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Smart Helmet for Bike Riders Safety

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Abstract: ***With the growing number of 2-wheel motor vehicles, the frequency of accidents is on the rise. A major portion of the fatalities 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 admittance to a hospital, or because he was riding while drunk. For this purpose, we use onboard sensors – gas Sensor, mems sensor. The accelerometer measures the change in tilt, in X Y and Z axes respectively, and sends the data to a server via an online application programming interface (API). 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. This can help optimize accident detection in the future when enough data is gathered to provide reliable accuracy. This will ensure the holistic safety of the rider at all times. This project presents an alert of the accident detection techniques by using smart helmet detection.***
Keywords: Alcohol detection, Helmet Detection, Arduino development board, MQ-2 Alcohol sensor, GSM, GPS, Accident detection

I. INTRODUCTION

With the growing number of 2-wheel motor vehicles, the frequency of accidents is on the rise. A major portion of the fatalities 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 admittance to a hospital, or because he was riding while drunk. We propose mechanisms that can detect if one is wearing the helmet, detect accidents, and detect whether the person has over-consumed alcohol. For this purpose, we use onboard sensors – gas Sensor, mems sensor. The accelerometer measures the change in tilt, in X Y and Z axes respectively, and sends the data to a server via an online application programming interface (API). 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. This can help optimize accident detection in the future when enough data is gathered to provide reliable accuracy. This will ensure the holistic safety of the rider at all times. This project presents an alert of the accident detection techniques by using smart helmet detection.

In this paper sensor module, will be placed in the helmet to detect weather a person worn helmet are not, once the person wears the helmet the signals get transmitted. The module in the bike allows the rider to start the vehicle once the module receive signals from helmet unit and RF transmitter will be placed in sign boards across highways so that the driver get prior intimation about obstacles earlier through voice output. In case of helmet lost android app is provided to ignite the vehicle through password for 3 times, again after receiving signals from helmet unit the count in android app goes zero so that again 3 chances will be provided to ignite vehicle during helmet lost. So, wearing a helmet can reduce this number of accidents and may save the life. This project aims for avoidance of accidents and develop helmet detection system. The proposed system is an intelligent/safety helmet. A module affixed in the helmet, such that, the module will sync with the module affixed on bike and will also ensure that biker has worn Helmet. Additional feature of accident-avoidance detection module will be installed on the bike.

II. EXISTING SYSTEM

The main problem is motor vehicles invented for making human life better but it ffects adverse on human being in the form of accident. Road accidents take place mostly by motor vehicles and motor vehicle is only a human made device if it causes badly in the form of road accidents. Accidents on roads cause harmful injuries to the biker. Mostly death occurs due to collision at brain of biker. This happens due to avoid the helmet while driving. In the accidental condition, primary treatment to the victim is generally delayed. This leads to increasing number of deaths in road accidents.

The clear majority of children and youth between the ages of 5 and 14 ride bicycles, with estimates of 70% (Sacks, Kresnow, Houston, & Russell, 1996). Although cycling confers significant health benefits, the bicycle is associated with more injuries than any other consumer project except for motor vehicles (Wilson, Hoover, Baker, Terete, Shock, & Garbarino, 1991). Data from the National Highway Traffic Safety Administration (2008) indicate 698 bicyclists were killed and 44,000 were injured in 2007 and 15% of those killed and 29% of those injured were under the age of 16.

These data also show the 10 to 15-year age group had the highest fatality and injury rates, with fatality rates 46% and injury rates 162% more than the average rate for all bicyclists. Bicycle fatality rates are highest in the state of Florida. Head injuries account for 75% of bicycle related deaths and more than two thirds of bicycle related hospital admissions (Brewer et al., 1995; Rivera et al., 1998).

One factor that appears in many studies is lack of peer support and unappealing helmet design (Lajunen, T., & Rasanen, M., 2001; Liller, Morissette, Noland, & McDermott, 1998). Another study (Loubeau, 2000) conducted focus group discussions with young adolescents who reported that bicycle helmets were uncomfortable because they were difficult to fit, and made them "feel dumb," "like a nerd," "you're a loser," "your mother makes you," "your mother is over protective."

III. PROPOSED METHODOLOGY

1) The idea of our project "SMART HELMET" is to first check if the rider has actually worn the helmet, in other words the availability of the rider's head inside the helmet to allow the vehicle to start.

2) The system makes it mandatory for the rider to wear helmet before starting the vehicle and also, he shouldn't have consumed alcohol. If the rider fail to do so then the vehicle cannot be started.

3) The GSM and GPS have been added in our project to find the location of the rider and send a message to a nearest emergency service in case accident has happened.

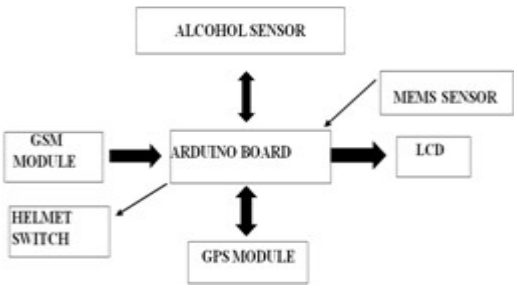

Fig: Functional block diagram

A. *Advantages of Proposed System*

1) No manual attention is needed.

2) Can be used for all kinds of two wheelers

3) Rider is enforced to wear the helmet

4) The rider can reach hospital as soon as possible in case of accident

B. *Arduino Development Board*

Fig: ARDUINO development board

The Arduino Uno R3 is an ATmega328P microcontroller-based development board. This is widely popular in Embedded electronics because of the available resources and easy to use by everybody features.
With 14 digital input/output pins where 6 can be configured and used as PWM outputs, 6 as analog inputs are a great addition for I/O related operations. Powered with a 16 MHz ceramic resonator, an USB connection, a power jack, an ICSP header, and a reset button. It includes a LED that can be useful in multiple applications or to test the board functionality. A voltage regulator, better to say an LDO, is available inside this development board to make this Arduino compatible for a wide range of input voltages. The application is very easy, just upload the code, and run.

C. MQ2 Sensor

Fig: MQ2 Alcohol sensor

It is one of the most accurate and mostly used alcohol sensor. This sensor can detect the presence of alcohol up to a range of 2 meters thereby making the detection process much accurate. Also, the sensitivity can be adjusted according to needs, making the sensor more versatile.

D. 16X2 LCD Display

Fig: 16 x 2 LCD

A 16X2 LCD is a device which is used for displaying any message in the form of text and numbers. They can be easily programmed and can be used with different microcontrollers. They are preferred over seven segments display due to the ease of their use and convenience. A 16X2 LCD has 2 registers, command and data. Command registers store the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. Data registers store the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. In our project, LCD plays a very important role of displaying information related to the current status of the system.

E. SIM 800L GSM/GPRS Module

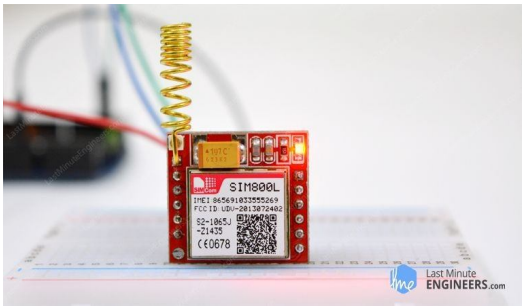

Fig: GSM SIM 800L module

SIM 800L Modem can work with any GSM network operator SIM card just like a mobile phone with its own unique phone number. SIM 800L GSM/GPRS modem is plug and play modem without need of RS232 serial communication supported. Applications like SMS Control, data transfer, remote control and logging can be developed. SIM 800L modem supports features like voice call, SMS, Data/Fax, GPRS etc. SIM 800L modem uses AT commands to work with supported features. Note that to be connected to a cellular network, the modem requires a SIM card provided by a network provider.

F. Buzzer

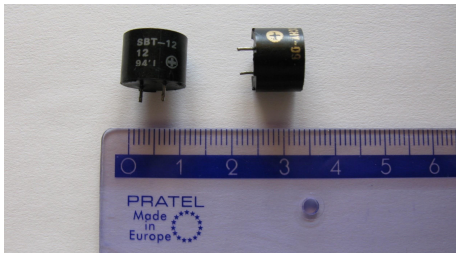

Fig: Buzzer

A buzzer is used in the system to alert the people nearby so that they can analyse the situation and take necessary action accordingly. The buzzer is connected via driver IC to Port 0.3 and 0.4 of the development board. It gets activated whenever alcohol is detected by the MQ3 sensor. It's frequency and tone can be changed and used according to the requirements. Hence, it is an easy and cheap way to alert people and grab attention to point out that something is wrong. The motor and the buzzer are connected to L293D driver IC. It controls the working of these components based on the voltage that they receive.

G. GPS NEO 6MV2

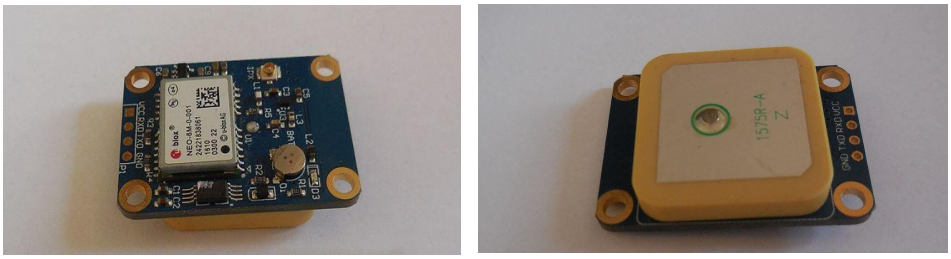

Fig: GPS module

The NEO-6MV2 is a stand-alone GPS (Global Positioning System) module featuring a high-performance 50 channel U-Blox 6 positioning engine. The NEO6MV2 GPS module checks for location on Earth and provides the Latitude and Longitude of the position it is in. This is a low-cost module with a detachable antenna, which also comes with a logic level converter and a voltage regulator, which makes it compatible with both 5V and 3.3V powered boards like Arduino Uno, Mega, Pro Mini, etc. It can be used in the Navigation Systems of Smartphones and Tablets, Drones, in location-based services, etc.

H. MEMS Sensor

Fig: MEMS Sensor

MEMS is a chip-based technology, known as a Micro Electro-Mechanical System. Sensors are composed of a suspended mass between a pair of capacitive plates. When tilt is applied to the sensor, the suspended mass creates a difference in electric potential. The difference is measured as a change in capacitance.

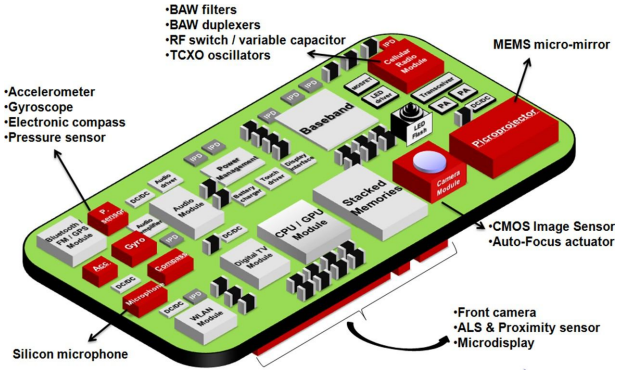

Fig: MEMS Sensor

I. Flowchart

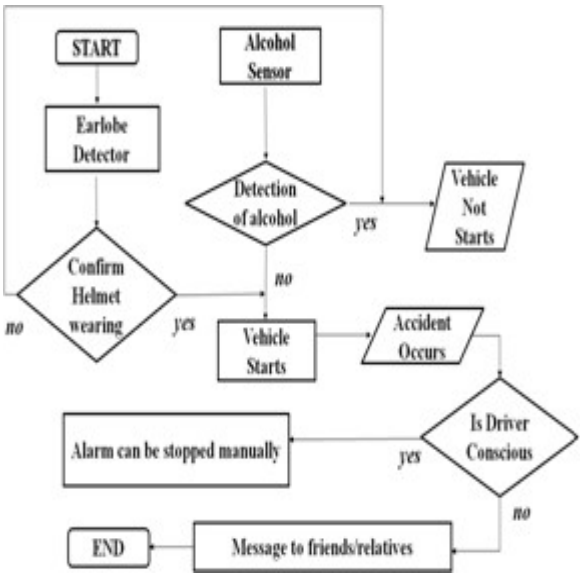

Fig: Flow chart

J. Advantages

1) It will help to reduce the number of road accidents which are very frequent in a country like India where the traffic is very high.
2) It will help to create awareness about the need to wear helmet during bike riding.
3) The system will ensure that the motorbike will not start unless the rider is wearing a helmet and has not consumed alcohol. Also GSM & GPS technologies are used to inform the family members in case of an accident.

K. Applications

1) The system will ensure that the motorbike will not start unless the rider is wearing a helmet and has not consumed alcohol. Hence safety of person is ensured.
2) Also, GSM technology is used to inform the family members in case of an accident. This project could be highly developed with upcoming technologies to provide further more safety and security to the vehicle systems.
3) In future if all the bike manufacturing companies include this system on each bike before the sell, accident rates will drastically all down.

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IV. RESULT

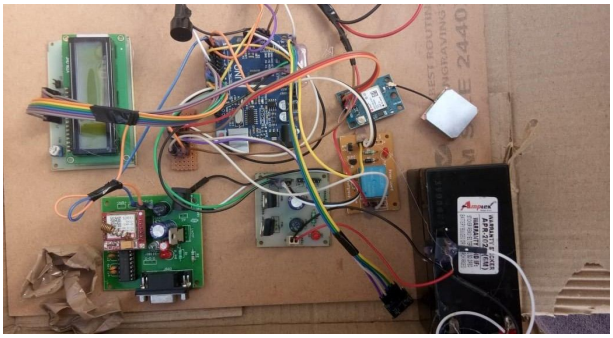

Fig: Real time execution

Whenever a drunk person tries to take control of vehicle, the alcohol sensor will detect the presence of alcohol and if presence of alcohol is detected by the sensor, it will shut down the bike ignition system and sound an alarm and incase of accident thereby alerting the nearby people and a message will be sent via GSM to specified mobile number with location using GPS.

Fig: Helmet Detection

Fig: Accident Detection

Fig: Accident Detection

The LCD screen present in the bike will display “Alcohol Detected” so that people are aware of the situation and hence can take the necessary action that may be required. Therefore, by using this system on a bike, any kind of loss of life or damage to property can be avoided. Simulation of the system has been done in Proteus software. All the components have been tested and connected as required thereby providing us with the desired result as shown in the above image.

V. CONCLUSION

This system was designed majorly to avoid motor bike accident. The accidents are increased majorly due to absence of helmet or the usage of alcoholic drinks so the major objective of this system is to develop an electronic smart helmet system. This system sequentially checking the helmet wearing and drunken driving.

By implementing this system, we can reduce head injuries occur offend. It helps the driver to control vehicle easily. And it is most economical and easy to use. So it has good social aspects authority. A prevention with advanced helmet is better than unfortunate incident.In case of unfortunate fall, shall inform the concerned.

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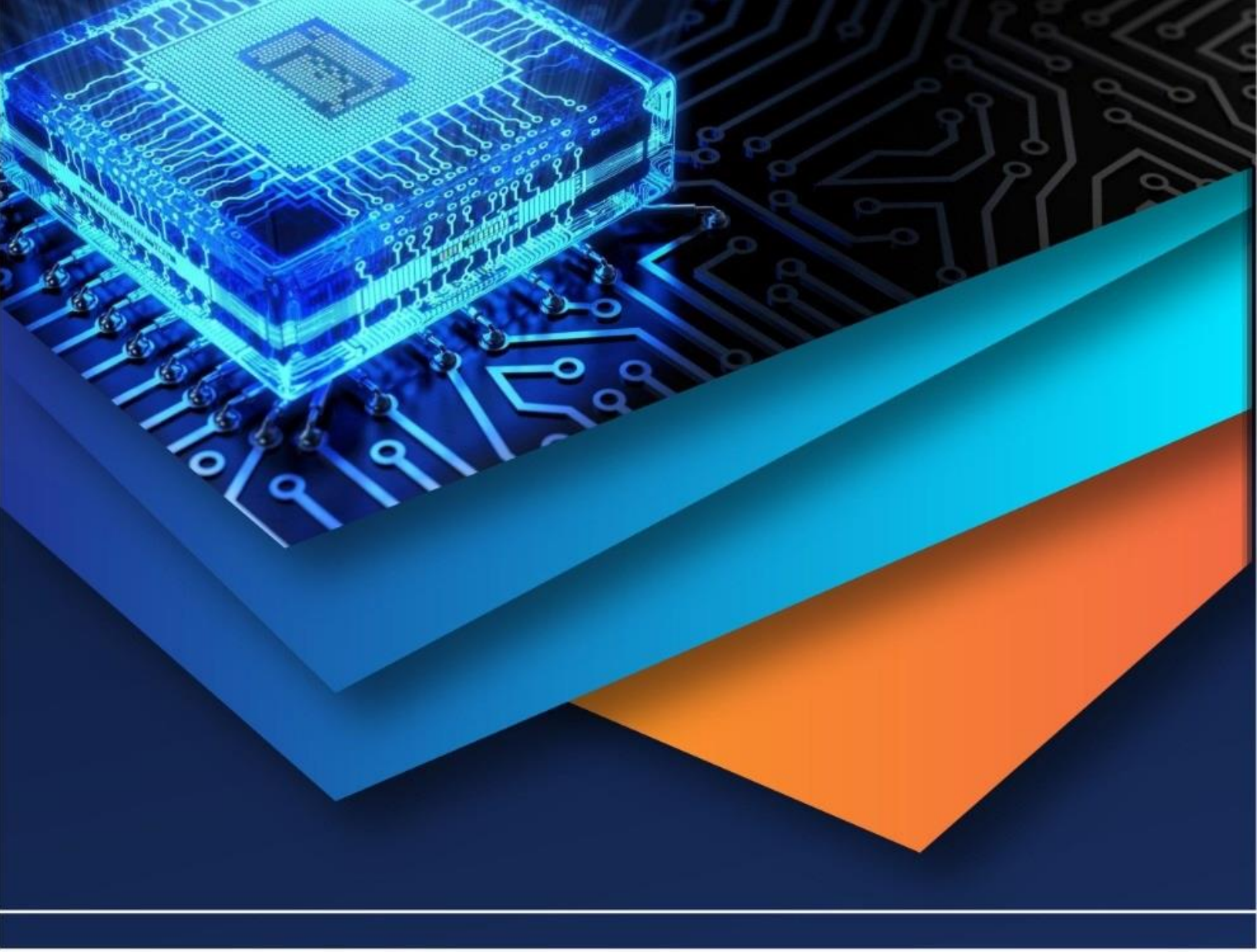

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