IoT based Smart Helmet

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ABSTRACT

Smart Helmet is a special idea that makes motorcycle riding safer than before. This is implemented using GSM and IoT technology. The SMART HELMET working is very simple, sensors are placed in different places of the helmet where the probability of hitting is more which are connected to the microcontroller . So when the biker crashes and the helmet hits the ground, these sensors sense and gives to the microcontroller board, then the controller sends the data using the GSM module automatically sends the message to family members. The aim of designing a helmet that could autonomously detect the accident. It also aims at minimizing the road accidents by immediately informing the location of the person met with the accident to the registered phone number in the application and also to the nearest police station and the hospital. These will help to save the life of the person. Also, the visor of the smart helmet can move automatically.

Keywords: Internet of Things, Notification, Location Tracking, Alcohol Detection, Accident Detection.

ARTICLE INFO

I. INTRODUCTION

Since Motorcycles and bikes form an integral part of personalized transportation in India. However, unfortunately, it also involves numerous accidents and subsequent loss of lives. Every year, about 400,000 teenagers go to the emergency department because of bike injuries and at least 15,000 teenagers have crash deaths in 2017 and were more than the number of motorcyclist death in 1997. By the survey report of ONE ISS, it was found 90% of motorcycles rider killed in accidents were not wearing a helmet. And also drunken driving is one of the massive reasons for the loss of lives. We aim to extenuate all these problems and ensuring safety.

Our project idea is based on the modification of the traditional helmet into an automatic system of helmet. It works through weather detection, location tracking to avoid manual approach towards the helmet. It also helps when a person meets an accident by sending a message to the registered contact number. Our work is to make it mandatory for the rider to wear a helmet during the ride meanwhile providing solutions to other major issues for accidents.
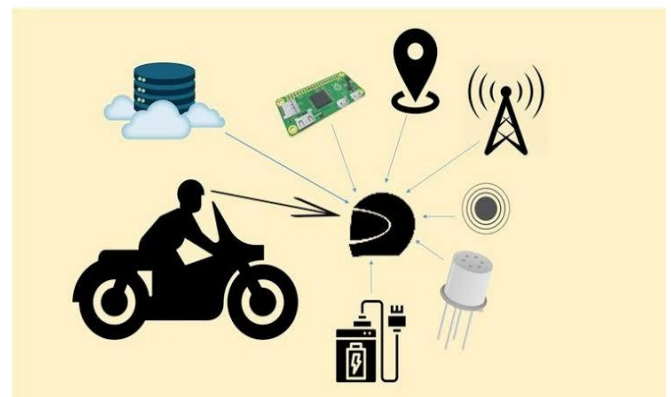

Fig.1 . Smart Helmet

An onboard alcohol sensor also analyzes the breath of the rider to detect if the current drunkness level is above the legal threshold. If it is, his/her emergency contact is informed, so that they may handle the situation. In the existing system helmet's visor cannot move automatically, and also when someone meets an accident, they are helpless. So to overcome this drawback our helmet provides automatic movement of the visor through weather detection, humidity if the weather values increase beyond the normal

condition the visor gets closed using this module in a system the person who met to an accident can be saved by tracking its location using Global Positioning System.

Human error is the main factor causing accidents such as violate traffic signs and speeding above the speed limit. These factors are reasonable because speeding could reduce the rider's response time to avoid unexpected obstacles. In addition, judging from a high percentage of deaths where head injury as the main cause and the reduction in injury probability by 27% can be concluded the importance of the rider to wear a helmet. Compared to road factors Human Factors are relatively easier to control. Therefore, we need a system that can detect the conditions of the climate, humidity, and also the rider.

II. RELATED WORKS

In the literature survey, we found several smart helmet systems but with different approaches and proposed solutions.
Sreenithy Chandran et al[1] monitored the value received from an accelerometer which is fixed in helmet and detects an accident by analyzing those values and sends an emergency notification to contacts with Global positioning system location.

Divyasudha N et al[2] we have received the recent trends in developing a smart Helmet system. The research also helps to understand the smart helmet system evolved over the period and currently by using emerging technology like the Internet of Things (IoT). This work also addresses the intelligent motorbike helmet system which is used to inform the rider about rear big trucks/buses for avoiding collisions.

Robin Karlose et al[3] the breath analyzer senses the amount of alcohol present in the breath of a person wearing the helmet and reports if it is beyond the legal limit. The helmet can connect to any smartphone via a cloud platform, to communicate with the online API, using the internet connection of the smartphone. This will ensure the safety of the rider at all times.

AmrutaMadhusan et al[4]propose the system which aims at reducing the loss of people's lives in road accidents and performs such tasks as accident detecting and sending of the location to the nearby hospital

III. EXISTING SYSTEM

Currently, accidents are a serious problem for everyone. Accidents are increasing day by day so efforts are made to avoid them to minimize their consequences. "In Maharashtra, a total of 13,059 persons died in road accidents in year2018". Naturally, in a four-wheeler, various safety features are available like ABS, airbag, GPS and automated guidance system over the periods. But in a two-wheeler, these features are not available.

The major portion of accidents occur because the person was either not wearing a helmet or his accident was not reported in time, and he could not be saved because of the delayed admission to a hospital, or because he was riding while drunk.

IV. PROPOSED SYSTEM

The IoT based Smart Helmet is a cost-effective supervised technology to provide security and safety of the rider against road accidents. The proposed IoT based Smart Helmet that detects road accident, detects alcohol consumption also track the rider and send the location to the registered relatives, nearby hospital and nearby police station by using GPS.

The system consists of the microcontroller (Arduino), humidity sensor, alcohol sensor, piezoelectric sensor, servo, and power supply in the below figure.
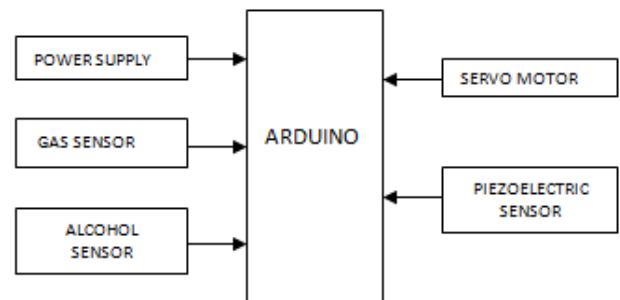

Fig.2. Block diagram for proposed Smart Helmet system

Here we design a system that checks mainly three conditions. The first condition is the detection of alcohol content in biker's breath with the help of an alcohol sensor. The second condition is the detection of an accident by using a piezoelectric sensor and the third condition is the detection of pollution by using a humidity sensor. The microcontroller unit in the helmet collects and processes the data by using sensors.

Once the rider starts the bike, during the ride the attached GPS receiver fetches the current location (latitude & longitude) and updates it to the pre-defined number with the defined periodicity. If any accident occurs then a piezoelectric sensor detects the pressure and crash then an alert message will be sent to a registered relative, nearby hospital and police station using IoT modem. In case of increase dust in the air, the visor of the helmet gets closed automatically if not closed.

B. The Functionality of sensors:

1. Gas Sensor(MQ6): The gas sensor is used for gas leakage detection.

1) Features of MQ6 Gas sensor

· Operating Voltage is +5V.
· Can be used to detect LPG gas.
· Analog output voltage: 0V to 5V.
· Digital Output Voltage: 0V or 5V.
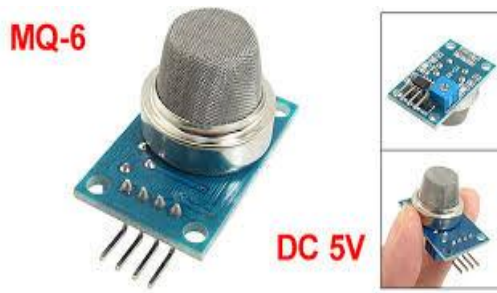· Can be used as a digital sensor or analog sensor.

Fig.3 . MQ6 Sensor

2. Alcohol Sensor(MQ3) :

MQ3 sensor can detect the presence of alcohol gases at a concentration from 0.05 mg/L to 10mg/L.

Features

- 5V operation.
- Simple to use.
- Output sensitivity adjustable.
- Analog output 0V to 5V.
- Digital output 0V or 5V.
- Low Cost.
- Fast Response.
- Stable and Long Life.
- Good Sensitivity to Alcohol Gas.
- Both Digital and Analog Outputs.

Fig.4 . MQ3 Sensor

3. Piezoelectric Sensor :

A piezoelectric sensors are used for measuring the temperature, pressure, strain etc. It is also called as a pressure sensor.
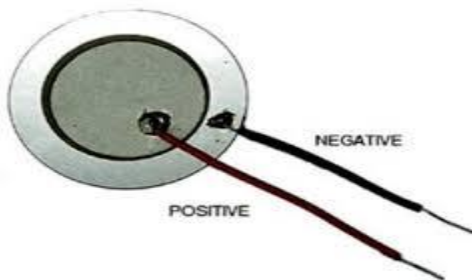

Fig.5. Piezoelectric Sensor

4. Buzzer :

A buzzer is an audio signalling device.

2)   Buzzer Features and Specifications

Rated Voltage: 6V DC.

- **Operating Voltage: 4-8V DC.**
- **Rated current: <30mA.**
- **Sound Type: Continuous Beep.**
- **Resonant Frequency: ~2300 Hz.**

Pin description of buzzer:

1. Positive pin: Identified by (+) symbol or longer terminal lead. It can be powered by 6V DC.

2. Negative pin: Identified by short terminal lead. Typically connected to the ground of the circuit.

Fig.6. Buzzer

Fig. 7.Arduino pin diagram

TABLE I: THE SPECIFICATION OF THE SMART HELMET DESIGN.

Component & Specification	Functionality
Arduino • Microcontroller: ATmega328P –8 bit AVR family microcontroller • Operating voltage: 3v/5v • Analog Input Pins: 6(A0-A5) • Digital I/O Pins: 14	This device is used as a control center and processes the data that is sent by the sensor and then sends the output to the output device.
Helmet	As a smart helmet base.
Buzzer • Input voltage: 5V • Active (internal oscillator)	This device is placed on the helmet module to give a warning sound notification to the rider.
Servo motor	This device used for controlling the visor movements.

V. CONCLUSION

We have proposed a smart helmet for providing road safety, it also works by getting the values from the sensors which detect various factors like humidity in an air, if the user has consumed alcohol or the user has met with an accident. In case of an accident detection, the system sends the message about the accident to the registered number via smartphone which is connected through the Cloud Platform. The accident location is also sent to the registered number along with the message. In this report, a new Smart Helmet is proposed to easily move the helmet visor according to weather conditions. The helmet also successfully detects if the rider has consumed alcohol or not. If the rider is drunk and riding the message will be sent again to the registered phone numbers and the nearest Hospital and Police Station.

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