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Research Paper

Design a System for Accident detection and prevention using IoT

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ABSTRACT: *In the modern era, road accidents are increased rapidly due to various reasons such as drunken drive cases, over speeding and driving under the influence of drugs. More than 80% of the death occurs due to head injuries which is due to not wearing the helmet, drunken driving and driving under the influence of drugs. The system incorporates advanced features, including an alcohol sensor and a limit switch to verify both the helmet`s presence and the rider's sobriety. The motivation behind this work is to address the increasing incidents of road accidents, emphasizing the correlation between alcohol impairment, helmet negligence, and delayed accident response. The proposed Smart Helmet ensures that the motorcycle starts only when the rider is wearing the helmet and is not under the influence of alcohol, promoting responsible riding behavior. This allows the helmet to send real-time alerts, including the precise location, to predefined contacts, streamlining emergency response efforts. By combining alcohol detection, helmet presence monitoring, and accident alert functionalities, the Smart Helmet represents a pivotal advancement in motorcycle safety, providing riders with a technologically sophisticated tool for a safer riding experience.*

KEYWORDS: *Smart Helmet, IoT, GPS, GSM, Bike Rider's Safety.*

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I. INTRODUCTION

Road traffic safety is an issue of concern around the world. With the rapid expansion of the road network, increasing number of vehicles and increasing average speed on roads, India is also witnessing a high number of road accidents in India – 2022, as per the report road accidents in 2022 increased by 11.9 percent. Additionally, a survey reveals that 2022 will see an 11.9 percent increase in the number of traffic accidents in India. Comparably, the percentage of fatalities and injuries brought on by 15.3% and 9.4%, respectively. There are a variety of reasons behind road traffic accidents, including human mistakes and the state of the road. Speeding will be the leading cause of death in traffic offences in 2022 [1], [2]. Integrating smart helmets and smart bicycles into one cohesive safety system is the goal of research. Research builds an integrated safety system, combining smart helmets and smart bicycles, designed to minimize the rate of two-wheeled accidents, and driving incidents. In the event of a collision, the accelerometer will determine the movement and tilt of the helmet, thereby signaling an accident. The system then sends location information via SMS to the driver's family and emergency contacts, preventing possible deaths due to accidents, reckless driving, and driving by accident. This article highlights the important role of smart helmet systems in enhancing road safety and combating the prevalence of drink driving accidents. These results strengthen existing knowledge and contribute to the ongoing debate on innovative solutions to reduce road accidents and improve overall traffic safety [3].

II. LITERATURE REVIEW

The literature presents diverse insights into road accidents and accident prevention technologies. Their work focuses on an innovative Accident Detection and Alert System, contributing significantly to advancements in the field of road safety technology by addressing the timely detection of accidents. This study not only focuses on the current state of technology but also evaluates the potential of wireless communication systems in enhancing road safety measures through proactive accident prevention. It contributes significantly to the understanding of cutting-edge embedded technologies, providing valuable insights into their application for effective accident detection and tracking [4].

III. EXISTING SYSTEM

The current generation of smart helmet systems available in the market tends to focus on fundamental safety aspects, such as providing head protection and basic communication functionalities like Bluetooth connectivity. However, there are drawbacks to these systems. For instance, many helmets lack an integrated alcohol detection system, relying on traditional and manual methods employed by law enforcement for checking a rider's alcohol levels. This manual process is not only time-consuming but also relies on intermittent checks, potentially allowing riders beneath impact of alcohol to go undetected. The absence of a built-in mechanism like a limit switch in most helmets means there is often no automated way to verify whether a rider is wearing the helmet or not [4-6].

This reliance on manual checks by law enforcement officers during routine stops may result in oversight and compromises the effectiveness of enforcing helmet wearing regulations. The envisioned smart helmet project addresses these limitations by incorporating an automated alcohol detection system and a limit switch, providing a more proactive and technologically advanced solution for enhancing rider safety and adherence to responsible riding practices. Furthermore, the absence of an integrated GSM module in conventional smart helmets limits their capacity to send immediate accident alerts to nearby individuals or emergency services. This deficiency in real-time communication capabilities can impede the prompt response needed in emergency situations, exacerbating the potential consequences of accidents. Figure.1 shows the block diagram of the Existing System.

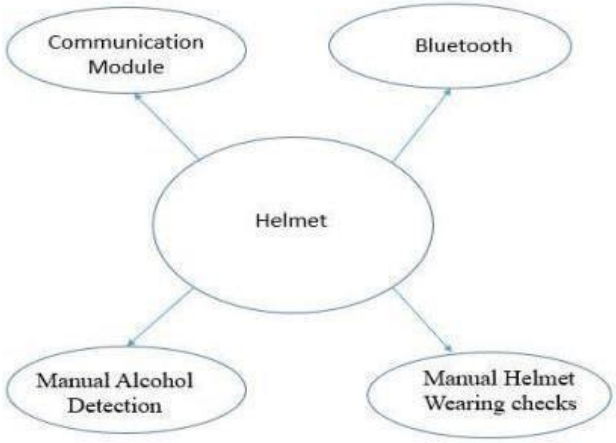

Figure 1: Block Diagram of Existing System

3.1 Drawbacks of Existing system

1. Limited helmet features
2. Inconsistent Helmet-wearing Monitoring
3. Manual Alcohol Detection
4. Ineffective Emergency Response.

IV. PROPOSED SYSTEM

The Proposed smart helmet system aims to overcome the drawbacks of existing solutions by integrating cutting-edge technologies. The system divides into three parts helmet section, bike section and mobile application. First, the helmet section has limit switch, alcohol detection sensor, RF transmitter, and Arduino UNO. The bike section has a 3-axis accelerometer, RF receiver, Arduino UNO and DC Motor. The helmet circuit sends a signal to the automobile circuit to start if the helmet is worn and no alcohol detects. Then

the automobile circuit started its operation. If an accident occurs on the way, 3-axis accelerometer senses crash or hit. After detecting an accident, the mobile application sends the accident location automatically to emergency contact number via the database. Figure.2 shows the block diagram of Helmet system.

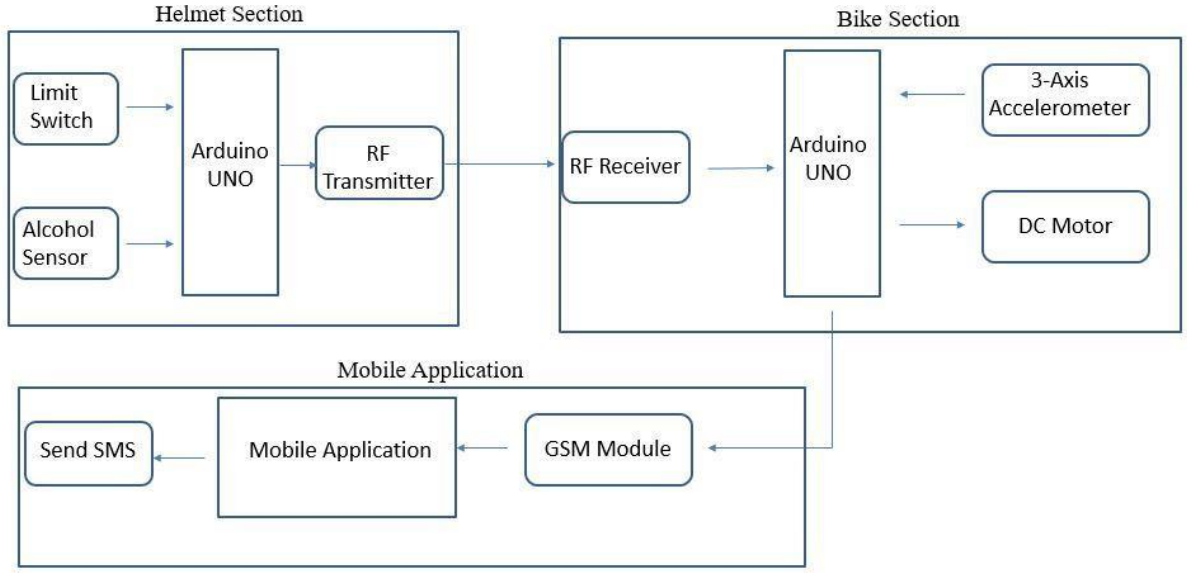

Figure 2. Block diagram of Helmet System

4.1 Flowchart of Overall System

Each unit has a separate microcontroller, for bike unit, we used Arduino UNO and for helmet unit, we used another Arduino UNO. The smart helmet will have a limit switch which will be used to detect if the rider has worn the helmet or not. MQ-3 sensor is used for alcohol detection purposes. Signal transmission between the helmet unit and bike unit is using an RF module. In the helmet side RF transmitter can be used and RF receiver used in bike side. We have used Arduino UNO in our Transmitter Circuit. When the Driver is drunk, "ALCOHOL DETECTED" with range is shown in the LCD Display. The RF Receiver receives the signal from RF Transmitter and sends the signal to Arduino in the bike section for control the ignition of the bike. If the person does not wear the helmet or if any alcoholic content in the riders breathe, the bike remains off and does now no longer begin its ignition. If the person wears the helmet and the sensor now no longer feels any alcoholic content, then only the ignition will start in the bike. If the bike met accident on the way, then the accident alert will send to the relatives and emergency number using GSM Module and the location is shared by using GPS Module to rescue the bike rider immediately and prevent the loss occur through the accident. The figure.3 shows the Flowchart of Proposed System.

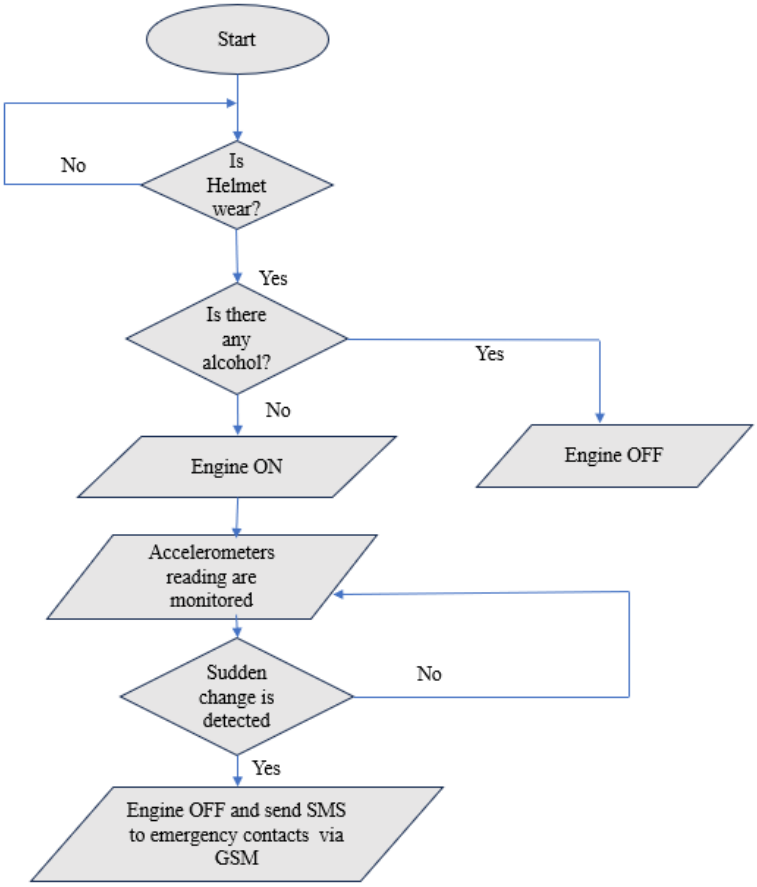

Figure 3. Flowchart of Proposed System

V. RESULTS AND DISCUSSION

The experimental setup comprises helmet and bike sections. The helmet section employs a limit switch and an alcohol sensor to detect helmet usage and alcohol levels. Data, including limit switch status and alcohol content, is transmitted wirelessly to the bike's Arduino. The Arduino processes this information, displaying the rider's state on an LCD. The engine's ignition is controlled based on these factors, discouraging riding without a helmet or beneath the impact of alcohol. Figure.4 shows the Experimental setup.

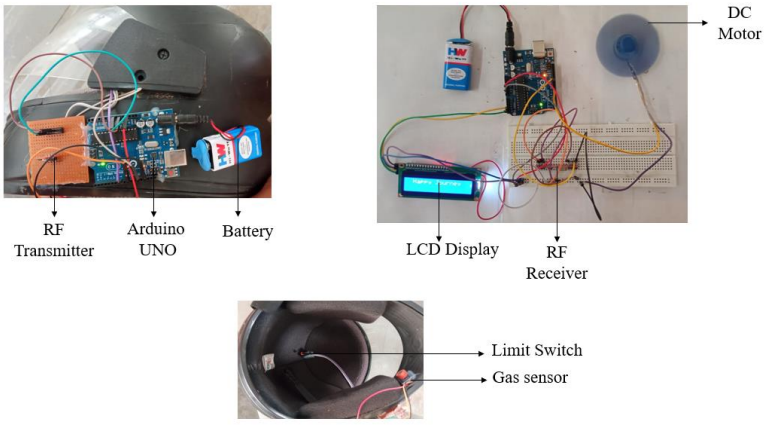

Figure 4. Experimental Setup

VI. CONCLUSION

Building upon our successful smart helmet system already on the market, our latest project takes innovation to new heights. We are enhancing the existing system by seamlessly integrating IOT capabilities. Picture a smart helmet that now no longer prevents injuries however transforms into a real-time accident information beacon. This breakthrough allows immediate transmission of crucial data, revolutionizing emergency response. Witness the evolution of safety in our journey to combine the best of smart helmet technology with the power of IOT, setting a new standard in the industry.

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