Design and Implementation of IoT based Smart Helmet Prevent Accident Detection and Safety

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Abstract-As the number of scooters and motorcycles has increased, there has been a concerning increase in annual traffic accidents in many different countries. Streets and roads in some of the most populous countries on earth are noticeably narrower. Despite having enough rules and regulations in place to avoid traffic accidents, the accident rate is increasing every day. It's essential to take into account things like riding a bike while inebriated and not donning a helmet. Motorcyclists cause fatal traffic mishaps by riding their motorcycles while intoxicated and without a helmet. But accident risk can be greatly reduced by donning a mask. This study makes excellent use of technology.

I. INTRODUCTION

Road accidents have become a huge concern in our everyday lives. Due to this huge population, many people are facing very high road accident fatality rate, and the official figure indicates 60 deaths per 10,000 motor vehicles [1]. It is estimated that many Bikers die every day in road accidents, and due to insufficient information regarding the accidents those riders cannot saved as they merely find help after the occurrence of the accident. However, with an increasing number of people, Motorcycles are also increasing on the roads and streets.

Helmets are one of the most essential and important elements of motorcycle riders must wear to avoid any possible road accidents. It ensures the safety of the motorcyclist's head from the deadly impact caused by accident and provides guarantee protection to the bike riders and provides 100 percent user reliability.

Approximately 1.35 million people die each year as a result of road traffic crashes [8]. The annual fatality rate from street Accidents are found to be severe. More than half of all road traffic Deaths are among vulnerable road users. The main objective of this project is to build and ensure a safe and cost-effective system to prevent alcoholics from rising motorcycle. This project is embedded with sensors modules and microcontrollers. The MQ-3 sensor is used as a breath analyzer that identifies the presence of alcohol in the user's breath if it is more than the pre-set permissible range, ignition will not start. It will provide the message to the registered number. This project ensures the safety of the motorcyclist in two ways. Firstly, whenever a motorcyclist starts the engine prevents any drunk rider from riding the vehicle. And secondly, if any accident occurs, then the SW420 vibration sensor detects It and an immediate text message are sent to the motorcyclist's relative or any known person of the motorcyclist. However, the first condition for starting the engine is to wear the helmet for riding motorcycle. It successfully deploys the alcohol detection technology that prevents drunk bike riders from roaming around the streets, making one's own life and other lives in danger. For bike unit, we use an Arduino Uno R3.The smart helmet will have a sharp IR sensor. Which will be used to detect if the rider has worn the helmet or not. The smart helmet will have an ultrasonic sensor. Which will be used to detect if the rider is in close proximity to the other vehicle, and it will indicate the rider and a known person.

The MQ-3 sensor is used for alcohol detection purposes. Signal transmission between the helmet unit and bike unit is using RF concept. The nRF24L01 is used as an RF module in our smart helmet nRF2401 is a single-chip radio transceiver for the worldwide 2.4–2.5 GHz ISM band it is on the transmitter side. And another is used on the receiver side. The receiver unit is to be placed on the bike where it will receive data and control the ignition. Using a DC gear motor an example to show how the ignition system will work. There is a DC adapter that is connected to the gear motor. A vibration sensor module, which SW420 has been used to detect road accidents. Using the SIM800L (GSM) in the receiver circuit, a text message is to be sent that an accident has happened. Unbox Neo 6M GPS module is used, which provides navigation points for the accident location on the given cell phone number. Also, there is an OLED display, which will show all

the output. It is to be placed on the bike where it will receive data and control the ignition. Using a DC gear motor as an example to show how the ignition system will work. There is a DC adapter that is connected to the gear motor. A vibration sensor module, whichSW420 has been used to detect road accidents.

II. METHODOLOGY

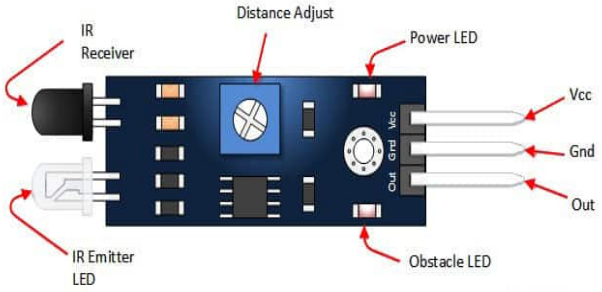

Fig. No. 1 Proximity Sensor

Figure No. 1 depicts the infrared proximity IR sensor structure from Sharp that is used inside the helmet to identify the motorcyclist's head and confirm that the user is indeed wearing the helmet. Between 10 centimeters and 80 cm, the motorcycle rider's cranium can be detected. As a result, it is a sensor that has analog voltage output and incorporated signal processing and can detect distance. Figure No. 1 displays the analog result in relation to the object's reflection distance. Digital signal, GND, and VCC connections are all present on the pointed IR. Pin 5 has the digital output attached to it. (D4). The Sharp IR has an 80 cm maximum range and an average reaction rate of 39 ms. The structure of the MQ-3 gas sensor, which detects alcohol, availability is shown in Figure No. 2. This gas sensor module is very useful for the leakage of alcohol. Because of its very high sensitivity and quick response time, measurements can be taken. This sensor gives an output that is analogue-resistive based on alcohol concentration. The voltage of the output from the MQ-3 sensor rises when the concentration of gas increases. The gas sensor MQ-3 uses SnO2. Which has a very low conductivity rate in the atmosphere, and this SnO2 material is used as a gas sensing material. In our atmospheric condition where alcohol gas is present, the conductivity of the gas sensor MQ-3 increases along with the concentration of the alcohol gas rises. So, this MQ3 gas sensor is an alcohol sensor capable of detecting alcohol concentration on anyone's breath. This MQ-3 sensor is used in our project as an alcohol sensor that can detect the presence of alcohol among the bike riders. When the alcohol gas presents in the air, the full sensor's conductivity

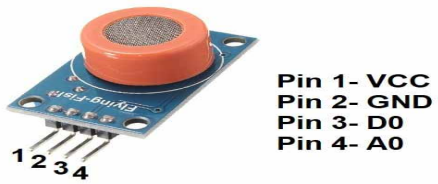

Fig. No. 2 Pin diagram of Sensor

The sensor we use in our proposed system is ultrasonic sensor. It is used because of its reliability and outstanding versatility. An ultrasonic sensor is a device that that can measure the distance to an object by using sound waves at a specific frequency and listening for that sound. Wave to bounce back. Time difference between sending and receiving the sound.

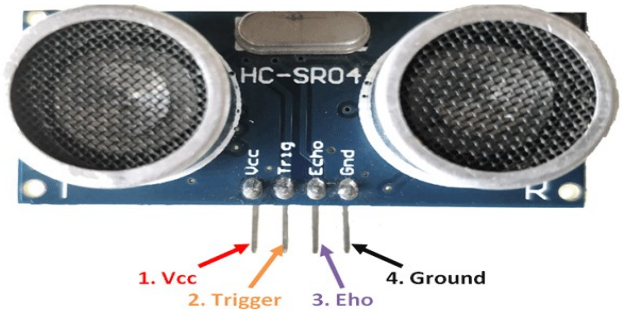

Fig. No. 3 Board diagram of Proximity Sensor

Liquid Crystal Display

LCD (liquid crystal display) technology is used in scratch pad displays and other small PCs. LCDs, like LED and gas plasma technology, allow for far slimmer presentations than cathode ray tube technology (CRT). LCD displays use far less energy than LED and gas displays since they emit light instead of obstructing it. LCD (liquid crystal display) technology is used in scratch pad displays and other small PCs. LCDs, like LED and gas plasma technology, allow for far slimmer presentations than cathode ray tube technology (CRT). LCD displays use far less energy than LED and gas displays since they emit light instead of obstructing it.

III. LITERATURE REVIEW

There has been a gradual increase in the number of motorcycles sold daily. The motorcycles that were recently manufactured have all the attributes in terms of mileage and performance. It is also priority for the manufacturers to take the safety factor into consideration as well. The people are buying motorcycles. In accordance with the growth with the increase in motorcycles, the safety factor also rises. There are a lot of accidents happening every day on the roads. There are certain causes that are responsible for it. Certain reasons are responsible for it, such as drivers' fault, bad road, and a mistake from another person on the road. A head injury is one of the most severe cases that lead to body paralysis and sometimes death.

There are three major issues that motivate us to design this project. The initial step is to determine whether the user is wearing the helmet or not. If the user wears the helmet, then the system will automatically initiate ignition of the motorcycle. Otherwise, it will stay off until the helmet is put on by the user. In order to fulfil these tasks, we have used an IR sensor from Sharp. The second step is the detection of alcohol levels. It will provide the message to the registered number. This is done with the aid of MQ-3 sensor. When these two conditions are fulfilled then ignition will start. The third main concern is in case of accidents, the arrival of medical assistance may be delayed. This is may turn out to be a matter of life or death. As an accident occurs, the longer it takes to receive medical aid, the lower the chances of the rider's survival. We have found different levels of alcohol. After changing the IR sensor value in our transmitter circuit.

Related Work

We attempted to build a smart helmet using a completely innovative technique. Despite the fact that smart helmets have been adopted in many nations, the concept has yet to be established in South Asian countries, where accidents occur frequently in daily life. Because our smart helmet differs from standard helmets, bike riders will avoid using them if they are unpleasant. As a result, we sought to make it as familiar to users as possible. All of our circuits have been positioned within the helmet fabric so that they do not come into contact with the user's head. A photo of our smart helmet is included below. The bike will be outfitted with a receiver circuit unit. We made every effort to maintain .The size of the helmet is just like any other helmet, and it is very comfortable to wear. We are calling the entire helmet the transmitter circuit, which will transmit data to the bike's receiver unit. The data will be sent via radio-frequency communication. And for that we have used the nRF24L01 module. We have placed the MQ-3 alcohol sensor in front of the rider mouth. Keep a safe distance so that it can analyses the driver's breath. And check if he or she is drunk or not. Then there is the Sharp IR sensor which checks if the helmet is worn or not. There are given conditions for both sensors. If these conditions are met, then the data will be transmitted through communication. All These sensors are connected using an Arduino Uno.

IV. PROPOSED SCHEME

This paper describes the design and implementation of smart Helmet using IOT for helmet unit we use Arduino no. The smart helmet will have a sharp IR sensor, which will be used to detect if the rider has worn the helmet or not. The sensor we use in our proposed system is ultrasonic sensor. It is used because of its reliability and outstanding versatility. An ultrasonic sensor is a device that that can measure the distance

between one vehicle and another vehicle. IF the distance of the vehicles is close transmit the message to led display or GPS. MQ-3 sensor is used for alcohol detection purpose. Signal transmission between the helmet unit and the bike unit is using a RF concept. NRF24L01 is used as an RF module in our smart helmet, the nRF24L01, is a single-chip radio. Transceiver for the worldwide 2.4–2.5 GHz ISM band. It is in the transmitter side, and the other is used on the receiver side. We have used an Arduino Uno in our transmitter circuit. When the driver is drunk, "BE SOBER AND WEAR A HELMET" is shown in the LED 16*2 display.

Proposed Methodology:

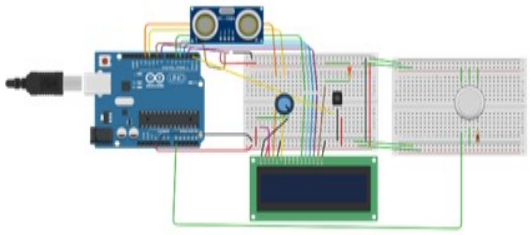

Fig. No. 5 Diagram of Proposed method

IV. RESULTS

The smart helmet was developed and tested for various conditions to find out how effectively it operates. There are mainly 4 different conditions the smart helmet is tested for. When the user is drunk and is not wearing a helmet, the bike will not start. The proximity IR sensor will detect No helmet is required, and the MQ-3 Alcohol Sensor will detect alcohol. And disable the ignition of the bike. When the user is wearing a helmet, the proximity sensor will give a positive Signal. But since the user is drunk, the MQ-3 sensor will give negative reading, and as a result, the bike will not be able to start. Ultrasonic sensor, It is used because of its reliability and outstanding versatility. An ultrasonic sensor is a device that that can measure the distance between one vehicle and another vehicle. IF the distance of the vehicle is close transmit the message to LED display or GPS.

VI. CONCLUSION

Our Smart Helmet is an intelligent system that will aid more secured bike riding. Regarding the poor condition of our roads, a large number of accidents, a lot of violations of traffic rules, and poor regulation system, there is no alternative to smart helmets for motorcycle riders safety. Wearing a helmet is imperative. While riding a motorcycle because it can save the rider from severe injury to the head in the case of an accident. So, this is where the sharp IR sensor will come into action. It will ensure that the rider must wear the helmet to start the bike. Drunk Driving is also an important issue to consider nowadays. Because drunk driving can cause more accidents in the case of bikes than cars. So, the alcohol sensor will check if the driver is drunk or not. Smart helmets are very popular in Western and European countries, but the concept is not familiar in Bangladesh yet. If we can make our design more full-proof and get a sponsorship, then we will mass produce it. A smart helmet might be a little bit more expensive than a regular helmet. but its benefits certainly outweigh the costs.

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