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Safe Drive Headgear System

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Abstract:- India, the world's second-most populous country, boasts a significant youth demographic. In contemporary times, young individuals exhibit a penchant for motorcycles, often prioritizing style over safety by neglecting to wear helmets. Consequently, motorcycle accidents have seen a steady rise, resulting in fatalities predominantly attributed to head injuries. However, the adoption of helmets could mitigate such risks and prevent tragic outcomes. Furthermore, instances of driving under the influence have surged, contributing to accidents and fatalities owing to reckless behavior. In case of hit and run it is becoming some difficult to identify the vehicle. So, there is a need of identify the vehicle which hit the backside. These unfortunate occurrences have spurred the development of a technologically advanced solution: a safe drive headgear system. This innovative device aims to curb accidents and minimize fatalities by incorporating key features. For instance, the motorcycle only initiates upon the rider donning a helmet. Additionally, in cases of alcohol intoxication, the ignition system automatically disengages. By using ESP 32 camera and IR sensor we can identify the vehicle in hit and run case. Moreover, in the event of an accident, the integrated GSM modem swiftly dispatches distress messages to pre-registered contacts via a SIM card.

***Keywords**:- Component; GSM Module ;Internet of Things; ESP 32 Camera ; GPS Module ; Safe Drive Headgear System)*

I. INTRODUCTION

Technology is a word we hear everywhere, especially in areas like education, making things, getting around, talking to each other, and staying healthy. In getting around, transport is really important for the economy and something governments use. There are lots of ways we can travel, but young people especially love motorcycles. Staying safe on a motorcycle depends on lots of things like the type of gear you use, how the bike is made, and how good the rider is. But even with all that, motorcyclists are some of the most at risk on the roads. Without the right protective gear, even a small mistake can cause big injuries or even death. It's not just about being careless though; people can get hurt or die because they're going too fast, driving recklessly, drinking too much, or not following the rules. But the biggest danger, which can cause immediate death, is not wearing a helmet. Wearing a helmet can reduce the chances of head injuries by 80% and save lives in accidents. With new technology like IoT, we can make roads safer. By adding sensors to bikes, we can warn riders and others around them about dangerous situations, like sending a message if there's a problem. Making wearing helmets compulsory for riders can help too. According to recent studies, every hour, 4 people die in road accidents, and 70% of them weren't wearing helmets. By looking at data from all over the world and using new tech, we can make rules to keep everyone safe. Our project's main goal is to make sure people are safe when riding motorcycles.

Objective: The main goal of this system is to make a helmet that keeps riders safe and stops them from driving when they've had too much to drink. It also tells someone if the rider has an accident and sends a text message.

II. PROPOSEED SYSTEM

We're making a safe drive headgear system using IoT tech to keep bike riders safe. Here's how it works:

- The system checks if the rider is wearing a helmet. If they are, the bike can start.
- It also checks if the rider has had too much alcohol. If they have, the bike won't start.
- If the rider has an accident, it sends a message to someone with their location.
- It also identifies the vehicle which hit out bike from back by using camera and ir sensor.

We're using IoT to make sure riders know the rules and stay safe. Wearing a helmet is really important for bike riders, but it's not enough to keep them safe if they don't follow the rules. Many people just wear any old helmet to avoid getting in trouble with the police, but those helmets don't keep them safe. That's why we're making a save drive headgear system to solve these problems.

III. SYSTEM DESIGN

The system has two parts

A. Helmet Part
B. Bike Part

A. Helmet Part

This part consists of alcohol sensor, Limit switch, RF transmitter and microcontroller. Alcoho sensor is used to detect whether the rider is consumed alcohol or not. Limit switch is used to identify whether the rider wore the helmet or not. The information is transferred from helmet part to bike part using RF transmitter.

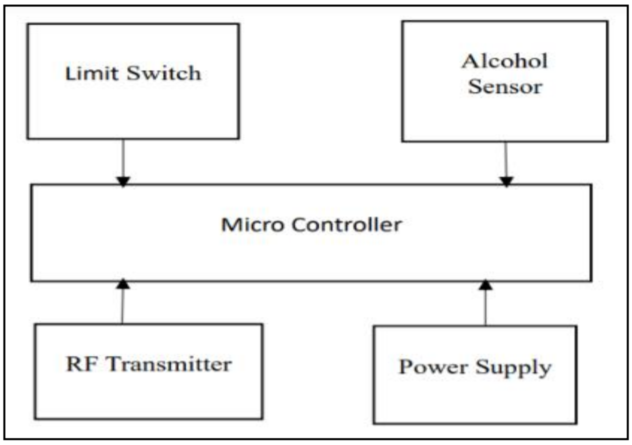

Fig 1: Block Diagram of Helmet Part

➢ *Main Components Description*

- *Alcohol Sensor*

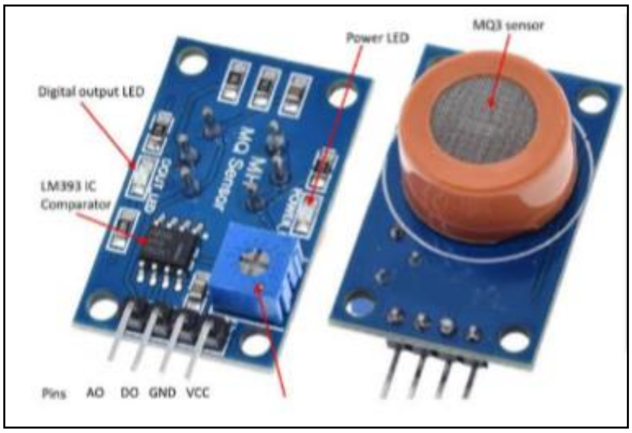

Fig 2: Alcohol Sensor

An alcohol sensor gauges the presence of ethanol in the air as someone breathes near it. When a person who has been drinking breathes into the sensor, it detects the alcohol vapor in their breath and provides an output based on the concentration of alcohol. This sensor is integrated into a helmet, strategically positioned to effectively detect the person's breath.

- *Limit Switch*

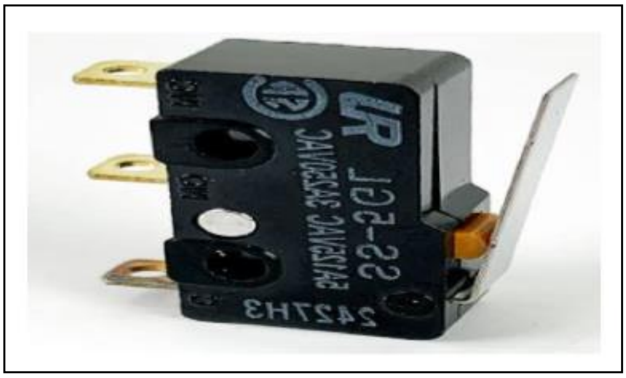
Fig 3: Limit Switch

A limit switch is an electromechanical device operated by a physical force applied to it by an object. Limit switches are used to detect the presence or absence of an object. These switches were originally used to define the limit of travel of an object, and as a result, they were named Limit Switch.

- *Rf Transmitter*

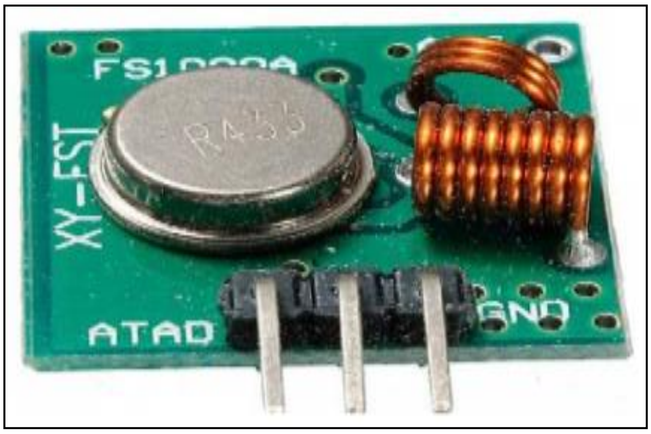

Fig 4: RF Transmitter

The radiofrequency (RF) transmitter is the generator of the radiofrequency current which is delivered to the transmitting coil. This creates a signal which is used to excite protons in the imaging field. Radiofrequency coils can be both transmitters and receivers of the radiofrequency signal or receivers alone.

- *Microcontroller*

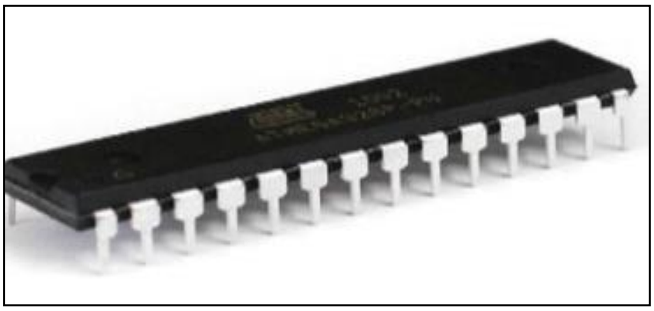
Fig 5: Microcontroller

A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output peripherals on a single chip.

B. Bike Part

Bike part consists of GSM module, GPS module, LCD display, Vibration sensor, RF receiver, Arduino UNO, ESP 32 camera, microcontroller, IR sensor and motor. These components are used to detect the accident and send the SMS along with location to pre saved contact. The image of the vehicle which will hit our bike from back will be captured using ESP 32 cam and send the image in telegram.

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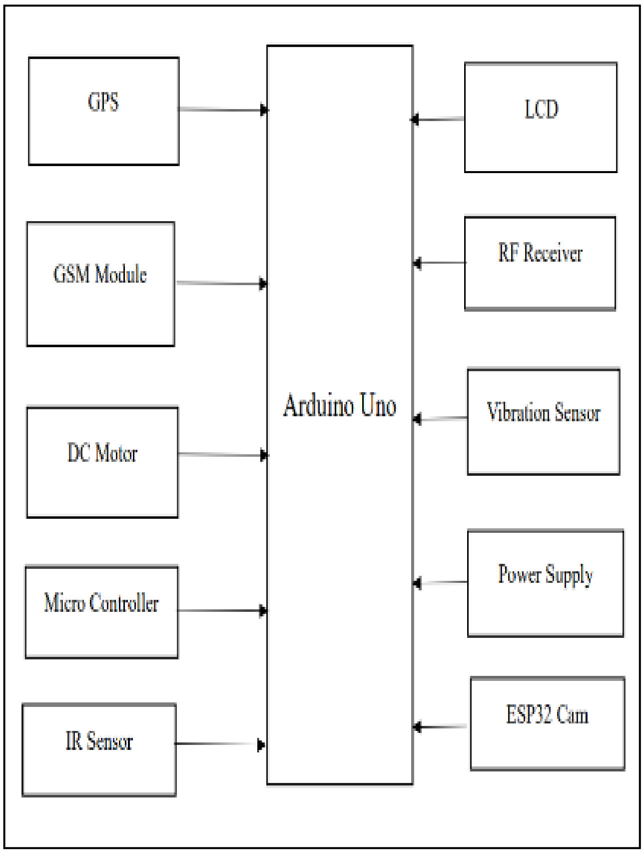

Fig 6: Block Diagram of Bike Part Main Components Description

- *GPS Module*

Fig 7: GPS Module

The Global Positioning System (GPS) relies on signals transmitted by satellites in space and ground stations on Earth to precisely ascertain its location on the planet. The NEO-6M GPS receiver module utilizes USART communication to interact with a microcontroller or PC terminal. It receives data such as latitude, longitude, altitude, UTC time, etc., in the form of NMEA strings from satellites. These strings require parsing to extract the desired information.

- *GSM Modem*

Fig 8: GSM Modern

The SIM800L CHIP offers a comprehensive Quad-band GSM/GPRS solution in a surface-mount technology (SMT) format, suitable for integration into various customer applications. These modules serve as integral components of Internet-of-Things hardware. Operating across Quad-band 850/900/1800/1900MHz frequencies, the SIM800L supports voice, SMS, and data transmission while maintaining low power consumption. Measuring a compact 17.6*15.7*2.3mm, it easily meets the slim and compact design requirements of customers.

- *LCD Display*

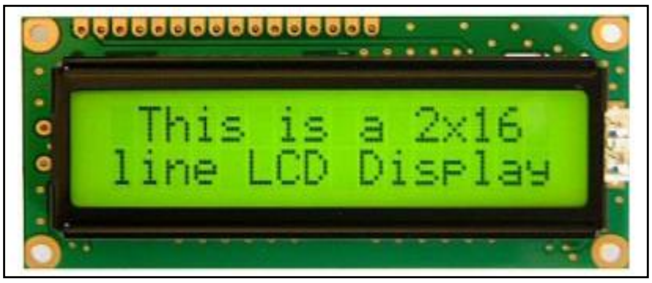

Fig 9: LCD Display

LCD, or Liquid Crystal Display, operates by utilizing liquid crystals as its primary mechanism. LEDs, on the other hand, have a wide range of applications for both consumers and businesses. They are commonly utilized in smartphones, televisions, computer monitors, and instrument panels.

- *Arduino UNO*

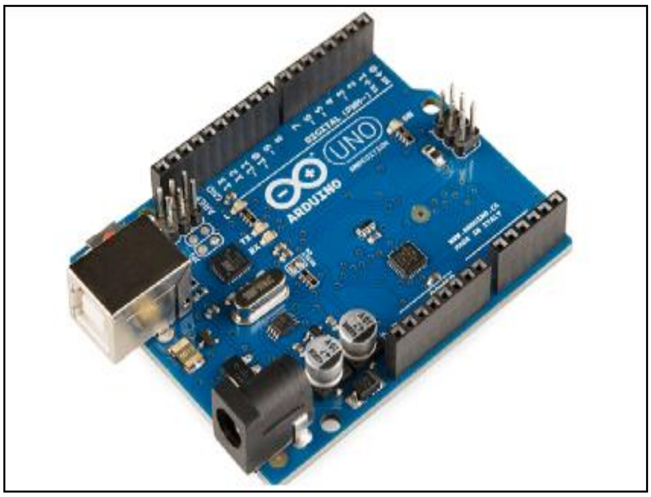

Fig 10: Arduino Uno

Arduino UNO is a microcontroller board built around the ATmega328P chip. Featuring 14 digital input/output pins (6 of which support PWM output), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button, it encompasses all the essentials to facilitate microcontroller operations. Simply connect it to a computer via USB cable or power it using an AC-to-DC adapter or battery to begin. UNO encourages experimentation without fear of irreversible mistakes; in the worst-case scenario, you can replace the chip inexpensively and start anew.

- *ESP 32 Camera*

The ESP32 CAM Wi-Fi Module Bluetooth with OV2640 Camera Module 2MP For Face Recognization has a very competitive small-size camera module that can operate independently as a minimum system with a footprint of only 40 x 27 mm; a deep sleep current of up to 6mA and is widely used in various IoT applications.

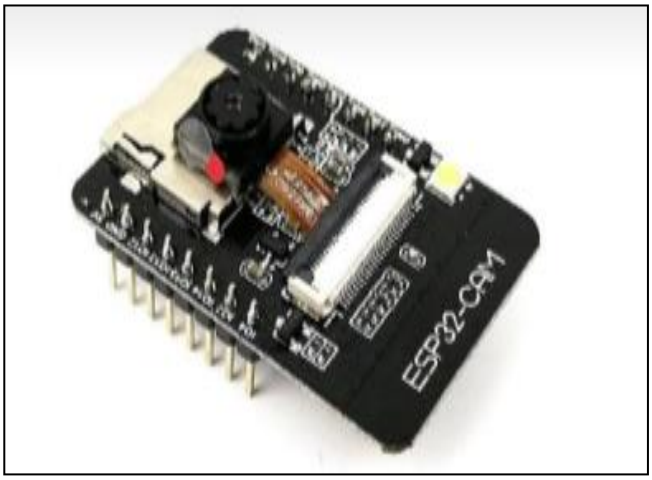

Fig 11: ESP 32 Camera

- *IR Sensor*

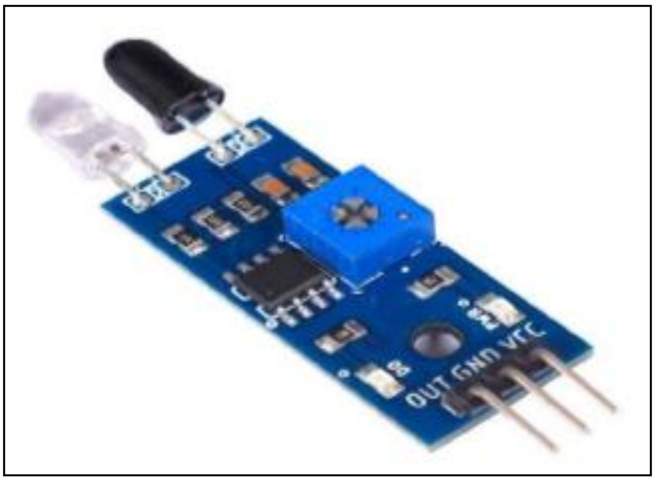

Fig 12: IR Sensor

An infrared sensor (IR sensor) is a radiation-sensitive optoelectronic component with a spectral sensitivity in the infrared wavelength range 780 nm … 50 µm. IR sensors are now widely used in motion detectors, which are used in building services to switch on lamps or in alarm systems to detect unwelcome guests.

- *RF Receiver*

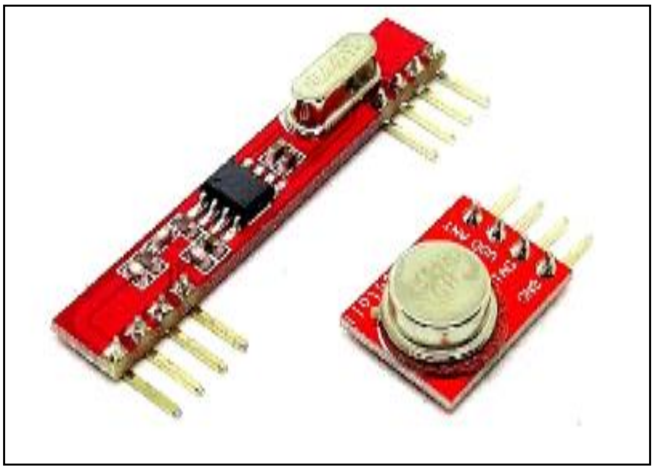

Fig 13: RF Receiver

RF receivers are electronic devices that separate radio signals from one another and convert specific signals into audio, video, or data formats. RF receivers use an antenna to receive transmitted radio signals and a tuner to separate a specific signal from all of the other signals that the antenna receives. Humankind communicates with artificially created radio waves that oscillate at various chosen frequencies. RF communication is used in many industries including television broadcasting, radar systems, computer and mobile platform networks, remote control, remote metering/monitoring, and many more.

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- *Vibration Sensor*

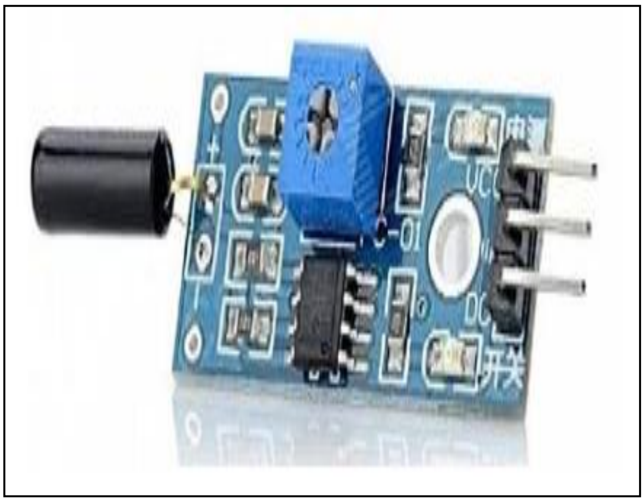

Fig 14: Vibration Sensor

A vibration sensor, or vibration detector, measures vibration levels in machinery for screening and analysis. Maintenance teams use industrial vibration sensors for condition monitoring, giving them insight into the magnitude and frequency of vibration signals.

- *Micro Controller*

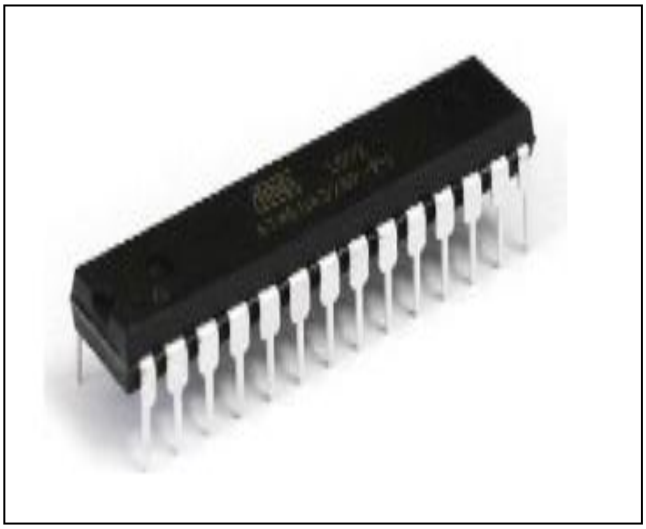

Fig 15: Micro Controller

A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output peripherals on a single chip.

IV. IMPLEMENTATION

This system's implementation ensures efficient accident detection at a minimal cost, enhancing safety measures for motorcycles and reducing road accidents. The "Safe drive headgear system" system achieves the following objectives:

- Monitoring the rider's helmet usage status
- Detecting alcohol content
- Detecting accidents and sharing location information
- To capture the vehicle image which come from backside and may involve in hit and run.

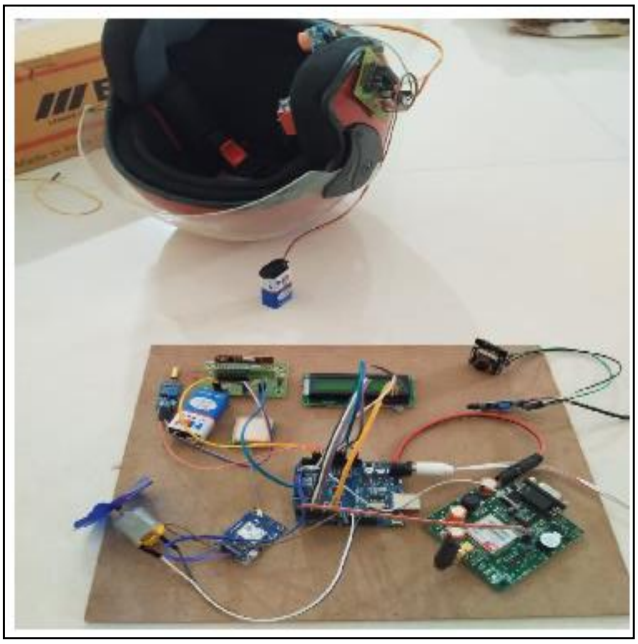

Fig 16: Circuit Diagram

A. Helmet Part

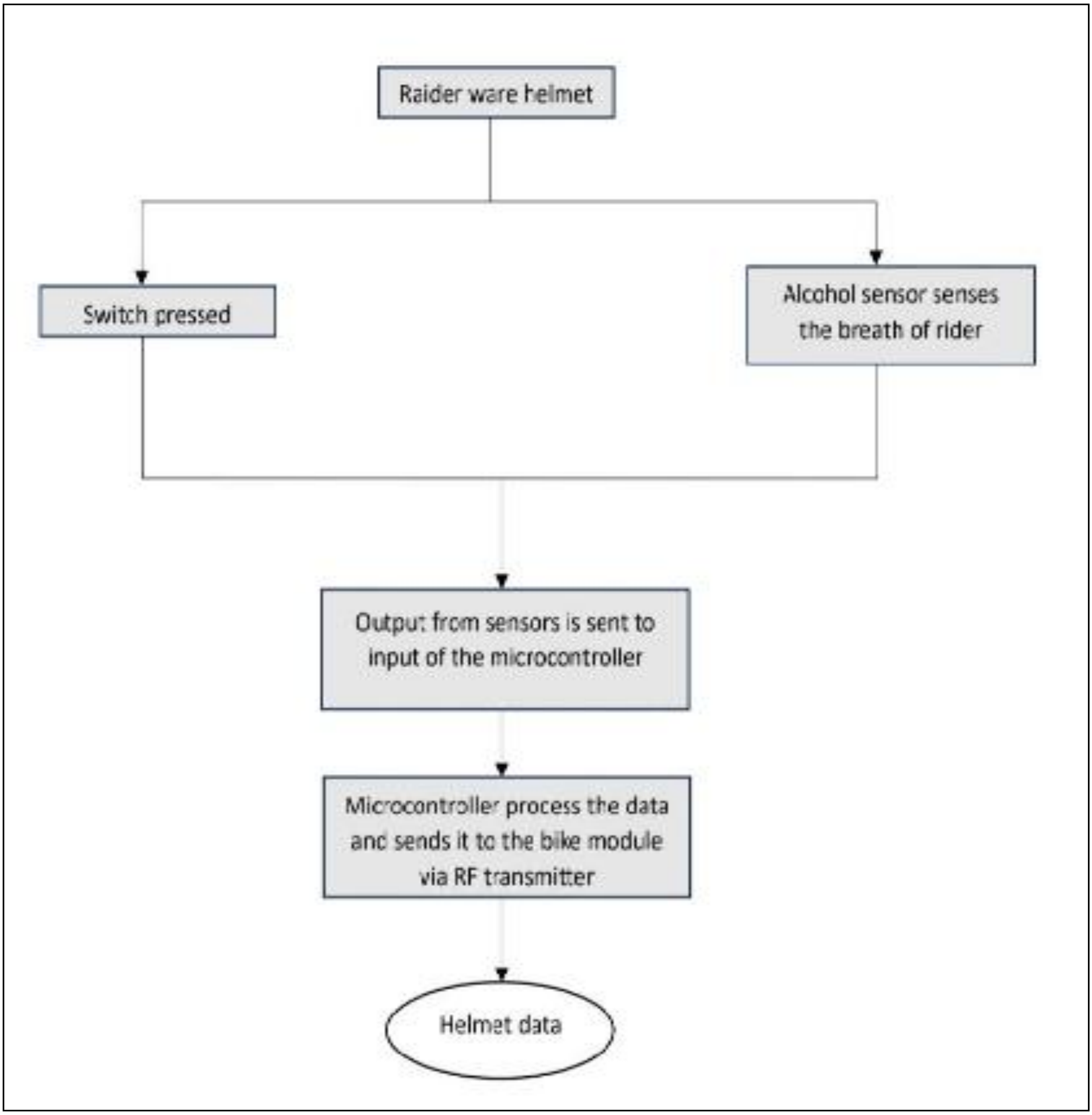

Fig 17: Flow Chart of Helmet Part

In the proposed system, a transmitter is housed within the helmet section, while a receiver is installed on the motorcycle. This setup enables seamless wireless communication between the two modules. When the rider dons the helmet, a switch within the helmet is activated. Simultaneously, an alcohol sensor integrated into the helmet detects alcohol vapors from the rider's breath. Should the sensor detect elevated alcohol levels beyond a predetermined threshold, indicating intoxication, the ignition system of the bike is disabled to prevent starting. The data gathered by these components within the helmet is processed by an embedded microcontroller. Subsequently, the processed data is transmitted to the bike module via RF transmission.

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B. Bike Part

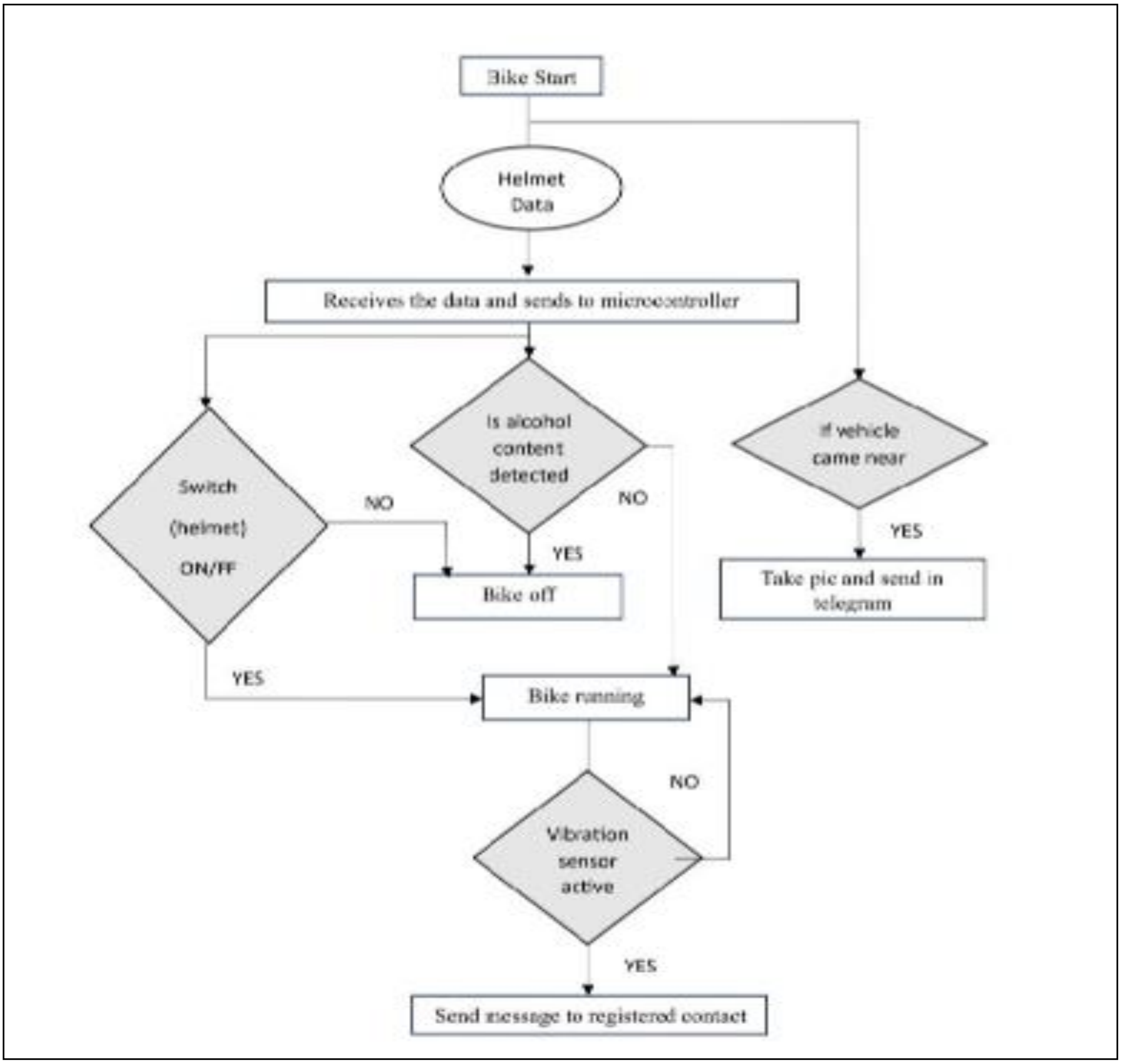

Fig 18: Flow Chart Bike Part

The RF receiver within the bike module picks up data sent from the helmet and transfers it to the microcontroller for evaluation. Based on the collected data from the helmet, the microcontroller determines whether to enable or disable the bike's ignition system. Two conditions must be met for the bike to start:

- Rider must wear the helmet since there is a switch in the helmet when the switch is pressed the ignition starts.
- The rider should not cross the threshold value of consumption of alcohol.

Starting the bike's ignition requires the helmet data to meet the specified conditions. If these conditions are not met, the bike will not start. Additionally, a vibration sensor monitors the bike's orientation relative to the ground. If the tilt exceeds a predefined threshold, indicating a potential accident, the system triggers an immediate notification to the registered contact number via GSM, including the accident location, facilitating prompt assistance for the victim.

The system swiftly alerts emergency services for immediate hospitalization and medical attention. Additionally, authorities, such as the police station, are notified of the incident. An IR sensor detects vehicles approaching the bike from behind, potentially involved in an accident. Subsequently, an ESP32 camera captures images of the vehicle and transmits them via Telegram.

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V. RESULT

The IoT-powered Two-wheeler Safety System, incorporating the Safe Drive Headgear, prioritizes safety and reliability. Its primary objective is to prevent injuries in case of accidents and identify the vehicle in the event of a rear-end collision. It also aims to deter cases of driving under the influence. Upon detecting an accident, the system notifies a registered contact with 90% accuracy, providing them with the location to ensure prompt medical attention. Accident detection relies on the feedback from a vibration sensor installed on the bike. Additionally, the system can identify alcohol presence in the rider's breath; if the rider is intoxicated, the bike will not start. Overall, the system's functionality revolves around monitoring the rider's actions.

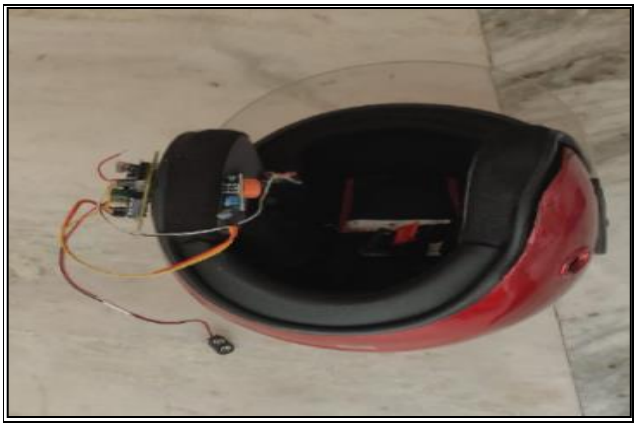

Fig 19: Helmet

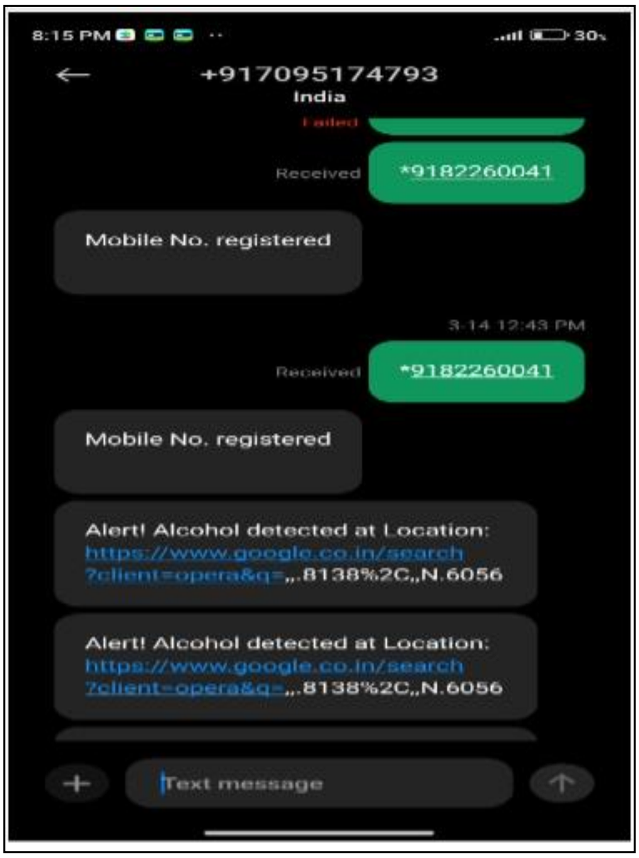

Fig 20: Alcohol Detection

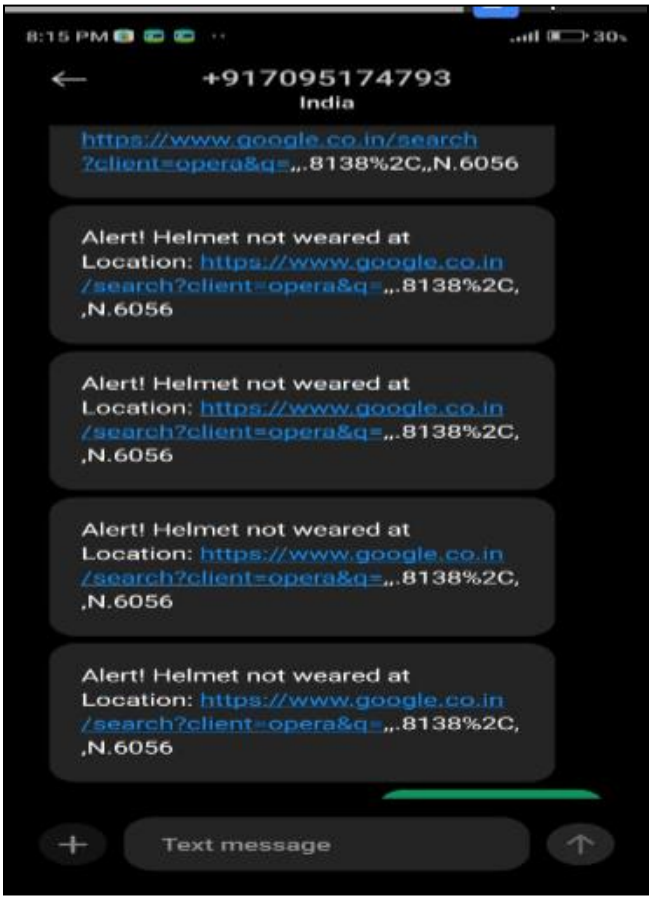

Fig 21: Helmet Detection

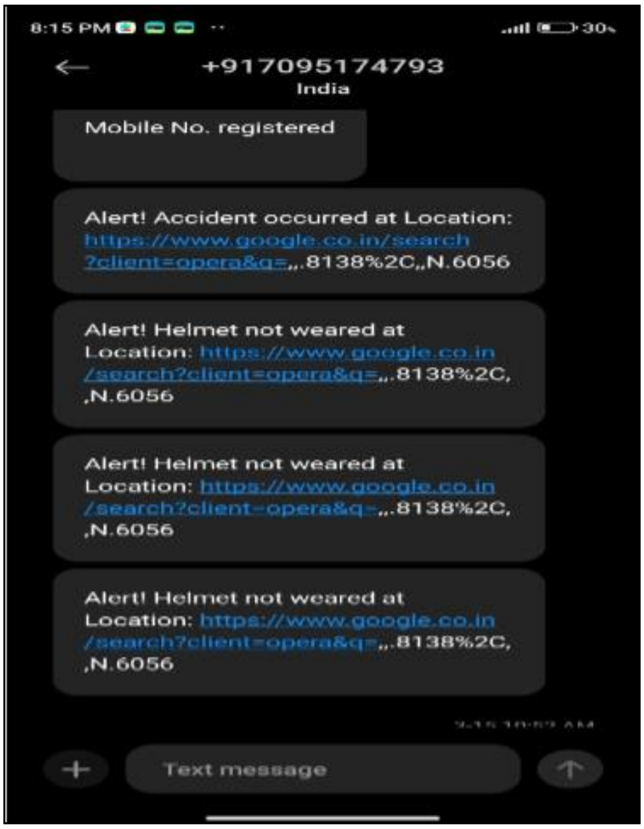

Fig 22: Accident Detection

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Fig 23: Picture Taken by Camera

VI. CONCLUSION

"The designed system ensures rider safety by automatically notifying registered contacts and providing the accident location for prompt assistance. Additionally, it detects alcohol consumption to prevent drunk driving incidents and mandates helmet usage. Furthermore, it employs IR sensors and an ESP32 camera to capture images of vehicles approaching from behind."

FUTURE SCOPE

We can integrate a range of bioelectric sensors into the helmet to monitor various physiological activities and display the rider's statistics. Voice commands can be utilized to manage basic bike functions. Additionally, helmet security is enhanced, allowing riders to park without additional precautions. Solar energy can be harnessed for charging electric vehicles and mobile devices on two-wheelers. Looking ahead, the potential for self-driving motorcycles with artificial intelligence promises enhanced safety and accident prevention.

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