cessation App, by exploring the data. It is established that anxiety was an important factor. But, its performance was low. The developers of mobile health apps need to reconsider the emotional attitudes of people.

**Merugula S., Chakka A., Muppidi S** [13] discussed the health care monitoring system with IOT and modern wireless technologies to monitor the health of patients using sensors that are connected to Arduino board. The connected sensors will gather readings and the information is processed, all the sensors that are connected will transfer the data with the assistance from Bluetooth module to the application and changes will be notified to the person connected to the application.

**EXISTING SYSTEM:**

In Existing method, Smart Helmet with Global positioning system and mobile communication modules which will help in avoiding such situations to a significant extent. The smart helmet has an option to identify if the rider is having a helmet on his head and finds out whether alcohol consumption prevails. A helmet is already weighing heavy. An average weight of helmet is 1.45 to 1.90 Kg. Some of them also cause head and neck pain. To avoid this, we have applied for the helmet pattern. The current situation is to take measures for the bike handlers who would lose their lives due to alcohol consumption and for not wearing the helmet. This design has sensors to detect accidents and the communication hardware is installed to instantly dial the assigned emergency contact. This helps to reach doctors at the earliest. The other existing helmet is fixed with sensors to read the speed of the bike and notify the rider to alter speed based on the obstacles ahead.

**III. MODELING AND ANALYSIS**

This system ensures the rider puts on the helmet properly while the complete journey details are recorded on the server. The system records the helmet status, speed of the vehicle, accident status and the location of the vehicle all through the time the vehicle ignition starts. The obtained data may be provided to the authorities for traffic monitoring or to a medical aid center to provide first-aid to the injured.

Here is the list of objectives of our paper

- To ensure safety for rider by wearing the helmet properly.
- To analyze the parameters for ignition from the sensors.
- To identify accidents (if any) and alert in presence and absence of IoT.

**HARDWARE IMPLEMENTATION:**

It functions using Arduino UNO, nRF24L01, IR sensor, MQ3 Gas sensor, Vibration sensor and Bluetooth module. Smart Helmet will take care of the Riders safety by insisting them to wear Helmet by the use of mobile application and various sensors. First Rider should have Smart Helmet and Mobile Application Rider has to wear the Helmet. If he / she are drunk or don't wear the helmet, they are unable to Ignite the vehicle. Smart Helmet also provides an additional feature of Accident Detection for the rider who wear Smart helmet.

**SOFTWARE IMPLEMENTATION:**

- Arduino IDE with Embedded C
- MIT App Inventor.
- This application will interact with Smart Helmet and Mobile Application. It gives necessary information on whether they are drunken, not wearing Smart Helmet, etc., if it is in above case then rider cannot start his vehicle. If accident occurs, Smart Helmet will detect it and alerts the health centers about the victims by sending the location of accident occurrence.
Figure 1: Block Diagram of Smart Helmet.

Figure 2: Flow Chart.

ALGORITHM:

Step 1: Hardware and Mobile application will be installed to the rider's helmet, vehicle and Mobile.

Step 2: Detection of Sensor Signals from Helmet Unit.

Step 3: Detection of Sensor Signals from Vehicle Unit.
Step 4: Through Wireless Transmission information from Helmet unit is transferred to Vehicle unit.

Step 5: Finally, Information will get transmitted to Mobile app through Wireless module.

Step 6: Check IR Sensor value is “LOW”.

Step 7: Vehicle will not ignite.

Step 8: Check Alcohol Sensor value is "HIGH".

Step 9: Repeat Step 7.

Step 10: Check Vibration Sensor value is "HIGH".

Step 11: Values will be sent to Mobile App through Wireless Transmission.

Step 12: GPS Location Information is sent to nearby Health Care Center.

Step 13: End.

HARDWARE DESCRIPTION:

ARDUINO UNO:

The Arduino possess a huge support group and a lot of support libraries and hardware add-on “shields” (e.g. Arduino wireless can be made easily with Weixel shield), making it a great introductory platform for embedded electronics. They also offer a Spark Fun Inventor’s Kit, consists of an Arduino Uno with an assortment of components such as breadboard, sensors, jumper wires, and LEDs that make it possible to create a number of modules.

Figure-3: Pin Diagram of Arduino Uno.
ALCOHOL GAS SENSOR MQ3:

![Figure-4: Alcohol MQ3 Sensor.](image)

Concentrations of 0.04mg/L to 4mg/L can be measured by the Sensor. The concentration sensing range is suitable for breathalyzers.

- Out of the two H pins available, one pin is connected to Ground and other is for supply.
- The interchangeable A pins and B pins will be tied to Supply voltage.

ESTIMATED ALCOHOL CONTENT IN BLOOD (EACB) BY INTAKE:

Widmark formula was used to calculate Estimated Alcohol Content in Blood (EACB).

The formula is given:

\[
\begin{align*}
\text{EACB}_{\text{Female}} &= (10M - 7.5T) \times \frac{1}{5.5M} \\
\text{EACB}_{\text{Male}} &= (10M - 7.5T) \times \frac{1}{6.8K}
\end{align*}
\]

where:
- \(M\) is Mass in Kilogram,
- \(T\) is Time,
- \(K\) is Number of Standard Drink

IR SENSOR:

![Figure-5: IR Sensor.](image)

IR Obstacle Sensor Module contains in-built IR transmitter and IR receiver to send out IR energy and searches for reflected IR energy to find out the presence of any obstacle in front of the sensor system. The module consists of on board potentiometer that allows the user adjust detection range. The sensor has stable response even in ambient light or in darkness.
VIBRATION SENSOR:

SW-420 vibration module can work from 3.3V to the 5V. During normal process, the sensor gives out Logic Low and when the vibration is sensed, the sensor provides Logic High. Three peripherals available in the module namely two LEDs, one for the Power state and other are for the output. In Addition, a potentiometer is also present to control the vibration threshold point.

![Vibration Sensor](image1)

**Figure-6:** SW 42 Vibration Sensor.

nRF24L01 MODULE:

A radio transceiver with single chip (nRF24L01), consists of a fully integrated frequency synthesizer, a crystal oscillator, a demodulator, Enhanced ShockBurst™ protocol engine and a power amplifier modulator. A SPI interface is used to program frequency channels, protocol setup and Output power. Power can be saved by Built-in Power Down and Standby modes.

![nRF24L01 Module](image2)

**Figure-7:** nRF24L01 Module.

BLUETOOTH MODULE:

A Bluetooth device (HC-05) used for wireless communication with smartphone. Communication is made with microcontrollers using USART. Settings of HC-05 can be changed using AT commands.
MIT APP INVENTOR:

MIT App Inventor, which is a web application integrated development environment. Newcomers can create computer programming for different operating systems. GUI allows users to drag and drop visual objects to create an application. They can run on android devices. App Inventor consists of Blocks and Design editor which provides get/set different properties and calls functions on a component block or a variable that represents a component. We can use a Web component for connecting to a website. Google is a suitable choice for this. We use it to display current location information.

IV. RESULTS AND DISCUSSION

This system gives the best possible resolution to inferior emergency facilities offered to victims in road accidents within the most practical method. With the help of this technology immediate action are taken once the accident occurs by alerting the various individuals. The proposed technique is extremely beneficial to the automotive trade. This will be a great help for medical community to provide medical assistance to save precious lives. It is like a virtual traffic police inspector, that is the ultrasonic sensor checking time to time if the helmet is still on or not.

Table-1: Standard Drink Chart (U.S.)

Note: This chart defines a drink as 13 g of ethanol, while the formula defines a drink as 11 g of ethanol.

<table>
<thead>
<tr>
<th>Alcohol</th>
<th>Amount (ml)</th>
<th>Serving Size</th>
<th>Alcohol (% by Vol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 Proof Liquor</td>
<td>44</td>
<td>One Shot</td>
<td>40</td>
</tr>
<tr>
<td>Table Wine</td>
<td>148</td>
<td>One Glass</td>
<td>12</td>
</tr>
<tr>
<td>Beer</td>
<td>355</td>
<td>One Can/Bottle</td>
<td>5</td>
</tr>
</tbody>
</table>
V. CONCLUSION

The main advantage of this paper is that you don’t have to pay fine in latter case; it’s just your bike which is going to be switched off. Use of this paper makes ones bike secure at crucial times, especially 
makes one's bike secure at crucial times, especially when one is away from the bike and someone is trying to steal it or in other words if there are any chances of theft that can occur.

VI. REFERENCES


