

Smart Helmet Using IOT Technique

Rai Abhishek, Kamisetty Bindusri Laxmi, Machkuri Venkatesh, Dr. A Venkataramana, M Rajamouli

Department of ECE
Government Polytechnic, Medchal,
Telangana, India

Email: raiabhishek3646@gmail.com, bindukamisetty@gmail.com, machkurivenkatesh08@gmail.com

Abstract- Smart Helmet is system used to design a helmet that provides safety to bike riders. It detects whether the rider met with an accident. A smart system can help to decrease death rates on road accidents. This smart system turns on the ignition only when the helmet is worn and no alcohol is consumed by rider. A smart system also helps to detect the obstacle and responds through automatic brake system. The system provides an alert and inform to the family or friends about the accident faced by the rider. Smart helmet system is developed using Arduino Uno for controlling the entire process, RF module to provide communication between helmet and bike unit, ultrasonic sensor for automatic break system, GSM and GPS module for SMS and current location identification, vibrating sensor for accident detection and node MCU to store the data of alcohol consumed by rider. The developed system is tested and works well.

Keywords- IoT, Smart Helmet, Arduino UNO.

I. INTRODUCTION

In recent years the Internet of things (IOT) has transformed the way we live, work and play. IOT is the network of physical device. To develop IOT, you will need a combination of hardware and software skills. Hardware components such as sensor, microcontroller and communication module such as Wi-Fi, GSM, Bluetooth. On the software side, we will need to be proficient in programming language such as C++, Java, Python and have experience with database cloud computing and network protocols.

The idea behind of IOT is to make the device smarter and more connected. Enabling them to communicate with each other and with humans in new and innovative way. IOT can offer several advantages to the human beings both in terms of personal convenience and overall well being of improved health care, Increasing safety, Enhanced convenience, improved accessibility, better communication increasing productivity.

Road accidents in India are significant public health and safety concern vidya high number of fatalities and injuries are occurring every year. In 2021, road accidents claimed the lives of 1.55 lakh Indians — an all-time record. Nearly 60% of those incidents were caused by over speeding. According to National Crime Records Bureau (NCRB) data released recently, more than 1.55 lakh people [3] were killed in road crashes across India in 2021, an average of 426 daily or 18 every hour.

This is the highest death figure recorded in such accidents in any calendar year. Over speeding continues to be the biggest killer on Indian roads. The data from the past few years show that nearly 60% of road crashes are caused

due to speeding. The share of fatalities due to speeding has been in the 55-57% range. Over speeding: Most of the accidents are occur due to the over speeding it is the natural psychology of humans to excel and to win, if there is a chance human will go to infinity in speed. But as the speed thrills it also kills, faster vehicles riders are more prone to accident.

Another significant factor contributing to road accidents is drunk driving: Consumption of alcohol to celebrate any instance is very common. But when it is mixed with driving it turns enjoyment to misery. Alcohol can reduces concentration of riding. It decreases reaction time of a rider body. Hands and legs take more time to react. It suppresses vision due to dizziness. Alcohol dampens fear and incites humans to take risks.

Wearing safety gear, such as helmets, is critical for motorcyclists. Unfortunately, many riders do not wear helmets, despite the law requiring it. Studies have shown that wearing helmets and other protective gear can significantly reduce the impact of an accident and prevent serious injuries. Ignoring safety gear while riding can result in fatal accidents.

All these factors while driving cause accident. Two Wheelers are the most vulnerable vehicles on according for 36.9% of total accidents. The commercial cost of road accidents in India is estimated to be around 3% of the country's GDP to overall to overcome this accident every citizen has to follow the traffic rules and safety measurements Most of the people are not wearing the helmet because of social enormous and convenient non enhancement of loss

To stay safe on the road, it is essential to follow traffic rules, drive responsibly, avoid excessive speeding, and never drive under the influence of alcohol. Wearing appropriate safety gear, such as helmets, is also crucial for reducing the risk of severe injuries in the event of an accident.

II. AIM AND OBJECTIVE OF THE PROJECT

- To design a smart system, which provides the safety of two-wheeler riders
- A smart system that can help to decrease death rates & road accidents
- To develop a smart system which turns on the ignition only when the helmet is worn and no alcohol is consumed by rider
- A smart system that helps to detect the obstacle and responds through automatic brake system
- To develop a smart system which helps to alert and inform to the family or friends about the accident faced by the rider

III. LITERATURE SURVEY

This survey provides an overview of the previous work related to the proposed system in the field of IoT and knowledge-based expert systems. Many noteworthy contributors have made significant contributions in this area. We have highlighted some of the most notable ones to identify the significant attributes of these systems

Guntupalli Sireesha [1] proposes a smart helmet system consisting of two units: the helmet unit (HU) and the motorbike unit (MU), which are connected via radio frequency (RF). The HU is equipped with sensors to detect the rider's pulse, alcohol content in their breath. The pulse sensor is utilized to determine whether the rider is wearing the helmet or not. The system also incorporates GPS and GSM modules to share the rider's location and send messages in case of an emergency. An accelerometer is utilized to detect accidents. The sensor installed on the bike is used to ensure that the rider is in the correct riding position, and in the event of an accident, it sends a message to the emergency contact.

Mohammad Ehsanul Alim et.al [1] and Sarosh Ahmad [2] propose an approach for bike safety which involves the use of two microcontrollers, Arduino NANO and Arduino Mega-2560, to control the entire system. Communication between the sender and receiver is established through two 2.4 GHz nRF24L01 modules. The system utilizes an MQ-3 alcohol sensor to detect whether the bike rider is under the influence of alcohol, and if so, the sensor turns off the engine. A Sharp IR sensor is also used to detect the rider's head within a specified range. The bike's engine will only start once the rider has buckled the helmet. GPS and GSM

technologies are used to track the rider's location and send text messages to their family members in the event of an accident.

Dr. S. Sekar [1] and L. Jaivenkatesh [2] have proposed an IoT-based smart helmet system that aims to enhance the safety of the driver. The system is designed to incorporate features such as alcohol detection and accident detection, which will enable real-time location tracking. The system is also designed to ensure that the rider wears safety equipment before starting the engine. If the rider fails to wear the required safety equipment, the engine will not start.

IV. PROPOSED SYSTEM

Nowadays, there is a huge rise in the production of bikes and motorcycles with different and new types of accessibilities. It is crucial to prioritize rider safety as it directly affects the lives of the riders and other road users. Motorcycle manufacturers have a responsibility to design and produce motorcycles that not only provide excellent performance but also include safety features such as anti-lock brakes, traction control, and airbags. The primary objective of this proposal is to address two critical issues that contribute to accidents - the failure to wear a helmet and riding under the influence of alcohol.

This technology of using a helmet to detect whether a rider is wearing it properly before riding is known as a helmet interlock system. This system blocks the ignition of the bike if the rider has not worn the helmet properly and gives an indication to the rider to wear the helmet. In case the rider doesn't wear the helmet, a buzzer unit is activated, and a warning sound is produced to prompt the rider to wear the helmet before starting the bike. This technology is a significant step towards ensuring rider safety and reducing the risk of accidents due to not wearing helmets

It will also check whether the rider had consumed alcohol or not. An MQ-3 gas sensor to detect alcohol consumption in a motorcycle helmet, the sensor would need to be placed near the rider's mouth so that it can detect any alcohol vapors exhaled by the rider. If the rider is drunk in heavily then the ignition will automatically stop, Using a Radio Frequency (RF) module for wireless communication between the helmet unit and bike unit can be a possible solution for implementing an alcohol detection system in a motorcycle.

When rider wears the helmet, which contains the MQ-3 gas sensor that detects the amount of alcohol consumed by the rider. The MQ-3 gas sensor converts the alcohol concentration into an electrical signal, which is an analog output. The analog output of the MQ-3 gas sensor is connected to the microcontroller, which reads the signal and processes the data. The microcontroller uses an

analog-to-digital converter (ADC) to convert the analog signal into a digital signal that can be processed by the microcontroller.

The microcontroller then processes the data and calculates the alcohol concentration. The microcontroller sends the calculated data to the Thing Speak cloud, which is a cloud-based IoT platform, proposed by MATLAB. The Thing Speak cloud stores the data and makes it available for further analysis and visualization. The data stored in the Thing Speak cloud can be accessed from any device with internet connectivity, such as a smartphone or a computer. The data can be used to monitor the alcohol consumption of the rider and to alert the rider or a designated authority in case the alcohol concentration exceeds the legal limit

The bike unit can also have an RF module that is connected to a microcontroller as a receiver. This microcontroller can receive the digital signal sent by the helmet unit and interpret it to determine if alcohol has been detected. If the alcohol level is above a certain threshold, the microcontroller can send a signal to the bike's ignition system to stop the engine.

The second issue is while riding a motorcycle there are many blind spots so the rider doesn't know whether a vehicle is approaching or not this cause major accident to the riders who follow the rules. The ultrasonic sensor works by emitting high-frequency sound waves that bounce off objects and return to the sensor. By measuring the time it takes for the sound waves to return, the sensor can calculate the distance between the motorcycle and any nearby objects.

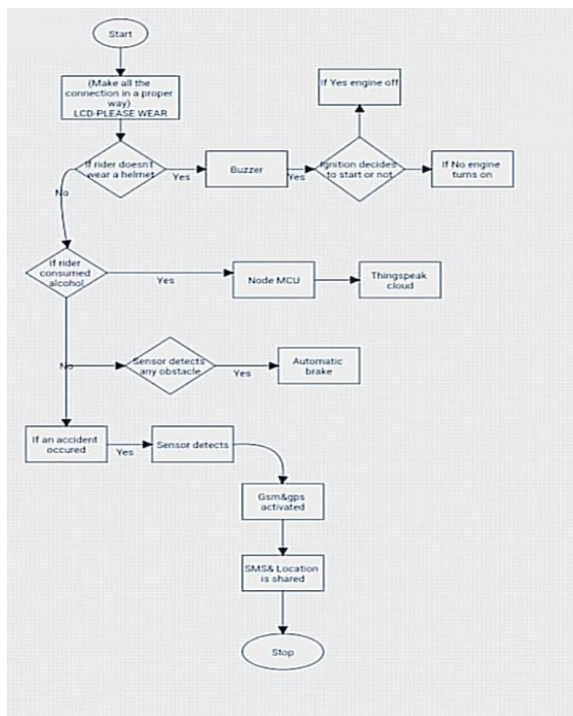


Fig1. Overall System Function.

To implement this system, the ultrasonic sensors can be connected to a microcontroller or other electronic device that can interpret the sensor readings and trigger the motorcycle's brake system if an obstacle is detected within a certain range. The microcontroller can also activate a buzzer unit and horn to alert the rider of the potential danger. This system works very accurate and reliable in detecting obstacles and triggering the brake system. Fig: 1 shows the overall system functioning

One of the challenges for motorcyclists involved in accidents is the time it takes to receive medical attention, and the difficulty in notifying their friends and family of the incident. To address this issue, the GSM module can be used to send a distress signal with the GPS coordinates to emergency contacts via text message. This will allow the rider's friends and family to be immediately notified of the accident and its location, and to take appropriate action.

V. SYSTEM DESIGN

The system design consist of two modules They are they are user module and admin module The user module is an active communicating module where the helmet sends a communication with the rider.The admin module is used to receive the response to the helmet unit

A: helmet section

B: bike section

1. Helmet Section:

Helmet unit consist of

- 433 hertz RF, transmitter module
- Switch
- MQ3 alcohol detecting sensor
- Node micro controller unit

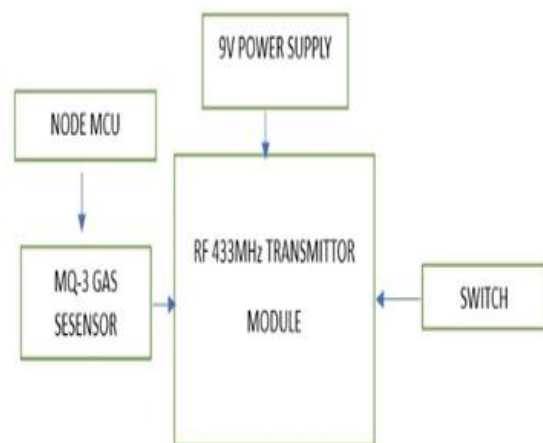


Fig 2. Block diagram of helmet section.

Through the switch and MQ3 alcohol detecting sensor the input signal is given to the 433 hertz RF transmitter module. This sensor reads the input values of the rider and the signal is transmitted by the RF module to the bike

section and it also includes a node MCU connected to MQ-3 GAS sensor, this takes the reading from the mq-3 gas sensors if rider consumed the alcohol the percentage of alcohol is stored in ThingSpeak cloud. fig:2 shows the block diagram of helmet section.

2. Bike Section:

The bike section consists of

- Arduino UNO
- 433M hertz RF Receiver module
- single relay [ignition]
- vibrating sensor
- ultrasonic sensor
- buzzer
- 16X2 LCD
- Motor[engine]
- Sim900A GSM module
- Neon 7m GPS module
- power supply

It receives the signal from the helmet section through Receiver module and process the data in Arduino uno microcontroller, than it gives command to the ignition whether to ON &OFF engine. Ultrasonic sensors detect obstacles and send signals to a microcontroller. The microcontroller triggers the brakes and activates alerts for the rider, such as a buzzer.

In the event of an accident, the vibration sensor will detect the impact and send a signal to the microcontroller unit (MCU). The MCU will then utilize the Global System for Mobile communications (GSM) and Global Positioning System (GPS) technologies to send a text message (SMS) containing information about the accident, as well as the location of the incident. fig:3 shows the block diagram of bike section.

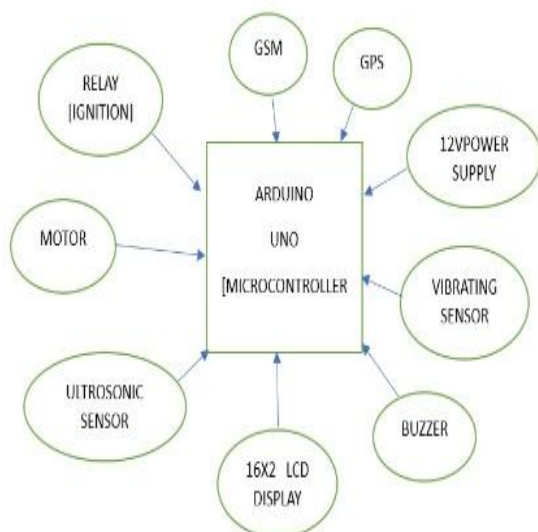


Fig 3. Bike section block diagram.

VI. RESULT

Ensure that all connections in the bike and helmet system are initialized correctly for proper functioning. fig:4 shows the helmet unit connections.

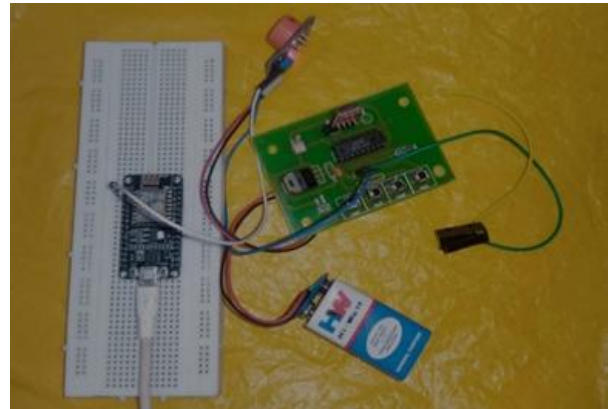


Fig 4. Helmet Unit Connections

1. Interlocking System:

The interlocking system is a safety feature that prevents the ignition from starting until the rider wears the helmet. This is done to ensure that the rider is wearing a helmet before starting the bike, which is a crucial safety requirement. The interlocking system works by using a sensor on the helmet and a matching receptor on the bike. When the rider puts on the helmet, the sensor on the helmet sends a signal to the receptor on the bike, and the ignition is then enabled.

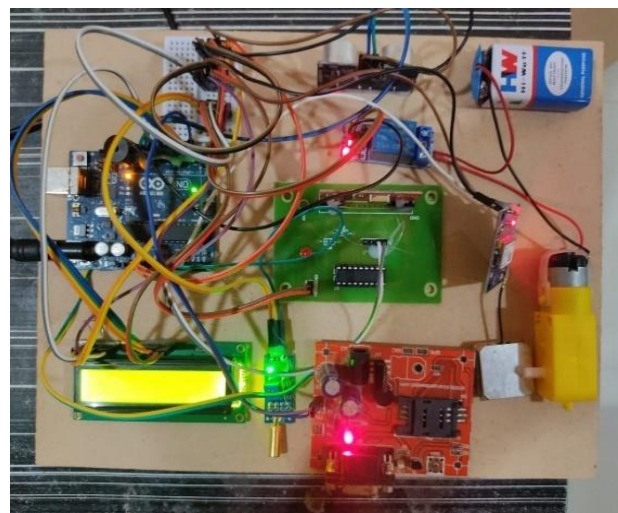


Fig 5. Bike Section Connections.

2. Helmet Detection Alert:

If the rider isn't wearing the helmet, an alert is sent through a buzzer and LCD display to prompt the rider to wear it. This is done to ensure that the rider wears the helmet before starting the bike, as riding without a helmet is dangerous and can result in severe injuries or death. As shown in Fig.6



Fig 6. Display Unit.

3. Alcohol Detection System:

To prevent drunk riding, the system checks whether the rider has consumed alcohol or not. This is done using an alcohol detection system that uses a breathalyzer to measure the rider's blood alcohol content (BAC). If alcohol is detected, the ignition is turned off, and the bike cannot be started. This is done to prevent the rider from riding under the influence of alcohol, which is a leading cause of accidents

4. Data Storage:

The system stores data on the rider's alcohol consumption in the cloud, which can be used to inform parents about their child's behaviour. This is done to ensure that parents are aware of their child's behaviour and can take appropriate action if necessary. As shown in fig: 7



Fig 7. Shows the the data storing in thingspeak cloud.

The system includes an automatic braking feature that can prevent accidents in case of sudden obstacles using Ultrasonic sensor. This feature uses sensors on the bike to detect any obstacles in the path of the rider. If an obstacle is detected, the system automatically applies the brakes to slow down the bike and prevent a collision. This feature is critical as it can help prevent accidents and ensure the safety of the rider.

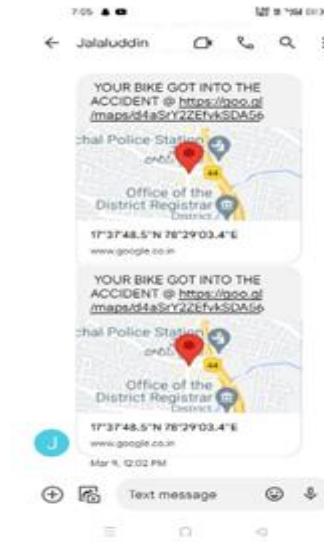


Fig 8. SMS and Location alert.

In case of an accident, the system features sensors that detect the impact and send an SMS along with location data to a registered phone number. This feature is crucial as it provides immediate assistance to the rider in case of an accident. The SMS includes information about the accident, including the location of the bike, the time of the accident, and the severity of the impact. The registered phone number can be that of a friend or family member who can come to the rider's aid, or emergency services.as shown in fig: 8.

The location data is obtained using GPS technology, which provides accurate information about the rider's location. This information can be used to quickly locate the rider and provide assistance, which is crucial in case of severe injuries. The SMS also includes information about the rider's condition, which can help emergency services provide appropriate medical assistance.

VII. CONCLUSION AND FUTURE SCOPE

The focus of the system is on the safety of riders, and it achieves this by making the use of safety equipment mandatory. Additionally, it ensures that the rider does not consume alcohol while riding. The ignition system prevents the rider from starting the bike if they violate any of the security rules, thereby overcoming many of the problems faced by previous systems. It starts detecting nearby vehicles and alerts the rider with a buzzer.

Furthermore, the reporting system is helpful in case of an accident as it informs family members via SMS with the location for immediate treatment. This system is also cost-effective. To improve the system further, the vehicle detection model can be enhanced to detect potholes and speed brakes on the road. This can be done by developing a dedicated embedded system that reduces the sensor processing time load on the microcontroller. One way to

achieve this is by using Raspberry Pi with the Pi camera module and positioning it in such a way that it can observe the projection on the mirror of the helmet. Moreover, small solar panels can be attached to the top and backside of the helmet to minimize the need for a battery and reduce the weight of the circuitry. This will make the system more efficient and sustainable

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