SmartVech: A Road Accident Prevention Initiative

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Abstract :   The risk of death decreases to about 2.5 times when riders wear a helmet as compared to when they don't wear it. According to a study, out of 600 people in a city in 2010 who lost their lives in road accidents, would have been alive if there had been universal compliance of helmet usage [1]. In this paper, an attempt is being made to avoid road traffic injuries. Road accidents are a major cause of premature death and disability all over the world. The bike will not start unless the rider wears a helmet and passes the alcohol test, thereby solving the problem of drunken driving. The bike will indicate the discharge of battery voltage. The helmet has an additional feature of accident indication and reporting through GPS-GSM technology which sends exact location to the family members in case of an accident. So that necessary help can be provided to the injured one.

IndexTerms - **Smart, GPS, Bluetooth, Tilt.**

I. INTRODUCTION

Over the years, two-wheelers have become very popular across the world especially in countries like India, the rate of growth of two-wheelers is about 20 times the rate of growth of population [1]. This has led to a rapid increase in the numbers of deaths and accidents. The main causes for this include drunk driving, avoiding safety gears like helmets, violation of traffic rules etc. Road traffic injuries are one of the major problems that are the leading cause of death and injury around the world. The studies have shown that most of the serious injuries and death cases can be prevented by the use of helmet and by avoiding driving after drinking alcohol [2]. The late arrival of the ambulance and lack of proper treatment on time has contributed significantly to the increased number of death rates.

II. FUNCTIONAL OVERVIEW

A. Alcohol and helmet detection

1) Helmet Detection:
- Limit switch will determine the presence of the helmet. It is placed on the top of the rider's head inside the helmet.
- It consists of an actuator which when comes in contact with rider's head will make the electrical connection and will determine the presence of helmet.

2) Alcohol Detection:
- After the helmet detection rider will now have to pass the alcohol test to start his bike.
- Alcohol detection will be done with the help of MQ3 sensor.
- It will detect alcohol concentration on your breath, the air blown will contain vapours which will be used for calculating alcohol content.
- It can detect the presence of alcohol gases at concentrations from 0.05 mg/L to 10 mg/L [3].

Figure 1: MQ3 Sensor for alcohol detection

B. Bluetooth Connectivity
- Bluetooth HC-05 module is used for a wireless connection.
- It will send the data from the alcohol sensor and limiting switch to the microcontroller through UART.

Figure 2: HC-05 Bluetooth Module for wireless connectivity.

C. Battery Indicator

- It will give you a visual indication of the battery's state of charge.
- For this, we have used 1N4148 diode with BC547, BC557 transistors and LEDs.
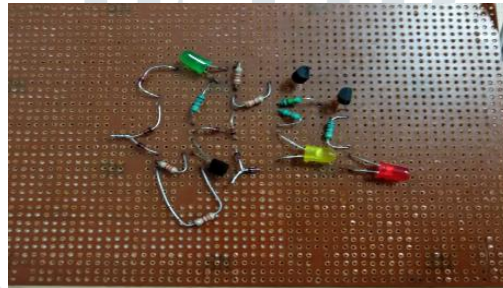- Different colour of LEDs will indicate the battery's state of charge.

Figure 3: 1N4148 diode with BC547, BC557 transistors and LEDs.

D. Tilt Sensor

- The tilt sensor is used for accident detection.
- It produces an electrical signal that varies with angular movement.
- It consists of a rolling ball that doesn't fall to its bottom when the sensor is tilted so that current cannot flow between the end terminals of the sensor

Figure 4: Tilt Sensor

E. GPS-GSM Model

- GPS (Global Positioning System) is a satellite-based radio navigation system it will display the current location of rider in terms of longitudes and latitudes [4].
- GSM (Global System for Mobile Communication) standard for mobile communication is the form of voice messages or text messages (SMS).

III. FLOWCHART

Fig 5 depicts the flow of a general scenario where the helmet is used by the rider. The bike will start only the rider wears the helmet and passes the alcohol detection test.
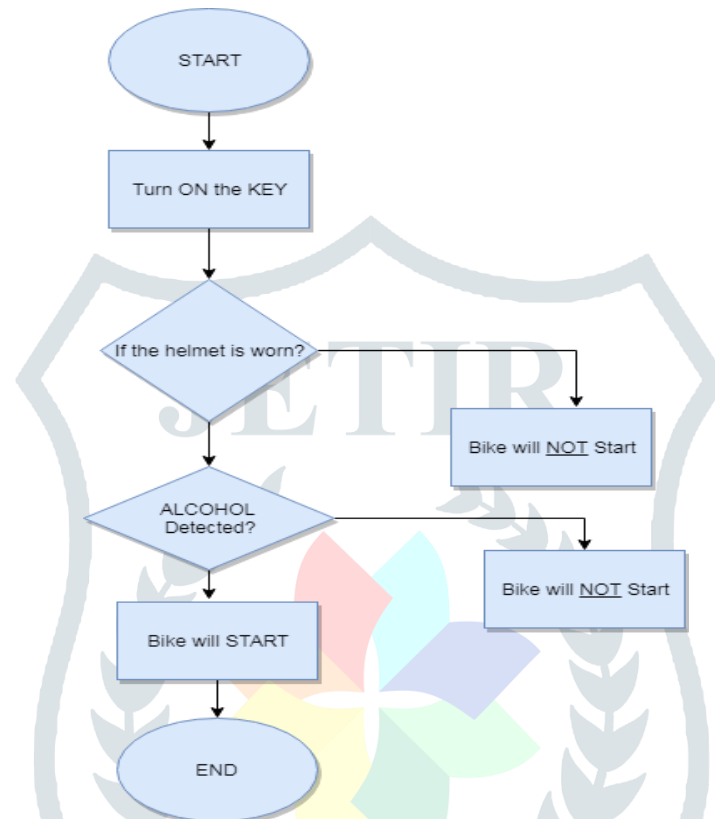

Figure 5: Flowchart of a general scenario

IV. WORKING

This project is designed for the detection of helmet and alcohol before allowing the rider to start the vehicle. When the rider of the 2 wheeler sits on the vehicle and turns the key on, the bike will not start unless the rider passes the helmet test.

Once the Limit switch detects the presence of the rider's head it signals the microcontroller to check for the alcohol. The MQ3 alcohol sensor is used for detection of alcohol. If the rider fails any of these tests they will not be able to start their vehicle. If there is alcohol the sensor will signal the microcontroller. The output from the limit switch and alcohol sensor will be sent to the microcontroller embedded within the vehicle via Bluetooth which will excite the relay to switch in order to complete the connection with the engine of the vehicle. Once the relay switches to turn on the engine, the vehicle tends to start. Hence, to wear the helmet and to pass the alcohol test became the necessary condition to start the vehicle. The other half of the project is embedded within the vehicle and it includes the Bluetooth HC-05, microcontroller, receives relay and the tilt sensor. The tilt sensor is used to detect the accident condition. The tilt in the vehicle after an accident will cause the tilt the microcontroller to give a high output further interfaced GPS-GSM module. This GPS module will give rider's current location with the help of which we can track the location of accident and the GSM module will send a text message to the area's ambulance and also to the family of the victim.

V. CONCLUSION

The World Health Organization states that 1.2 million people lose their lives annually due to road traffic injuries [1]. This project aims to significantly reduce this number as in case of two-wheeler riders most of the death cases occur due to head injuries which can be prevented by the use of helmet and by avoiding driving after drinking. This system can be used in all kinds of bikes and will help the government in implementing the compulsory use of a helmet. This prototype will force people to wear a helmet in order to start their bikes.

The project also incorporates accident reporting system that helps to know the location of the vehicle for rescuing in the case of

accidents which will solve the problem of the delayed arrival of the ambulance at accident site so that the necessary first aid can be provided to the rider [5]. Time is an important deciding factor in the case of life and death in an accident. This smart helmet will make the life of motorcyclist more safe and secure.

VI. FUTURE SCOPE

The government can implement this project and should mandate the two-wheeler manufacturers to incorporate these helmets as an integral part of the vehicle. There can be security system to avoid the risk of the theft of helmet by use of unique locking codes, fingerprint sensors etc. An additional system to check the speed of the vehicle can be added. The government should allow more advanced development of this project to make it more compact and reduce its size.

VII. ACKNOWLEDGMENT

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