IoT Based Smart Helmet for Safety

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Abstract: The death rate of the two-wheeler is increasing day by day due to accidents. The majority of accidents are due to drunk driving and without wearing helmets. By making helmet mandatory and not allowing drunk and driving we can reduce deaths after accidents. this system proposes a smart flexible helmet for two-wheelers to save them from deaths. The proposed system describes a smart low-cost helmet for two-wheelers with safety features. The helmet includes different sensors such as MQ3 Alcohol sensor, IR Sensor, Vibration sensor SW 420are used& IoT devices such as Arduino nano which is a microchip controller ATmega328 is used. The aim of this project is to describe a prototype system and integrating some different IoTtechnologies and some safety levels for the two-wheelers..

Keywords: Smart Helmet, Internet of Things (IoT), Arduino nano, Alcohol sensor, Vibration sensor.

I.INTRODUCTION

The Internet of things describes physical objects that are embedded with sensors, processing ability, software, and other technologies that connect and interchange data with other devices and systems over the Internet or other communications networks. The death rate of two wheelers is increasing every year due to lack of safety and precautions. Two-wheelers have claimed the highest number of lives — nearly 70,000 people — in road accidents in the country during 2021. According to the latest report of the National Crime Records Bureau (NCRB), as many as 1,55,622 people lost their lives due to road accidents in 2021. Road safety continues to be a major developmental issue, a public health concern and a leading cause of death and injury across the world. At least one out of 10 people killed on roads across the world is from India, according to the World Health Organization. The cost of road accidents is borne not only by the victims and their family, but by the economy as a whole in terms of untimely deaths, injuries, disabilities and loss of potential income. It is indeed a matter of great concern that despite the continuing efforts of the Government in this regard and our commitments for halving fatalities we have not been able to register significant progress on this front.During the year 2021, a total number of 4,12,432 road accidents have been reported in the country, claiming 1,53,972 lives and causing injuries to 3,84,448 persons. Unfortunately, the worst affected age group in Road accidents is 18-45 years, which accounts for about 67 percent of total accidental deaths.

A motorcycle frequently called motorbike or two wheelers, which is the most used form of automobiles because of its low price. But this is the most unsafe automobile. The accident can happen for

driving fast or drunk driving. Safety and security in vehicle traveling is essential. With the rapid Growth of population in India it is very difficult to use public transport to go to work.This has resulted in increase in two wheelers. Increase in two wheelers has resulted in increasing accidents due to lack of safety in two wheeler vehicles. Accidents in two wheelers cause deaths ,majority of which are due to head injuries and lack of medical help after accidents. By checking Helmet before ride and providing medical help after accidents we can save life.

. This paper presents smart helmet system to avoid the accident. The system divides into Helmet checking, Alcohol detection and Accident detection system. At first, the helmet circuit has push button placed on seats, which detects whether the driver sat on driver seat. Second system check whether drive worn helmet by using another push button placed in the helmet. Third Alcohol sensor senses the beath of the driver and detects whether alcohol is consumed by the rider if yes engine will not start. The fourth Vibration sensor is placed near front wheels when an accident takes place vibration sensor detects it. Then an SMS will be sent to the rider relatives.

II STATEMENT OF PROBLEM

The survey of the study of Accidents in India states that the majority of Accidents are Two wheelers. Even though the government has made many traffic rules to avoid accidents, in spite of this the rate of accidents is increasing due to not following traffic rules. The majority of deaths in road accidents of two-wheelers is due to not wearing helmets and drunk driving. Thus deaths due to accidents can be reduced by making helmet compulsory for riding bikes and avoiding drunk and drive. This can be implemented by developing a smart Helmet which detects whether driver has worn helmet or not, Driver has consumed alcohol or not.

III OBJECTIVES OF THE PROJECT

The main objectives of the project are:

- To develop a IoT based project that provides safety to motorcycle riders.
- To allow ignition only when the helmet is worn properly.
- To allow ignition only when alcohol is not detected.
- To allow ignition only when Riders are on seat.
- To alert family members/friends by giving information about the accidents

IV LITERATURE REVIEW

Mohammad Ehsanul Alim et.al [1] has given an approach Arduino NANO and Arduino Mega-2560 are microcontrollers which control the entire components of the system. Two 2.4 GHZ nRF24L01 for communication between sender and receiver. MQ-3 alcohol sensor is used which can detect whether the bike rider is consumed alcohol or not. If the bike rider is alcoholic, then the MQ3 sensor detects it and turn off engine. A Sharp IR sensor detects the head of the rider within the specified range. The Bike rider's engine will start only when the rider will buckle the helmet. GPS & GSM Technology is used for tracking the location of the bike rider and sending text message to the family members of the Bike rider when an accident occurs

Dhruvesh H. Patel has et.al [2] proposed an approach which the System is plan and implemented such a way

that the bike will not ignite until the rider wear helmet and pass an alcohol test, this will help to solve the problem of 'drink and drive'. It consists of GSM GPS technology which sends the message to the family member as well as hospital with the current location at the time of an accident.

Dr. S.Sekar[3] designed a smart system in which the ignition starts only when the helmet is worn properly and alcohol is not detected, recognize and respond, the vehicles coming from sides of the rider, alerts the family members/friends by giving information about the accidents. The methodology of the proposed IoT based Smart Helmet system contains two interconnected units that is separated using wireless communication between the Helmet Unit (Arduino UNO) act as transmitter and the Bike Unit (Arduino MEGA) act as receiver. NRF24L01 Transmitter & Receiver Module is used to establish these two wireless connection. Smart helmet system is planned and implemented in such a way that the two-wheeler will not ignite until the rider wear worn the helmet properly using IR sensor and pass an alcohol test by MQ-3 sensor which will help to solve the problem of drink and drive. To prevent accident by alerting the rider of nearby vehicles coming using Ultrasonic Sensor. Detecting the accident and tracking the location of the accident using GPS neo6m and sends SMS to emergency contact by GSM800L.

Mangala Nandini V[4] proposed smart helmet for Industries. The system provides real time monitoring of industries from the monitoring station. The transmitter unit is placed on helmet of worker and receiver unit placed on the monitoring station. The Wi-Fi wireless technology is used for data transmission from the working environment to the base station. The MQ7 Air Quality Sensor is used to monitor the level of Methane, LPG, CO respectively LM35 is used for monitoring temperature. The limit switch is used for detection of helmet removal condition. The limit switch placed inside the helmet

Pranav Pathak[5] has proposed a IoT based smart helmet. The project is comprised of two units - the Helmet unit (HU) and the motorbike unit (MU). These units communicate via RF using the NRF24L01 module. The HU has a pulse rate sensor that measures the pulse rate of the rider. A pulse rate sensor is used for detecting whether the rider is wearing a helmet or not. The sensor used for monitoring the alcohol content in the breath of the rider is an MQ-3 alcohol sensor

V PROPOSED WORK

The block diagram of the proposed method is as shown in Figure 1The first step is to identify whether the helmet is worn or not. If the helmet is worn then the ignition will start otherwise it remains off. For this, a push button is used. The second step is alcohol detection. An alcohol sensor is used as a breath analyzer which detects the presence of alcohol in a rider's breath and if it exceeds the permissible limit ignition cannot start. MQ-3 sensor is used for this purpose and a push button can be used and another rider seat button is added for checking whether the rider is on bike or not .When these three conditions are satisfied then only ignition starts. The third main issue is accidents and late medical help. If the rider has met with an accident, he may not receive medical help instantly, which is one of the main reasons for death. Every second people died due to delay in medical help or in the case where the place of accident is unmanned. In fall detection, we place a vibration sensor in the unit. By this mechanism accidents can be detected and send an alert message to family members. The aim of this project is to make a protection system in a helmet for the safety of bike riders. The smart helmet that is made is fitted with different sensors responsible for detection.

Flow chart of Smart helmet is as shown in Figure2.All data from sensors read by a controller named arduino Nano. When the device on it starts reading all sensor data like vibration, alcohol, IR sensor and push button. If the vibration sensor detects a bike fall then it directly alerts the rider family members through text

message with location so that family members can reach out early to the spot. If the sensors fitted on helmet like alcohol used to detect if rider is drunk or not. IR sensor is used to detect if the rider is wearing a helmet is sitting on the rider seat or not and push button sensor is used to find if the rider is wearing helmet or not. In case all their sensors are true then only bike ignition is on otherwise it will be off until all sensors are true

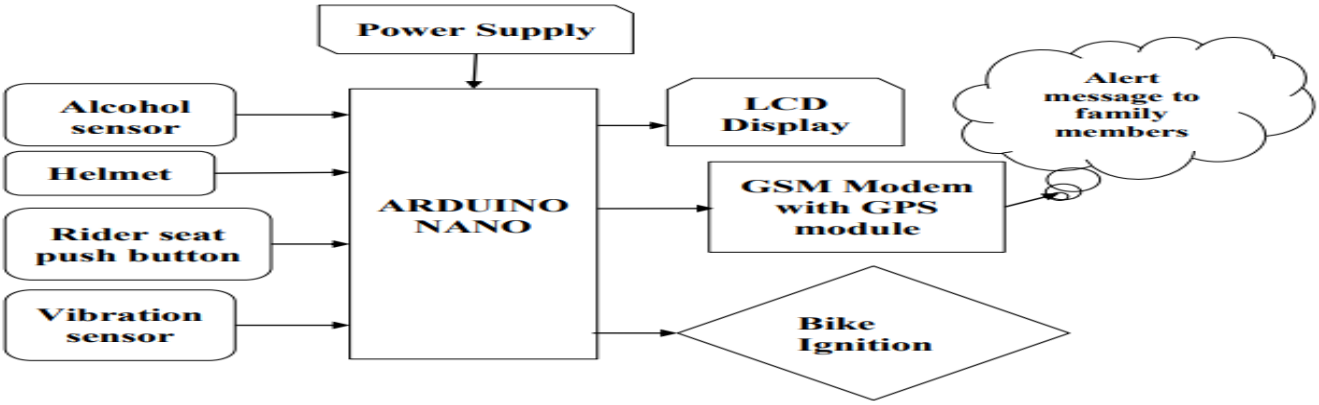

Fig1:Block diagram of Smart helmet

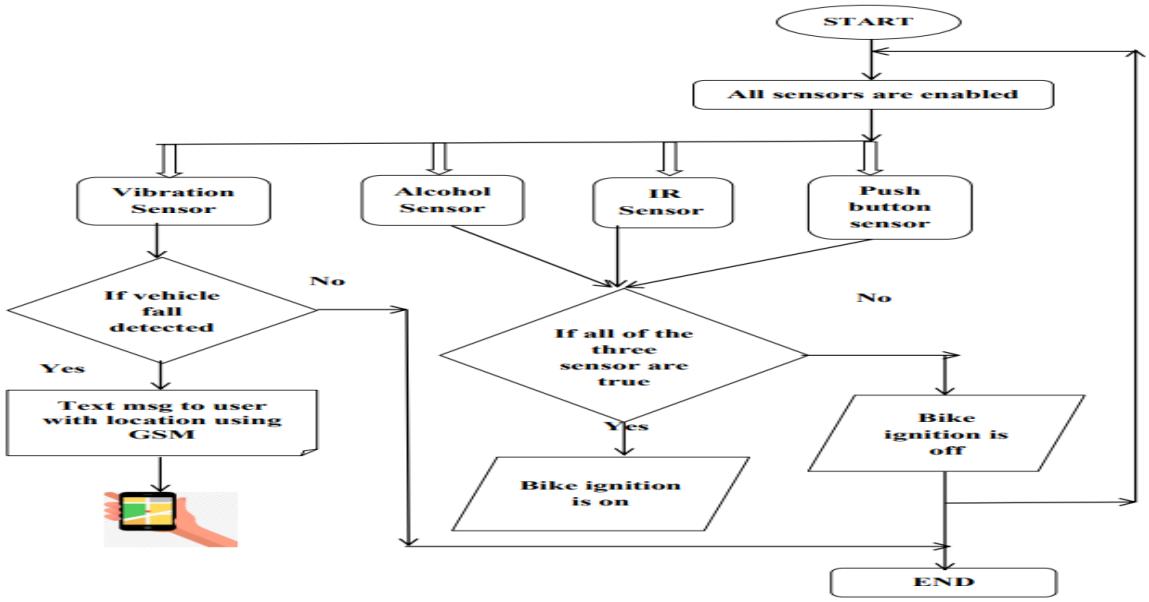

Figure2:Flow chart of smart Helmet

V HARDWARE AND SOFTWARE COMPONENTS USED IN IOT BASED SMART HELMET

1. **Arduino Nano**: Arduino Nano is an open-source breadboard-friendly microcontroller board based on the Microchip ATmega328P microcontroller (MCU).
2. **The MQ3 sensor** is one of the most widely used in the MQ sensor series. It is a MOS (Metal Oxide Semiconductor) sensor. Metal oxide sensors are also known as Chemiresistors because sensing is based on the change in resistance of the sensing material when exposed to alcohol. The MQ3 alcohol sensor operates on 5V DC and consumes approximately 800mW. It can detect alcohol concentrations ranging from 25 to 500 ppm.

3. **Limit switch**: This is used for Detecting the presence or absence of an object using a contact or noncontact detecting device is possible using a simple switch. Once the object is detected then these devices will generate an electrical signal that is used to control different types of equipment and also processes in different industries. One such is a limit switch
4. **IR sensor**: The IR sensor or infrared sensor is one kind of electronic component, used to detect specific characteristics in its surroundings through emitting or detecting IR radiation. In this sensor, an IR LED is used as an emitter whereas the photodiode is used as a detector.
5. **Vibration sensor**: The vibration sensor SW-420(Fig 3.12) Comes with breakout board that includes comparator LM 393 and Adjustable on board potentiometer for sensitivity threshold selection, and signal indication LED. This sensor module produces logic states depending on vibration and external force applied on it. When there is no vibration this module gives logic LOW output. When it feels vibration then output of this module goes to logic HIGH. The working bias of this circuit is between 3.3V to 5V DC
6. **Liquid Crystal Display (LCD):**LCD is used to display status of the various sensors such as Limit switch which indicates driver has sat on seat or not.
7. **GSM/GPS Module**:GSM module is used to send location information to family members.

VI RESULTS AND DISCUSSION

The proposed system is tested for operation of all the objectives the results are as shown in following snapshots. As shown in the following images when rider sits on seat Limit switch generates a pulse resulting in a message “Rider seat detected” on LCD.MQ3 sensor measures alchol level and displayes on LCD.If the Alcohol level is above 1000 ,which indicates Alcohol is consumed. Whenever system is turned on it continuously monitors for sensor outputs.When Rider seat switch output goes high,Push button inside the helmet is pressed which indicates driver has worn helmet and Alcohol is not consumed then Motor interfaced to aurdino nano board is rotated.In this project DC motor is used to demonstrate bike.

Figure2:Rider seat detection

Figure3:Mq3 sensor output

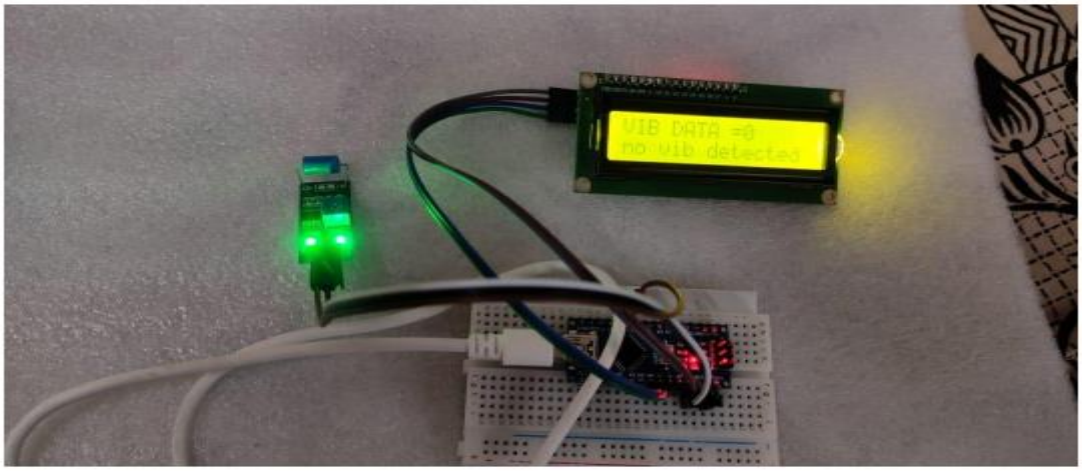

Figure4:Vibration sensor output.

VII APPLICATIONS, ADVANTAGES

- It can be used for bike riders
- It can used in cars
- It can be used in construction sites.
- It can be used in Industries.
- This system is cost effective.
- This system can be implemented few components.

V CONCLUSION

Through this study, we developed a smart helmet which was designed to help bike riders . The design and implementation of a system which can provide safety to bike riders. Hence the system is reliable with simple and easily available components, making it light weight and portable. This product can be enhanced by adding additional features in the near future.

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