IOT Based Smart Communication System for Accident Prevention

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Abstract--A smart helmet is a type of protective headgear used by the rider which makes bike driving safer than before. The main purpose of this helmet is to provide safety for the rider. This can be implemented by using features like alcohol detection, accident identification, location tracking and fall detection. The helmet module (transmitter) output data will be received by the vehicle module(receiver) and process will take place by wireless technology. This makes it not only a smart helmet but also a feature of a smart bike. It is compulsory to wear the helmet, without which the ignition switch cannot turn ON. If the rider is drunk the ignition gets automatically locked. In case of an accident it will send a message through GSM along with location with the help of GPS module. The distinctive utility of project is speed indication, if the rider goes in high speed warnings are given through buzzers.
Keywords: smart helmet, IOT, sensors, accident reporting, emergency response.

I. INTRODUCTION

Traffic accidents in India have been increased every year. As per Section 129 of Motor Vehicles Act, 1988, every single person riding a twowheeler is required to wear protective headgear following the standards of BIS (Bureau of Indian Standards). Also drunken driving under the influence (DUI) is a criminal offence according to the Motor Vehicle act 1939, which states that the bike rider will get punishment. Currently bike riders easily escape from the law [1]. These are the three main issues which motivates us for developing this project. The first step is to identify whether the helmet is worn or not. If helmet is worn then ignition will start otherwise it remains off. For this, proximity IR sensor is used. The second step is alcohol detection [2]. Alcohol sensor is used as breath analyzer which detects the presence of alcohol in rider's breath and if it exceeds permissible limit ignition cannot start. MQ-3 sensor is used for this purpose. This semiconductor gas sensor detects the presence of alcohol gas at concentrations from 0.04 mg/L to 4 mg/L, a range suitable for making a Breathalyzer. When these two conditions are satisfied then only ignition starts. The third main issue is accident 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 dies due to delay in medical help, or in the case where the place of accident is unmanned. In fall detection, we place accelerometer in the bike unit. By this mechanism accidents can be detected.
The aim of this project is to make a protection system in a helmet for the safety of bike rider. The smart helmet that is made is fitted with different sensors responsible for detection [3]. There are two main units in this project. Each unit uses a microcontroller. Signal transmission between the helmet unit and bike unit.

II.LITERATURE SURVEY

There have been a number of studies on IOT-based smart helmets with impact marks. In one of these studies, S. Shoo et al. [1] proposed a smart helmet that uses accelerometer, gyroscope and GPS module for accident detection. The headset sends a message to a mobile application via Bluetooth to alert emergency services. The authors tested the prototype on a dummy and reported that the helmet was able to accurately detect collisions.

Another study by M. A. Ali et al. [2] proposed a smart helmet that uses a combination of sensors, including a heart rate sensor, accelerometer, and gyroscope for collision detection. The helmet will send an alert to emergency services, including the GPS location of the crash. The authors tested the prototype on a human subject and reported a high rate of accurate collision detection.

In a similar study, S. Liao et al. [3] proposed a smart helmet that uses ultrasonic sensors to detect obstacles and a GPS module to track the position of cyclists. The helmet sends alerts to cyclists through a vibrating motor and to emergency services in the event of an accident.

Another study by S. M. Mahmud et al. [4] proposed a smart helmet that uses accelerometer and gyroscope for collision detection. The helmet sends an alert toemergency services with the GPS location of the accident. The authors tested the prototype on a motorcycle and reported a high rate of accurate collision detection.

In a recent study, S. Base et al. [5] proposed a smart helmet that uses accelerometer, gyroscope and camera for collision detection. The headset sends alerts to emergency services with GPS location and a video feed of the crash scene. The authors tested the prototype on a human subject and reported a high rate of accurate collision detection.

III. EXSISTING SYSTEM

This existing idea addresses three main objectives: [1] To ensure the safety of the rider, [2] To the Rising modern needs of technological innovations, and [3] to overcome the accident rate.

IV.PROPOSED SYSTEM

A. PROBLEM DESCRIPTION

With the rapid urbanization and staggering growth of transport networks like two-wheeler vehicles, safety on the roads and security on the bike has emerged as an inescapable priority for us. It has expanded the rate of accidents, which leads to several damages with loss of lives. In many circumstances, we cannot able to detect the accident's location.

B. SYSTEM ARCHITECTURE

It is already mentioned that the project is divided into two units namely helmet and bike. In helmet unit,also called the transmitter unit, theproximity IR sensor is placed on inside upper part of the helmet where actually head will touch with sensor surface. And alcohol sensor is placed on in front of rider's mouth so that itcan sense easily. And the battery and regular circuits were fixed inside the helmet. Secondary controller and RF transmitter circuit were also placed inside the helmet. Antenna is located outside the helmet.

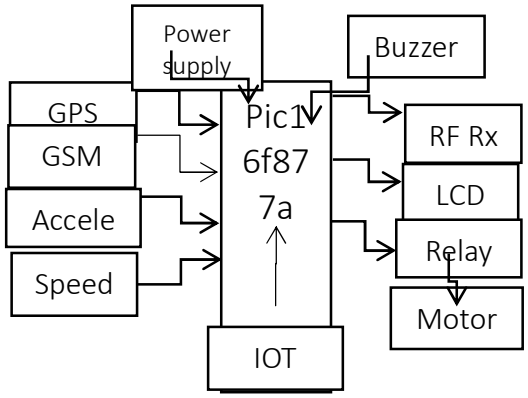

Fig.1: BLOCK DIAGRAM

C.MODULES

1. Proteus software
2. Speed sensor
3. Alcohol detection sensor
4. Acceleration sensor
5. LCD
6. Power supply
7. Buzzer
8. Relay,Motor

9. GPS,GSM

VI. WORKING PRINCIPLE

1. Helmet Section

The transmitter is placed in the helmet section while the receiver is placed in a particular bike. Thus, there will be wireless communication between two modules (helmet section and bike section).

When the bike rider wears the helmet, the switch is pressed present in the helmet. While breathing the alcohol sensor present in the helmet detects the alcoholic gas and bike will not start because ignition will be OFF. Accelerometer embedded in the helmet measures tilting of the helmet. The output of these components in the helmet will be input for the micro-controller which is embedded on the helmet. Then the processed data which is the output of the micro-controller of the helmet is sent to the bike module through the RF transmitter.

2. Bike Section

To start bike ignition a person must follow two conditions:

Condition 1 - Rider must wear the helmet since there is a switch in the helmet when the switch is pressed the ignition start.

Condition 2 - The rider should not cross the threshold value of consumption of alcohol.

To start the ignition of the bike the output of the helmet data must match above two conditions when it matches only then the bike starts or else it won't start. The accelerometer will measure the condition of the helmet whether it is tilted concerning with the ground or not, if it is tilted with more than the threshold value, then it means that accident has occurred after that immediately the notification will be sent to the registered contact number using GSM and also it sends the location of the accident occurred. So that they can take victim immediately to the hospital and provide medical treatment and further they can also inform about the incident to the police station.

Sensor Data Collection:

The smart helmet is equipped with sensors such as an accelerometer, speed sensor, IR-sensor and GPS. These sensors collect data about the rider's movement, position, and speed.

Data processing:

The data collected by the sensors is processed by algorithms to detect accidents. Algorithms analyze sensor data to determine if the rider were involved in an accident.

Location:

The GPS sensor in the helmet can be used to track a rider's location. This information can be used to provide emergency services with the exact location of the victim in the event of an accident.

Real-time feedback:

Smart helmets can provide real-time feedback to the driver, such as warnings about dangerous driving behaviors or warnings about potential hazards.

Overall, the working principle of IOT-based smart helmets with a collision indicator is to collect and process data in real-time to provide a safer driving experience for the rider. By monitoring a driver's vital signs, location, and driving behavior, helmets can detect accidents and issue warnings to drivers and emergency services.

VI.RESULTS AND DISCUSSION

The IOT-based smart helmets with a collision indicator can be measured for their effectiveness in detecting collisions and providing warnings to drivers and services urgent. And also the speed limits are monitored with speed sensors and give indications with the buzzer.

In terms of collision detection, smart helmet algorithms must be designed to accurately detect collisions while minimizing false positives. The helmet must be able to detect a variety of crash situations, such as collisions with other vehicles or objects, sudden deceleration, or falls. The helmet's crash detection efficiency can be evaluated through real-world testing and analysis of sensor data.

The helmet's ability to provide rider warnings and emergencyservices is alsoimportant. Warnings must be timely and accurate, providing drivers and emergency services with the informationn they need to respondto an accident. Helmets must also be able to provide real-time information to the rider, such as warnings about dangerous driving behavior.

The ability to monitor the driver's vital signs, position, and driving behavior is also important. By tracking the driver's location, the headset can provide emergency services with the driver's exact location in the event of an accident. By providing real-time feedback to the rider.

1. Status of the rider wearing a helmet
2. Alcohol content detection and
3. Accident detection and location sharing
4. Over speed indication

Overall, the outcome of an IOT-based smart helmet with a collision indicator will depend on the effectiveness of the sensors, algorithms, and connectivity to the IOTplatform. Testing and analyzing real-world sensor data can help gauge a helmet's effectiveness in detecting collisions and providing warnings. User feedback can also be used to identify areas for improvement and new features to add to the headset. Ultimately, the goal of smart helmets is to provide a safer driving experience for riders and help reduce the number of accidents on the road.

VII.CONCLUSION

IOT-based smart helmet with accident indication has the potential to significantly improve road safety for motorcycle riders. By incorporating sensors, algorithms, and connectivity to an IOT platform, the helmet can provide real-time feedback, monitor the rider's vital signs, location, and driving behaviour, and detect accidents. In the event of an accident, the helmet can provide alerts to the rider and emergency services, helping to reduce response time and improve outcomes.

Overall, the smart helmet is a promising example of how IOT technology can be used to improve safety in a specific domain, such as motorcycle riding. However, further research and development are needed to refine the technology and improve its accuracy, reliability, and ease of use. Additionally, user feedback and engagement will be critical to ensure that the helmet meets the needs and preferences of motorcycle riders.

In the long term, smart helmet with accident indication has the potential to become an integral part of a broader safety ecosystem, incorporating other IOT devices such as smart vehicles and road infrastructure. By creating a more comprehensive safety ecosystem, we can work towards the goal of zero accidents on the road, improving the safety and well-being of everyone on the road.

VIII.FUTURE SCOPE

We can implement various bioelectric sensors on the helmet to measure various activities and we can view the statistics of the rider. We can use voice commands to control the basic bike functionalities. Now the rider can leave the helmet on the two-wheeler while parking, without any special actions or security measures. We can use solar energy on two- wheelers for charging the electric vehicles and for mobile devices. In the future self – driving motorbikes can be developed with artificial intelligence and the rider will be safe and no accidents will occur.

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