Smart Headgear for Rider Protection from Intoxication and Emergency System

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Abstract-The motorbike obsession in today's world, particularly among the younger generation, is truly amazing. As the number of motorcyclists in our nation rises, so do the number of traffic accidents and fatalities. We built an intelligent system designed to enhance motorcycle safety by addressing two major factors contributing to traffic tragedies: failure to wear helmets and alcohol consumption. The system incorporates helmet detection and alcohol sensing technologies to prevent the motorcycle's ignition from starting if the rider is not wearing a helmet or has consumed alcohol beyond the permissible limit. Through audio-visual alerts, the system notifies the rider or the pre-designated contact of the rider, of unsafe behaviors and aims to discourage them. By combining these features with accident reporting capabilities, the system strives to promote a safer riding culture, reduce accidents, and ensure timely medical assistance in the event of an accident.

Keywords—helmet, alcohol, ignition, motor, location, alert, accident, slipping

I. INTRODUCTION

The motorbike obsession in today's world, particularly among the younger generation, is truly flabbergasting. As the number of motorcyclists in our nation tends to only get higher, so are the number of traffic accidents and fatalities; the majority of these are the result of failure to wear a helmet. and consumption of alcohol is one of the factors that lead to these accidents. Although the traffic department uses breath analyzers to determine whether a rider has consumed alcohol or not, it is impossible to check every rider on the road. The majority of fatalities will occur as a result of the injured person not receiving enough medical care.

We are developing an intelligent system that prevents traffic accidents, detects alcohol use, and can also detect issues and instantly inform any fatality to a predetermined number in order to solve the aforementioned issue.

The project can determine if a person is intoxicated or not by using the alcohol sensor to detect the presence of alcohol in the blood by his/her breath. The bike won't start if the rider is discovered to be intoxicated. The bike won't start if the rider doesn't put on the helmet in those situations. The project will not permit the bike to start if he does not wear a helmet and will not permit the bike to start if he has consumed alcohol.

The device will provide an audio-visual alert in the form of a buzzer and 10 mm LED if the rider has consumed alcohol beyond the specified limit after starting the bike or tries to remove the helmet.

The initial stage in this project is to determine whether or not a helmet is being worn. The vehicle ignition will switch on if the helmet is worn by the rider; else, it will not. The Helmet press button is employed in this. Alcohol detection is done in the next stage. When the rider's breath contains more alcohol than is permitted, an alcohol sensor is utilized as a breathalyzer to identify the presence of alcohol and prevent the ignition from starting. This is accomplished using the MQ-3 sensor. Only when these two requirements are met does ignition begin.

The goal of this project is to create a helmet protection system for bike riders' safety. This project consists of two parts.

II. LIMITATIONS OF EXISTING SYSTEM

The helmets that are currently in use are just basic headgear. Some of them are not even ISI certified and don’t protect the head/face completely. People casually go out on their motorcycle without a helmet which has proven to be fatal in case of severe accidents. Wearing a helmet helps in avoiding head injuries. There are also cases of drivers/riders being highly intoxicated in spite of wearing a helmet. But in these cases, there have been loss of lives/injury of other people because of the drunk driver/rider. So, this project offers a model solution where a rider can't start his vehicle unless he is wearing a helmet and is sober as mentioned in [1].

There also have been situations where in spite of the person being perfectly alright and following all rules before driving, he/she might have run into an accident unfortunately. In such cases, immediate medical response is a must and can be vital for survival. There could be cases where no one is around when the accident occurs and the rider's injuries might end up being fatal if not treated immediately. In such cases a system that sends an SOS to a close contact or the nearest police station/Ambulance with the location could be saved.

III. PROPOSED SYSTEM

The solution proposed in this project to bypass the existing limitations is the usage of an alcohol sensor along with a helmet press button connected in series to satisfy the logical AND condition. So only when the outputs from both the sensors satisfy the condition input in our Arduino code, will the driver be allowed to start. The Arduino processes the inputs detected by an MQ-3 alcohol sensor and a limit switch placed inside the helmet and directs the RF Transmitter to send the necessary signal to the RF receiver. Similar to [2] this receiver will be attached to the motor circuit in the vehicle. The Arduino in the motor circuit receives the signal from the RF receiver and processes these inputs and accordingly sends the data to the relay driver.

There is also a vibration sensor along with a tilt sensor in the motor circuit to detect accidents and when an accident occurs. The vibration sensor is utilised to detect when an accident occurs. The tilt sensor whose sensitivity can be adjusted by operating the potentiometer fixed inside it is used for fall or slip detection of the bike.

The GPS present identifies the accurate location of occurrence of the incident and the GSM module which has a SIM inserted inside it sends an SOS message with the rider's location to a contact he/she had entered before itself along with the nearest police station. This notifies someone concerned and can help in the rider attaining immediate medical attention. A similar message is also sent when alcohol is detected in the rider's breath alerting the user of an unsafe rider trying to ride the vehicle. The RF transmission takes place at a frequency of 433MHz.

Further, to prevent failure of the circuit, a step down transformer is used to take in power from a higher power source and to convert into a 5V source. This accounts for drops in voltage that can occur as the circuit consists of a number of devices connected in series drawing on the power thus giving a constant voltage supply. The same idealogoy is followed in [5].

The below flow chart provides a detailed picture of the working of this project.

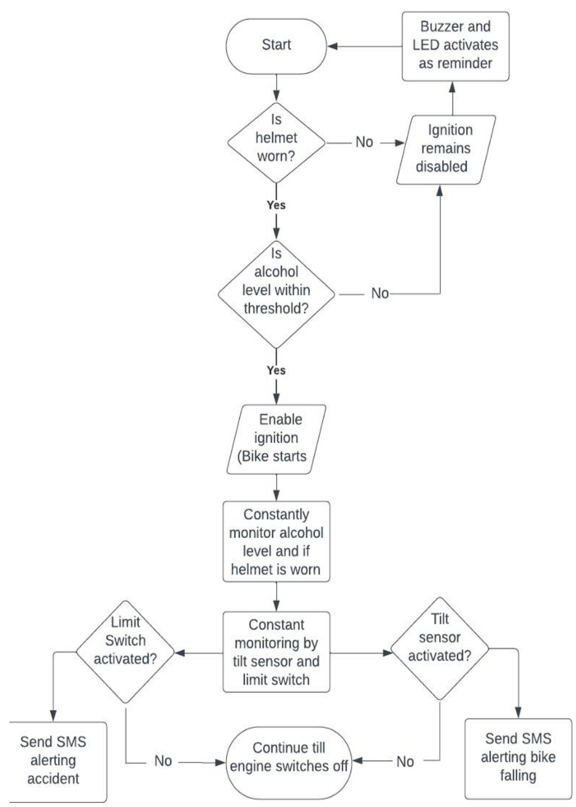

Fig. 1 Flow Chart

IV. SYSTEM DESIGN

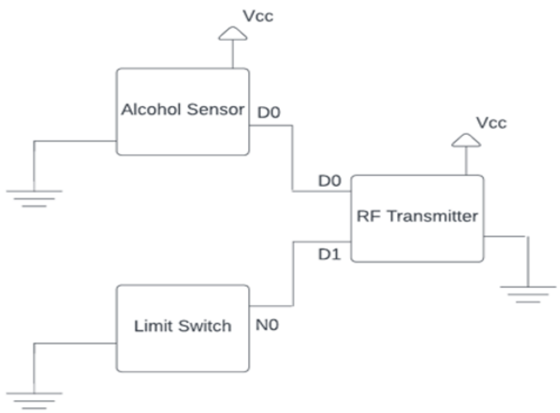

Fig. 2 Transmitter

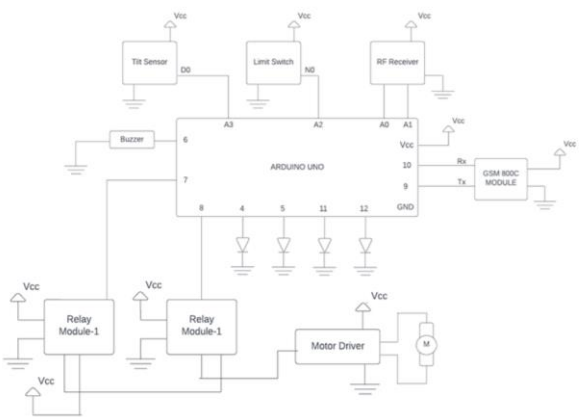

Fig. 3 Receiver

A. Arduino UNO

Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Fig. 4 Arduino Uno

B. Tilt Sensor

Tilt sensors are devices that provide an electrical signal that changes in response to angular movement. Within a constrained range of motion, these sensors are utilized to measure slope and tilt. Because inclinometers produce both a readout and a signal, they are sometimes referred to as tilt sensors because tilt sensors only produce a signal.

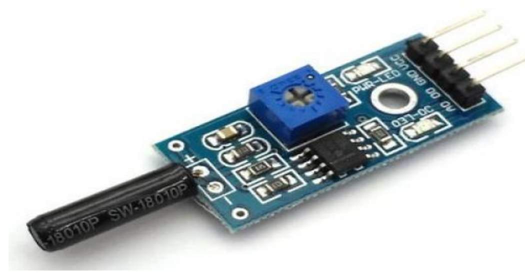

Fig. 5 Tilt Sensor

C. MQ-3 Alcohol Sensor:

Fig. 6 MQ3- Alcohol Sensor

It is employed to determine the amount of alcohol in breath. You can place it right in front of the mouth. The sensor detects different alcohol molecules and calculates whether the rider is intoxicated. A potentiometer is also included in the sensor to modify the gas concentration. Using a resistance of 200 K, we calibrate the detector for an air alcohol concentration of 0.4 mg/L. There are four pins on it: GND, VCC, A out, and D out. Digital and analogue outputs are also supported by the sensor. Here, we make use of the sensor's digital output.

V. RESULTS

The ignition of the engine responds according to the combination of two factors -

Case 1: Helmet not on: It is observed that when the rider does not have the helmet placed on his head the ignition system of the engine / motor refuses to activate.

Case 2: Helmet on and not drunk: Once the rider places the helmet on and is detected to not be in an intoxicated state, the relay modules in series are both activated allowing the engine to switch on.

Case 3: Helmet on and drunk: Now in case the rider wears the helmet while being drunk, the MQ-3 sensor detects this and sends the signal to the Arduino which in turn switches off the respective relay module. This prevents the bike engine from switching on. The buzzer beeps to alert the individual that he is incapable of driving. The following message is also sent to the registered number to alert the concerned person of the attempt to drive the vehicle while drunk -

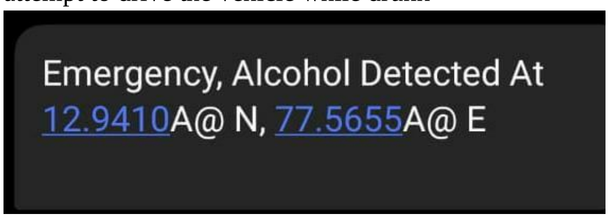

Fig. 7

Coming to the notification section of the project, on subjecting the sensors to the required conditions for triggering their functioning the response is satisfactory. When the tilt sensor [11] is activated beyond its threshold, the buzzer once again beeps in response to this and the LED displaying the activation of the sensor lights up. This is followed by the sending of a message notifying that the bike slipped.

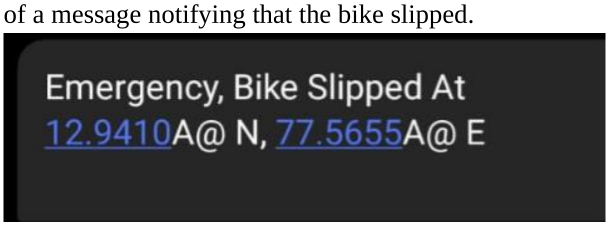

Fig. 8

Similarly when the limit sensor is subjected to the conditions for an accident the circuit responds in a similar fashion. The respective LED lights up and the following message is sent.

Fig. 9

VI. CONCLUSION

In summary, the smart helmet project has shown to be a creative and practical way to improve safety and many other aspects of daily living. Smart helmets have successfully addressed the drawbacks of conventional helmets and provided a number of advantages by integrating cutting-edge technology like IoT, sensors.

Firstly, real-time monitoring and detection capabilities offered by smart helmets have greatly increased safety standards. By incorporating sensors, it is possible to identify possible hazards like impacts, abrupt movements, or aberrant physiological conditions, allowing for early alerts and quick action.

Secondly, smart helmets provide useful data gathering and analysis tools. They offer helpful insights for performance analysis and risk assessment by continuously tracking and logging different metrics, including speed, position, and biometric data.

As technology continues to advance, we can expect further improvements and innovations in smart helmet designs, making them even more effective in safeguarding lives and improving the quality of our daily experiences.

VII. REFERENCES

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