# Safety and Smart System for Motorcyclist Using Internet of Things

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*Abstract* — Life is a wonderful gift from the All-Powerful. The decision to live it joyfully rests with each person. On the other hand, we are not demonstrating any interest in protecting our lives. One of the biggest mistakes is failing to wear a helmet when riding a bike, which results in the loss of more than a million lives every year. In order to effectively solve this issue, this project is currently being developed. The Smart Helmet is designed to assess the rider fundamental needs and aid in a safe journey. The Smart Helmet is a new technology designed to address the issue of people not feeling comfortable wearing helmets while riding bikes. The helmet uses wireless technology to monitor whether the driver is wearing a helmet or not, and if not, the vehicle will automatically turn off. It also detects alcohol consumption and will not allow the vehicle to turn on if alcohol is detected. The helmet recognizes traffic signs and reminds drivers if they forget their keys in their vehicles. The overall goal of this project is to provide riders with safe and comfortable journeys by implementing new technologies and safety regulations.

***Keywords:*** Safety and Smart System, Motorcyclist, Internet of Things

## I. INTRODUCTION

IoT stands for Internet of Things, which means accessing and controlling daily usable pieces of equipment and devices using the Internet. IoT is an advanced automation and analytics system that deals with artificial intelligence, sensor, networking, electronic, cloud messaging etc. to deliver complete systems for the product or services. The system created by IoT has greater transparency, control, and performance. Our mobile device contains GPS Tracking, Mobile Gyroscope, Adaptive brightness, Voice detection, Face detection etc. In India, traffic accidents have been on the rise, and helmets have become compulsory for two-wheeler riders under Section 129 of the Motor Vehicles Act, of 1988. It is estimated that many bike riders die every day in road accidents due to insufficient information regarding the accidents those riders cannot be saved as they merely find help after the occurrence of the accident... However, compliance is often lacking, and drunk driving is still a major problem. To address these issues, a smart helmet has been developed with Force Sensing Sensor (FSR) and alcohol sensors to detect helmet use and prevent ignition if the rider is drunk. The main purpose of our papert is to ensure safety and build a cost-effective system to prevent alcoholic people from riding a motorcycle. More than half of all avenue visitor's death is amongst inclined avenue users like pedestrians, motorcyclists, and cyclists, Additionally, the helmet has an accelerometer to detect accidents and send location information to nearby hospitals for quick medical assistance. The helmet is made up of two units, each with a microcontroller and RF module for signal transmission. Before starting the bike, the helmet checks for helmet use and alcohol consumption. In the event of an accident, the helmet detects the rider's condition and sends location information for quick medical assistance. By incorporating these features, the smart helmet aims to improve rider safety on the road.

## II. LITERATURE SURVEY

A lot of wearable technology has been produced to make people's lives easier and more sophisticated because we are living in the IoT era, when all electronic gadgets operate using smart principles. Despite the fact that many academics have studied the idea of IoT, only a small number of their works have been reviewed in this part, which inspired us to work on IoT. Jesudos [1] Proposed the concept involves using various sensors, such as an infrared sensor, a gas sensor, and a vibration sensor, to monitor the activities of a person wearing a helmet. The gas sensor can detect the amount of liquor that the person has consumed, while the vibration sensor can detect an accident. The vehicle's bar control is also handled by the micro- electro- mechanical systems (MEMS). Mehata [2] Presented a paper proposes a method that would allow workers to be alerted whenever a fall occurs in the workplace. It utilizes a wearable device that's built using electronic components and sensors, and a cell phone to communicate with each other. Divyasudha [3] proposed a concept to prevent accidents and monitor alcohol consumption, a system consisting of a microcontroller, position sensor, alcohol sensor, piezoelectric sensor, RF transmitter, IOT modem, GPS receiver, power supply, and solar pane. Manish Uniyal [4] Suggested a system with two units, a helmet unit and a two-wheeler unit. The two-wheeler component receives the helmet's position information from the RF receiver using the appropriate frequency. Shoeb Ahmed Shabbeer [5] suggested the use of a smart helmet to identify and report accidents. This technique makes use of a microcontroller that's connected to a Vibrator and a module for GSM. Sreenithy Chandran [6] put forth the konnect smart helmet system. Here, they employ a network of integrated sensors, Wi-Fi enabled CPUs, and cloud computing infrastructures to identify and stop accidents. Mohammed Khaja Areebuddin Aatif [7] Proposed method using an Arduino Uno, a Bluetooth module, a push button, and a 9V battery was offered. Here, the Bluetooth- enabled smart helmet is connected to cell phones and has a push button for usage in case of an emergency. Archana [8] developed a method that uses a sensor to detect human contact when the rider plugs in the bike key to decrease accidents. When he puts on the helmet, the sensor locks it automatically, and he can only take it off when the bike is stopped. Agung Rahmat Budiman [9] presented a smart helmet system that integrates several capabilities. To ensure the rider's safety, a warning notification is sent if a rider is not wearing a helmet, if he is in hazardous conditions, and if his helmet is not properly locked. Prashant Ahuja [10] Suggested GSM and GPRS module-based smart helmet system. This prototype serves to

 

notify the person concerned about the accident so that he may take the necessary action because, as we all know, the arrival of the ambulance to the place may be delayed.

## III. METHODOLOGY

Every year, motorcycle-related accidents lead to catastrophic deaths and cost enormous money in several nations. A smart helmet helps to reduce those accidents casualty and saves lives. In this prototype design, the smart helmet has two sets of circuits. One is the helmet circuit, and the other is the onboard circuit which has a GPS (Global Positioning System) that sends the location and other details to the nearest hospital and law enforcement agencies for immediate action.

### *A. Infrared Sensor*

An IR sensor in Fig 1 works by detecting the infrared radiation emitted by an object. The basic working principle of an IR sensor are as follows, IR emitter emits infrared radiation towards the object being monitored, The object reflects some of the infrared radiation back towards the IR detector, The IR detector receives the reflected infrared radiation and converts it into an electrical signal, The signal processing circuit processes the electrical signal received from the IR detector and converts it into a usable form. The output display displays the processed output signal. The amount of infrared radiation reflected by the object depends on various factors, such as the distance between the object and the IR sensor, the material of the object, and the ambient temperature. The signal processing circuit is designed to filter out unwanted noise and amplify the signal so that the output display can provide a clear and reliable indication of the presence or absence of the object being monitored.IR sensors can be used in a wide range of applications, such as object detection, temperature measurement, and proximity sensing. They are widely used in consumer electronics, industrial automation, medical equipment, and security systems.

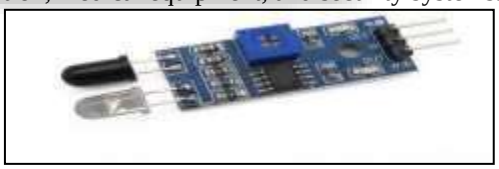

Fig 1. Infrared sensor

### *B. MQ-3 Sensor*

The MQ-3 sensor in Fig 2 works on the principle of gas sensing. The gas-sensing element in the sensor is made of a material that is sensitive to alcohol vapours. When alcohol vapours come in contact with the sensing element, they cause a change in its electrical conductivity. The workings of an MQ-3 sensor are as follows, Heating is the sensing element of the sensor is heated by a small heater to a high temperature. This helps to increase the sensitivity of the sensing element to alcohol vapours. Detection is when alcohol vapours are present in the air, they come in contact with the sensing element, which causes a change in its electrical conductivity. This change in conductivity is proportional to the concentration of alcohol vapours in the air. Signal conditioning is the change in conductivity of the sensing element is converted into a measurable voltage by the load resistor, and the signal conditioning circuit amplifies and filters this voltage to make it measurable. The output from the signal conditioning circuit is displayed on an output display, which shows the measured alcohol concentration in the air.

The sensitivity of the MQ-3 sensor to alcohol vapours can be affected by various factors such as humidity, temperature, and other gases in the air. Therefore, it is important to calibrate the sensor for accurate measurements. MQ-3 sensors are widely used in breathalyzers, as well as in other applications that require the detection of alcohol vapours in the air, such as industrial safety systems and automotive applications.

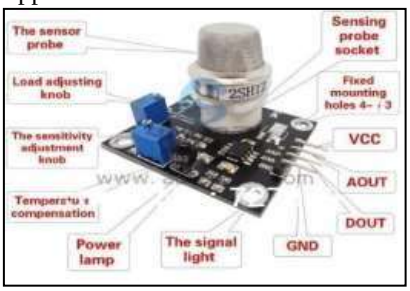


Fig. 2: MQ-3 sensor

### *C. Vibration sensor*

The working of a vibration sensor in Fig 3 is based on the principle of measuring the motion or acceleration of a mass in response to the vibration of a system. The working of a typical vibration sensor are Sensing element, the sensing element in the vibration sensor is a transducer that converts the mechanical motion of the mass into an electrical signal. It can be based on various principles such as piezoelectric, capacitive, or electromagnetic. Mass and spring, the mass in the vibration sensor is connected to a spring, which provides a restoring force that opposes the motion of the mass. When the system vibrates, the mass moves in response to the vibration. Motion detection, the motion of the mass is sensed by the sensing element, which generates an electrical signal proportional to the motion or acceleration of the mass. This signal is typically a voltage or current signal. Signal processing, the electrical signal from the sensing element is processed by the signal processing circuit, which typically includes amplification, filtering, and sometimes digitization. The processed signal can be displayed on an output display or transmitted to a data acquisition system for further analysis. Calibration, the sensitivity and frequency response of the vibration sensor may vary depending on the design and application. Therefore, calibration of the sensor is necessary to ensure accurate and reliable measurements.

Vibration sensors can be used in a wide range of applications, such as monitoring the performance of industrial machinery, detecting structural defects in Vibration sensors can be used in a wide range of applications, such as monitoring the performance of industrial machinery, detecting structural defects in buildings and bridges, and measuring the acceleration of vehicles. They are widely used in automotive, aerospace, and industrial applications, as well as in research and development.

 

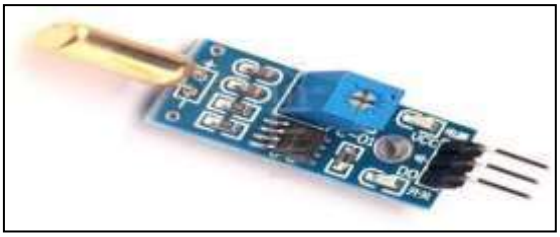

Fig. 3: Vibration sensor

*D. GSM and GPS*

When GSM and GPS in Fig 4 are used together, the mobile device can transmit its location information to a remote server using the GSM network. This allows the device to be tracked in real time, and location- based services can be provided based on the device's location information. For example, a vehicle tracking system may use a GPS receiver in the vehicle to determine the vehicle's location and transmit the location information to a remote server using the GSM network. The remote server can then provide real-time location information to the vehicle owner or fleet manager, allowing them to monitor the vehicle's location and track its movements.

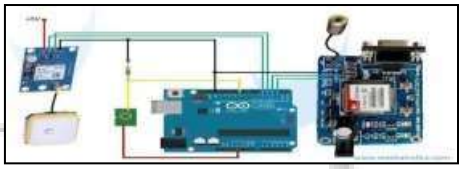

Fig. 4: GSM and GPS

*E. Arduino microcontroller*

Arduino in Fig 5 is an open-source electronics platform that consists of hardware and software components. It is designed for building interactive projects and prototypes and can be used by hobbyists, students, and professionals. The Arduino platform consists of the following components are Microcontroller board, the microcontroller board is the hardware component of the Arduino platform. It is a small circuit board that contains a microcontroller chip, which is the brain of the Arduino. The microcontroller chip is programmed with software that controls the inputs and outputs of the board. Input / Output pins are on the Arduino board are used to connect sensors, actuators, and other electronic components. There are digital pins that can be used for reading or writing digital signals, and analogue pins that can be used for reading analogue signals. Power supply is the Arduino board can be powered by a USB cable, battery, or external power supply. The power supply provides the necessary voltage and current for the board to operate. Programming environment is the software component of the Arduino platform. It is a user-friendly interface that allows users to write and upload programs to the microcontroller board. The programming environment is based on the C++ programming language and includes a library of functions for interacting with the hardware. Shields are add-on boards that can be attached to the Arduino board to extend its functionality. There are shields available for a wide range of applications, such as motor control, wireless communication, and sensing.

The Arduino platform is designed to be easy to use and accessible to people with little or no experience in electronics or programming. It has become a popular tool for prototyping and experimenting with interactive projects and has been used in a wide range of applications, such as robotics, home automation, and art installations.

Fig. 5: Arduino microcontroller

## IV. Simulation and Results

The smart helmet ensures that the motorcycle rider doesn't violate the traffic rules like wearing a helmet and consuming alcohol. If any of the rules are violated, then the rider can't start the motorcycle. With the help of GPS-enabled smart helmets, riders can get turn-by- turn directions and avoid using their phones while riding. The smart helmets can also detect changes in movement and provide an emergency alert to the riders. This feature can help alert emergency services after a serious accident. A smart helmet can also monitor a rider's vital signs, such as their heart rate and temperature. It can notify them if they need to seek medical attention or take a break. These types of helmets provide users with a convenient and safer riding experience. As more advanced technology is introduced, we can expect to experience even more innovations in smart helmets.

## V. Conclusion

The designed Smart helmet ensures the safety of the rider by making it necessary to wear a helmet and also ensures that the rider hasn't consumed alcohol. To overcome the violation of traffic rules like not wearing a helmet and drunk & driving, there is no alternative to smart helmets for motorcycle rider's safety. Wearing a helmet is imperative while riding a motorcycle because it can save the rider from severe injury to the head in the case of an accident. So, this is where the sensor will come into action. It will ensure that the rider must wear the helmet to start the bike. Drunk driving is also an important issue to consider nowadays. Drunk driving can cause more accidents so, the alcohol sensor will check if the driver is drunk or not. Smart helmets are very popular in Western and European countries, but the concept is not familiar in India yet. If we can make our design more full-proof and get a sponsorship, then we will be to mass produce it. A smart helmet may be a little bit more expensive than a regular helmet but its benefits certainly outweigh the costs. In addition, it will help save lives, aid in better data collection and builds an infrastructure solution using Emergency Crash Reporting Software to support the rescue services of the country.

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