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Advanced Security System for Bike Rider's Safety

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ABSTRACT: Now a days majority of accidents are due to drunk and drive and careless rash driving which is leading to severe injuries or even death. One of the main reasons for such an impact of accidents is not wearing helmet. The existing solution for this problem is random check-ups by policemen using breathe analysers and government has enacted some laws in order to make helmet mandatory for a bike rider etc. But, this is not sufficient to provide safety to the rider. So, we have taken the above problem into consideration. Our basic idea is to make the helmet as a key to start the bike i.e. the bike would not start without both the key and the helmet. We have implemented a complete automated solution for wearing the helmet and to detect the alcohol taken by the rider and to control the speed if the bike enters any cautionary areas. In this, we have attached a small wireless transmitter operating at 433MHz frequency within the helmet. The sensors attached to the helmet continuously monitor the alcohol levels. The data is transferred to the receiver mounted on the bike. The receiver continuously tracks the transmitter and if anything goes wrong it turns off the bike and gives an alarm and subsequently sends SMS to the registered numbers (parents, etc.) along with GPS location coordinates. It is a preventive security measure for avoiding the fatality caused due to accidents for riders as well as general public. This project is constructed using AT89C52 microcontroller, SIM900 GSM module, 433MHz RF transmitter and receiver, HT12E and HT12D RF encoder and decoder and other power supply components.

KEYWORDS: Rider's safety, AT89C52 microcontroller, alcohol detection, speed control.

I. INTRODUCTION

Accidents have become order of a day. Despite of many efforts taken by different government and non-government organizations all around the world by conducting various awareness programs against careless driving, yet accidents are taking place every now and then. So, we have come up with this idea of safety system. It may not prevent the occurrence of accidents, but it could reduce the severity caused due to them.

II. RELATED WORK

This is not a new idea. We have referred various papers to know more about the concept. The present existing systems include helmet authentication system, alcohol detection systems and accident identification systems each one separately. And these systems are very expensive and have heavy infrastructure as they use two microcontrollers-one in helmet unit and other one in bike unit. They have also used different sensors like temperature sensor, force resisting sensor etc., for implementing helmet authentication feature. Their frame work model used a DPDT electromechanical relay and hence there is some time lag in wearing the helmet and switching on the circuit. This makes the entire system complicated. However, in our proposed system we have deployed low cost and high performance components to implement various features.

In this paper we have put forth a system which helps in reducing the impact caused due to accidents. It consists of four features. The first one is to identify whether the helmet is worn or not. If the helmet is worn then ignition will start. Otherwise, it will be off condition. The second one is alcohol detection. If the alcohol content is above a permissible level the ignition will be turned off and message will be sent to registered numbers. The third one is that when an accident occurs, the system will send the accident location acquired from the GPS utilizing the GSM network. The

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fourth feature is speed control. If the bike enters any sensitive areas like schools, centres etc., the speed will be automatically reduced to a predefined limit.

III.PROPOSED METHODLOGY AND DISCUSSION

This system consists of following sections:

1. Transmitter section
   - i) RF transmitter section
   - ii) IR transmitter section
2. Receiver section

The RF transmitter section is placed in the helmet and IR transmitter is placed near the cautionary areas. The RF receiver will be mounted on the bike.

1. Transmitter section:

i) RF transmitter section:

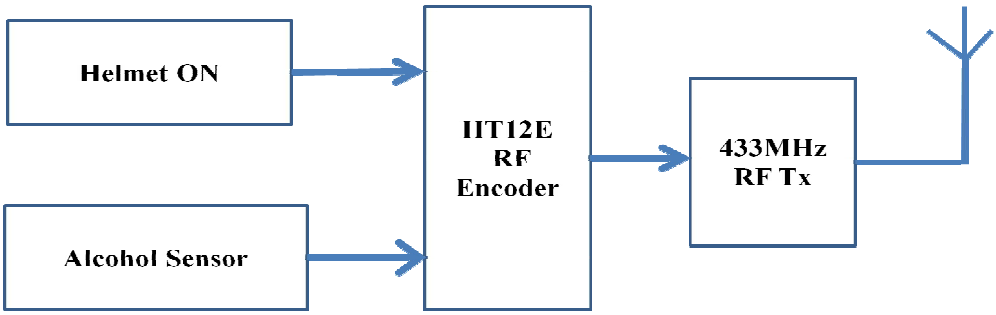

Fig.1 (a): Block diagram of RF transmitter part

The signals from push button and alcohol sensor are sent to the HT12E IC. When the encoder receives the parallel data in the form of address and data bits, it encodes those signals into serial bits. The serial data is then fed to the 433MHz RF transmitter.

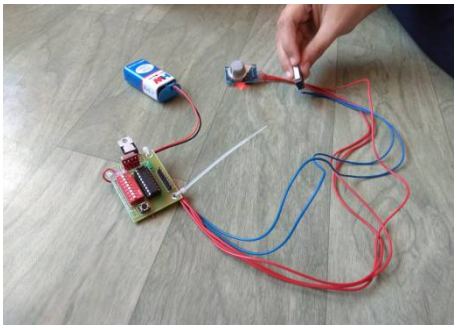

Fig.1 (b): Transmitter proposed model

As shown in the figure 1(b), the RF transmitter section consists of push button, alcohol sensor, HT12E encoder and 433MHz RF transmitter. First, it checks for the input from push button. If it is '1' then it checks for second condition i.e. alcohol detection. When both the conditions are satisfied the ignition will be turned on.

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ii) IR transmitter section:

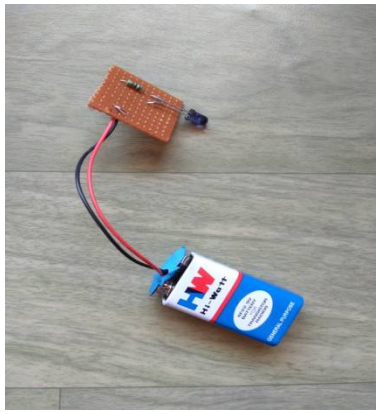

Fig.2: IR transmitter part

This section is used for implementing speed control feature. This should be placed in areas where speed of bike should be reduced. It consists of an infrared LED which is in series with 1K ohm resistor and a battery is connected across its terminals.

2. Receiver section:

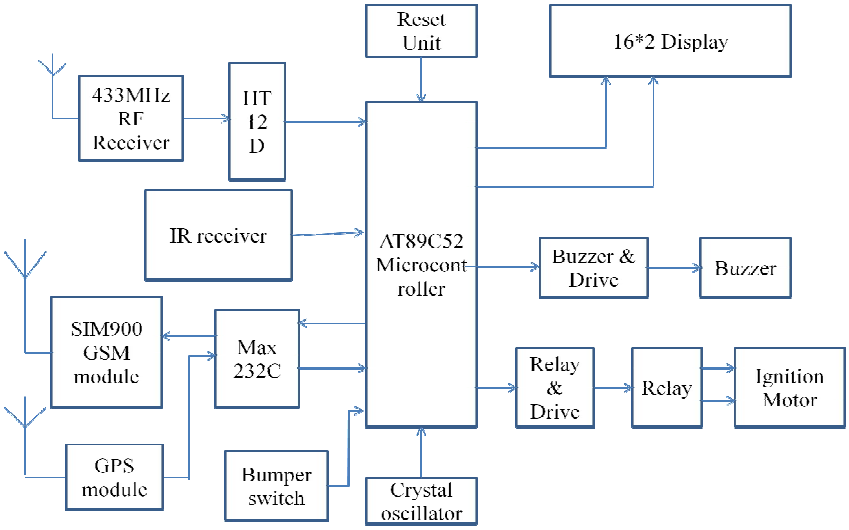

Fig.3 (a): Block diagram of receiver part

In this system AT89C52 microcontroller is used. When the system is switched on, LED will be turned ON indicating that power is supplied to the circuit. The RF communication acts as a medium between helmet unit and bike unit. In case, if the rider didn't wear the helmet, the bike will not start and intimate the rider to wear the helmet by displaying "Wear helmet to start bike" on LCD. In normal condition, when the helmet is worn the push button gets pressed and sends signal to the RF transmitter and then it checks whether the driver is drunken or not by using MQ-135 alcohol sensor. If drunken, it will not allow to start the bike and displays the message "Alcohol detected, ignition off" on the LCD and SMS will be sent. If not, it will send signal to the RF transmitter and then it radiates the ASK modulated signal.

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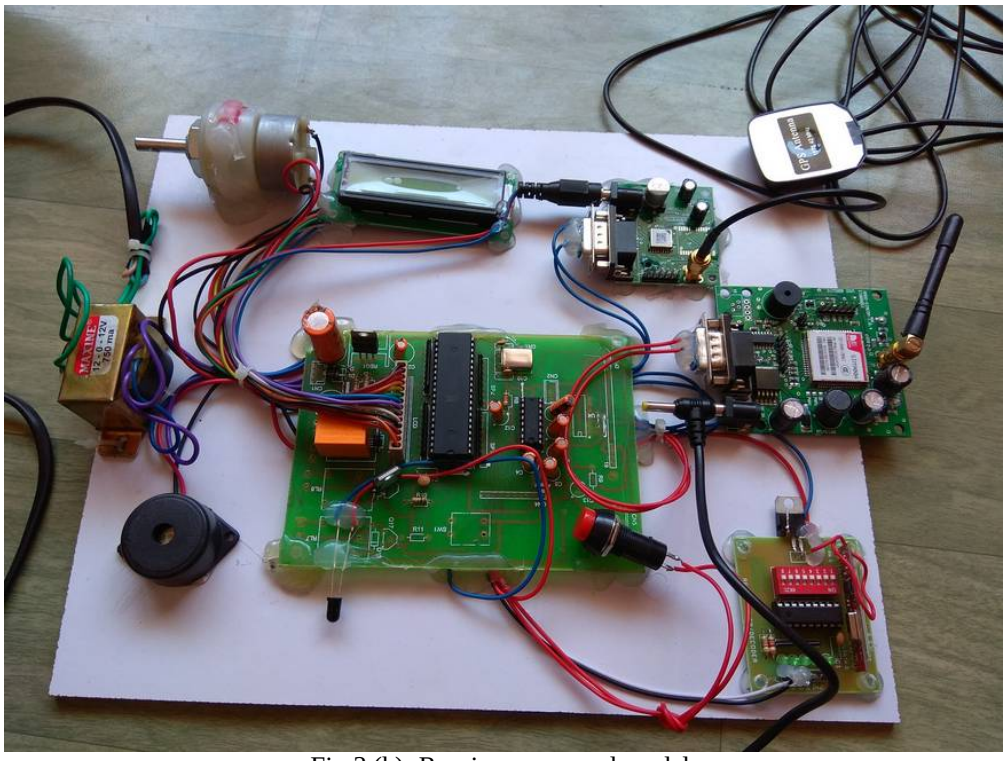

Fig.3 (b): Receiver proposed model

The RF receiver (as shown in figure 3(b)) is mounted on the bike. It receives the radiated signal and activates the relay. The relay removes the ignition wire from the ground and connects it with the starter switch to start the bike. When the accident occurs the bumper switch sends signal to the microcontroller. The GPS receiver receives the location of the vehicle that met with the accident and gives the information back. This information will be sent to a mobile number through a message using GSM network. The message will give the information of longitude and latitude values. Using these values the position of the vehicle can be estimated. To run the GPS and GSM modules 12V is required and to operate microcontroller 5V is required. So MAX232C a voltage level shifter is interfaced between the two. Now the question is that when accident occurs, how will the microcontroller detect the accident? This is done by using a bumper switch which is placed in the receiver part. When the bike crashes, it hits the ground and the bumper switch gets pressed and sends signal to the microcontroller. Upon receiving the signal, the microcontroller detects that accident has occurred and it will send an SMS containing information about the accident and location of accident.

If the bike enters any sensitive zones, the IR receiver fixed in the receiver part detects the radiated IR signal transmitted from the IR transmitter. Then the speed will be reduced to a predefined limit.

Here, in our project we have placed a stepper motor instead of bike for demonstration purpose.

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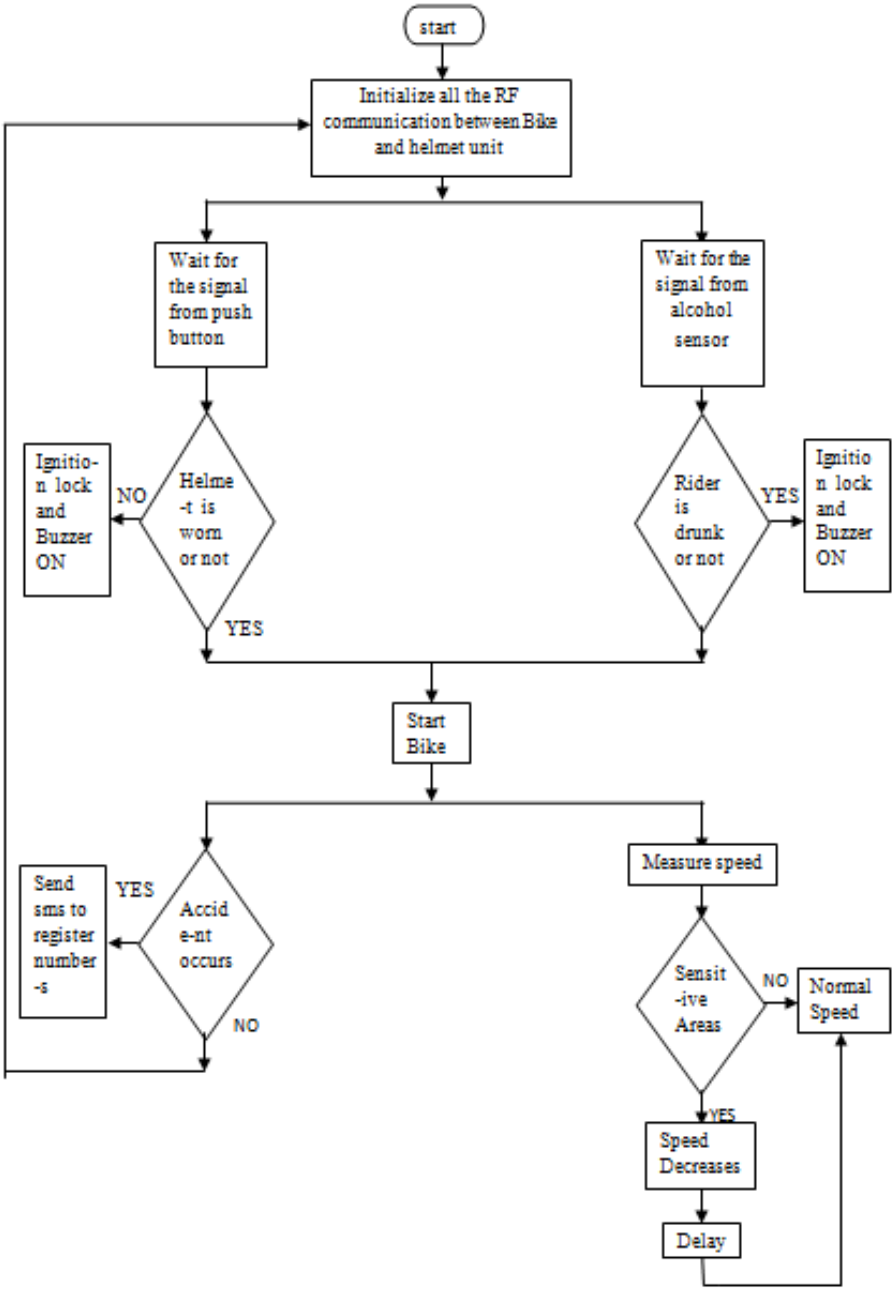
FLOWCHART:



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IV.RESULTS

Fig.4: When the bike is started, it will display the title of our project "Advanced security system for bike rider's safety".

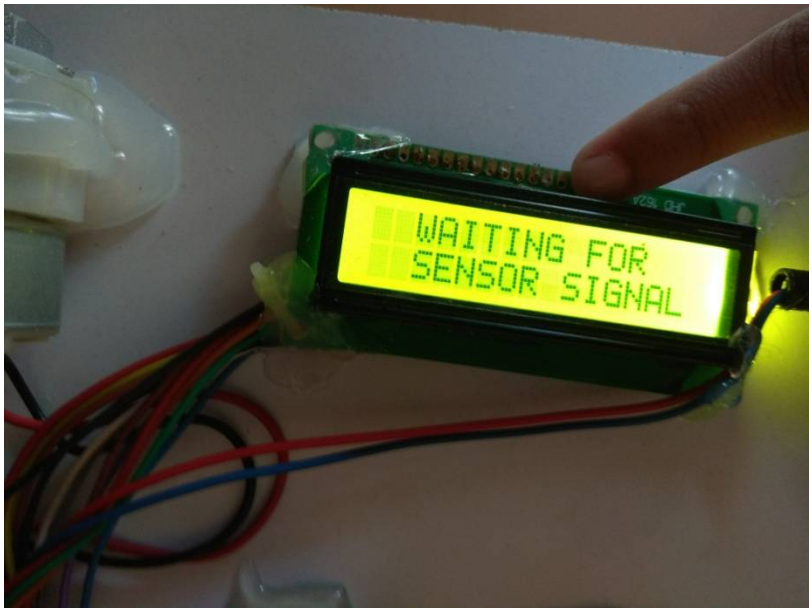

Fig.5: Then it waits for the signal from the push button and the alcohol sensor.

Meanwhile, the signals from push button and alcohol sensor are sent to the encoder. It then encodes the obtained information and sends it to the transmitter. The receiver readily receives the information and the action is performed accordingly.

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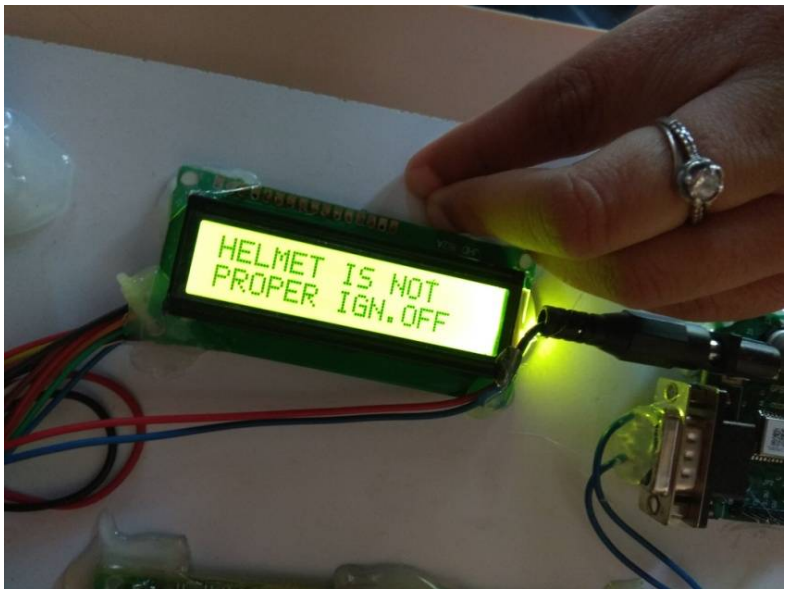

Fig.6: The bike won't start till the rider puts on the helmet. So, it will remind the rider by displaying the message "Helmet is not proper ignition off".

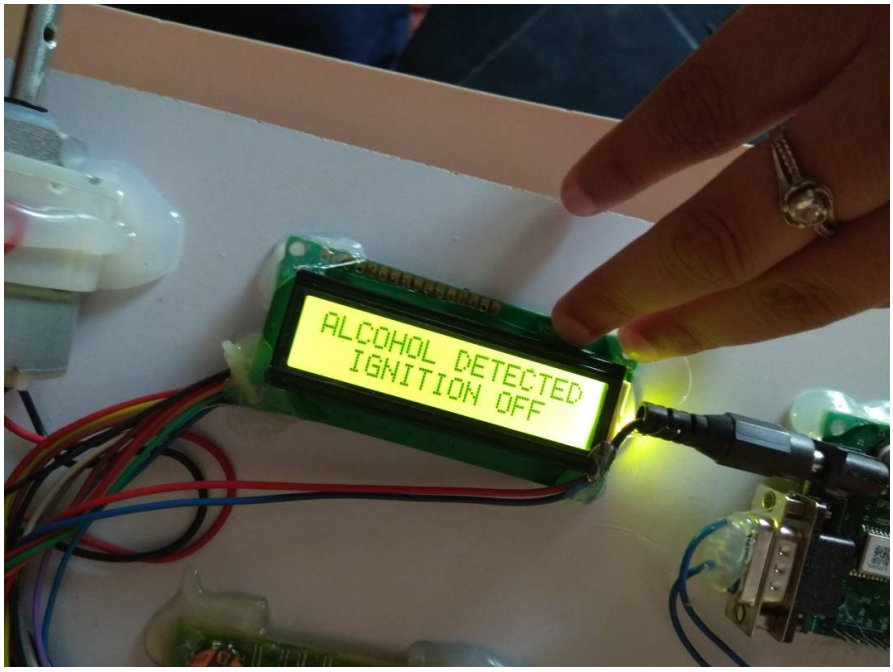

Fig.7: If alcohol level in the rider's breath is above the limit, then it will display the message "Alcohol detected- Ignition off" and then turns off the ignition.

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Fig.8 (a): When the accident occurs it will display that "Acc. Occurred Ignition off" and the sends the message to selected numbers.

Fig.8 (b): Screenshot of alert message

As shown in figure 8(b) the alert message contains latitude and longitude coordinates obtained from GPS system. Using satellites in the sky, ground stations allow the GPS receiver to know where the accident has taken place, in terms of latitude and longitude, on the earth.

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Fig.9: When bike enters sensitive areas it will display "Sensitive zone detected-Go slow" on LCD.

V.CONCLUSION

This security system provides better safety to the rider and helps to reduce the impact caused due to road accidents to some extent. There are cases where people who met with accidents had died just because they didn't wear helmet and also due to late medical help. In such cases, this system proves to be very helpful as proper action and medication could be provided to the victim without any delay. If this is implemented on a broad scale, at least half of the lives that are lost due to bike accidents could be saved.

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