EMBEDDED SYSTEM CONTROLLED SMART VEHICLE

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ABSTRACT---This project minimizes the risk of accident by using intelligent system which takes corresponding steps. Initially the system inside the vehicle checks whether the person has placed the helmet on his head or not. If the person had placed the helmet then the system checks for the presence of alcohol. While riding if there is any violation then the system intimates the control room. In case of an accident, the intelligence system sends the location details and a message to the pre-defined mobile number. The eye blink sensor detects the continuous inactivity of eyelids and sounds the buzzer accordingly.

KEYWORDS---Atmel, sensors, RF transmitter and receiver, relay, DC motor.

I. INTRODUCTION

Road traffic crashes are one of the world's largest public health and injury prevention problems. According to the World Health Organization (WHO), more than a million people are killed in road accidents. Each year all over the world, there are thousands of highway deaths and tens of thousands of serious injuries due to Run-Off-Road accidents. Everything from simple driver inattentiveness, to fatigue, callousness, to drunk driving is responsible. This project gives the idea to prevent accident in the early stage and present a practical road safety measure for the user to prevent them from the accident using the various sensing application. To prevent or to reduce these road accidents we introduce the SMART VEHICLE. This project aims to increase the rate of road safety among people and to reduce the increasing number of fatal road accidents over the years. It also reduces the road accidents caused due to alcohol consumption. The motorcyclist cannot start the vehicle unless helmet is worn. Alcohol sensor senses if the driver has drunk. The ignition turns on only when alcohol test is negative and helmet sensor result is positive. When an accident occurs, the information will be passed to concerning officials and individuals through mobile SMS. Using DTMF technology we able to control the speed of the vehicle when the driver violates the specified speed in the particular region. They also able to locate the accident location through the GPS technology. The eye blink sensor detects the continuous inactivity of eyelids and sounds the buzzer accordingly.

II. RELATED WORK

There is huge amount of work in progress in the implementation of add-on interaction systems for road vehicles especially motorcycles. Several road accident alerting methods are proposed but still problem persists.

Mohammed Khairul Afiq Mohd Rasli implemented a "Smart Helmet with Sensors for Accident Prevention". When a motorcyclist involves in a high speed accident without wearing a helmet is very dangerous and can cause fatality. Wearing a helmet can reduce shock from the impact and may save a life. There are many countries enforcing a regulation that requires the motorcycle's rider to wear a helmet when riding on their motorcycle, Malaysia is an example. With this reason, this project is specially developed as to improve the safety of the motorcycle's rider. Motorcyclist will be alarmed when the speed limit is exceeded. A Force Sensing Resistor (FSR) and BLDC Fan are used for detection of the rider's head and detection of motorcycle's speed respectively. A 315 MHz Radio Frequency Module as wireless link which able to communicate between transmitter circuit and receiver circuit. PIC16F84a is a microcontroller to control the entire component in the system. Only when the rider buckled the helmet then only the motorcycle's engine will start. A LED will flash if the motor speed exceeds 100 km/hour [1].

D Aneesh Alocious implemented an "Embedded System Controlled Smart Bike". The system minimizes the risk of accident and if any accident happens then this intelligence system takes corresponding steps. This system follow some steps before the rider start his journey. Initially the system inside the bike check whether the rider placed helmet on his head or not, if he had placed helmet then the system checks for the presence of alcohol presence in the drivers exhaling air. If both conditions are met then only the bike will start. While riding, the system continuously records the speed of the vehicle and this recorded value, is accessible through the serial port of the system which can be useful for the police men to identify whether the vehicle had violated the rules or not. If any accident occurs then the intelligence system

sends the location details to the nearby police station as well as nearby hospital for the emergency service. Along with this, the system also sends a message about the incident to pre-defined mobile number as well [2].

Manivanan implemented a "Wireless Accident Information System Using GSM and GPS". A Smart Display and Control which will monitor the zone and maintains the specified speed in the zone levels. The system includes three modules automatic speed control module, accident detection and information sending module. Automatic speed control module includes RF transmitter placed in specific location and RF receiver in the vehicle. Security enabling module includes sensory units which ensures the condition of helmet and the driver. This module includes alcohol sensor and Accident detection module [3].

S Boopathi implemented a system "Real time based smart vehicle monitoring and alert using GSM" that senses any accident in the vehicle and intimates pre-programmed numbers like the owner of the vehicle, ambulance and police. The GSM technology is used to send the position of the vehicle to the pre-defined numbers. When a car meets with an accident, the GPS technology sends the location of the car to the nearby hospital [4].

S AnilBabu implemented "Helmet detection system". The impact of accidents are further more in dune buggy ,specifically when the driver involves in a high speed accident without wearing a helmet. Wearing helmet can reduce shock from the impact and may save a life. The aim of this research work is development of smart helmet detection system Driver will be unable to start vehicle without wearing helmet. An ultrasonic sensor HC/SR04 was used for detecting the driver helmet, ATmega328 microcontroller to control the entire safety system. The technology connects the drivers with the Ignition system. If the driver's helmet is removed after starting off vehicle, the control unit will disengage the power input to the ignition switch after 30 seconds resulting in halt position [5].

Anusha Singh Guatam designed "A Smart Helmet System". A GSM Based Smart-Helmet can be introduced as an intelligent system, which checks whether the person is wearing the helmet and has a non- alcoholic breath before driving. If any of these conditions are not met, the bike does not start. A transmitter on Smart-Helmet generates a signal on the basis of two mentioned conditions with the help of a switch and an alcohol sensor and then sends it to the receiver on the bike through the RF transmitter. In case alcohol is detected the GSM module attached to the receiving unit sends message to a registered mobile number [6].

III. PROPOSED SYSTEM

The proposed system is Embedded System Controlled Smart Vehicle. The system ensures the safety of the vehicle drivers by making it necessary to wear the helmet or seat belt along with alcohol detection, if the driver consumed over a specified amount as per the Government guidelines. Using the sensing technology, the vibration of the vehicle is monitored regularly and if the accident occurs a intimation is sent as message to a predefined mobile number through the GSM and location of the vehicle is tracked through the GPS. The drowsiness of the driver is continuously sensed and stops the vehicle if the eye blink of the driver is closed permanently. The vehicle speed is regulated in a particular zone and prohibition of horn is made possible.

1. Vehicle Section Module
2. Road Section Module

The vehicle section includes the sensing parts of the vehicle drivers and the road section includes the speed regulation part.

IV. SYSTEM DESIGN

The system design includes two parts: Vehicle and Road section.

A. VEHICLE SECTION

The Figure 1 consists of microcontroller, IR sensor, vibration sensor, gas sensor, DTMF, RF transmitter, eye blink sensor, GSM and GPS, switch and buzzer.

AT89S52 is a microcontroller is the control unit in the system. It reads all the analog values from all the sensors and it make possible to achieve the threshold level set for the sensors.

The eye blink sensor detects the drowsiness of the driver and when the driver the closed his eyes the vehicle is stopped.

The IR sensor which indicates the presence of helmet or seat belt and if the driver is consumed alcohol above the threshold limit set then the vehicle will be unable to start for certain duration and is achieved through the relay provided.

Since the vehicle is continuously monitored , when the accident occurs and the vibration exceeds the threshold limit, then the message is sent to the predefined mobile number set in the GSM module and the location is easily tracked through the longitude and latitude provided by the GPS module.

The communication between the vehicle and road section is achieved through the RF transmitter and receiver. The transmitter is fitted on the sign boards

on the roadways will transmits the desired signal and the receiver in the vehicle part will decode it and gives as the input to the microcontroller. Based on the signal, the speed of the vehicle is regulated and the horn is prohibited.
Dual Tone Multiple Frequency (DTMF) is used control the transmitted signal through phone using different codes for different transmitters
.

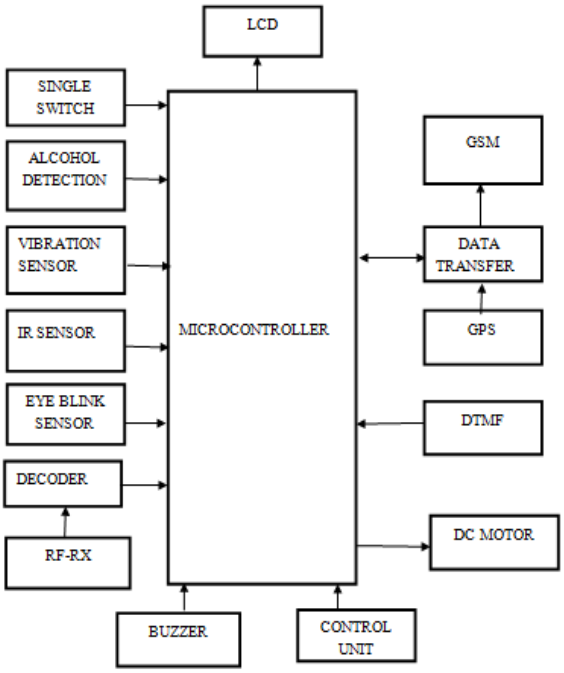

Figure 1-- Vehicle Section

B. ROAD SECTION

The Figure 2 consists of RF receiver, encoder, relay and power supply.
A step down transformer is used to step down the voltage from 230V to 12V and is converted into DC power using the bridge rectifier circuit.
The RF transmitter will transmits the signal from the sign boards in different roads and the signal is given to the receiver part and the signal is transmitted in the encoded form and it will be decoded latter.
In the RF-TX operation, the conditions are taken as shown in the Figure 2. The vehicle (DC motor) speed is controlled as well the horn is prohibited and switches off in case of red signal is received.
A single button type switch is provided to control the speed of the motor and thus prevents from violating the speed in the particular zone.
A relay is used in order to achieve the different speed as it is connected to DC motor.
Using DTMF the mobile phones are connected and using the binary coding of the numbers by gathering the position of the vehicle through GPS as shown in Figure 1.

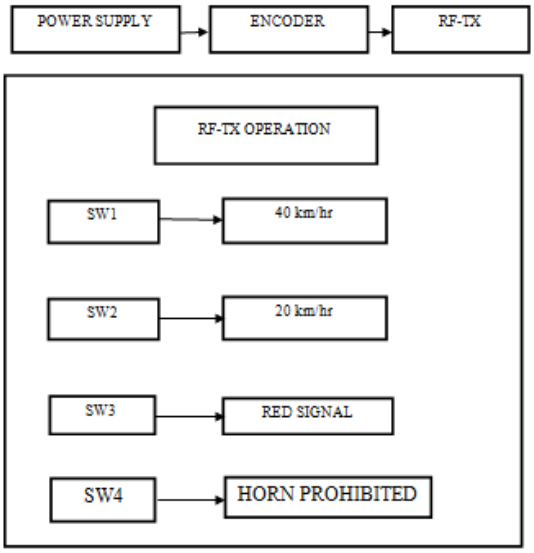

Figure 2 -- Road Section

V. SYSTEM IMPLEMENTATION

The software and hardware implementation parts of the system are described here.

A. PSEUDOCODE

1. Set the interfaced sensors with the threshold values.
2. Set the speed of the vehicle to be regulated.
3. Check for the presence of alcohol and absence of helmet. If True stops the ignition else proceed.
4. Check the drowsiness of the driver. If true regulate the speed and alert else proceed.
5. If the accident occurs, alert message is sent and location is tracked else go to next step.
6. Check the speed limit. If above the set value, regulate it else continue.

B. SYSTEM WORK FLOW

The flowchart shown in the Figure 3 explains the workflow of the system.
The system has been interfaced with all sensors and the threshold limit is set. The vehicle driver will not be able to start the vehicle when he consumed alcohol or unless he wears the helmet or seat belt. The drowsiness of the driver is checked through the eye blink sensor output is high or low and if low, then the ignition of the vehicle is turned off. When the accident occurs, the vibration sensor will activate and thus alerts by sending the message through the GSM service and the location of the vehicle is tracked through the GPS. The speed of the vehicle is regulated when it exceeds the specified limit in a particular zone and the horn is also prohibited.

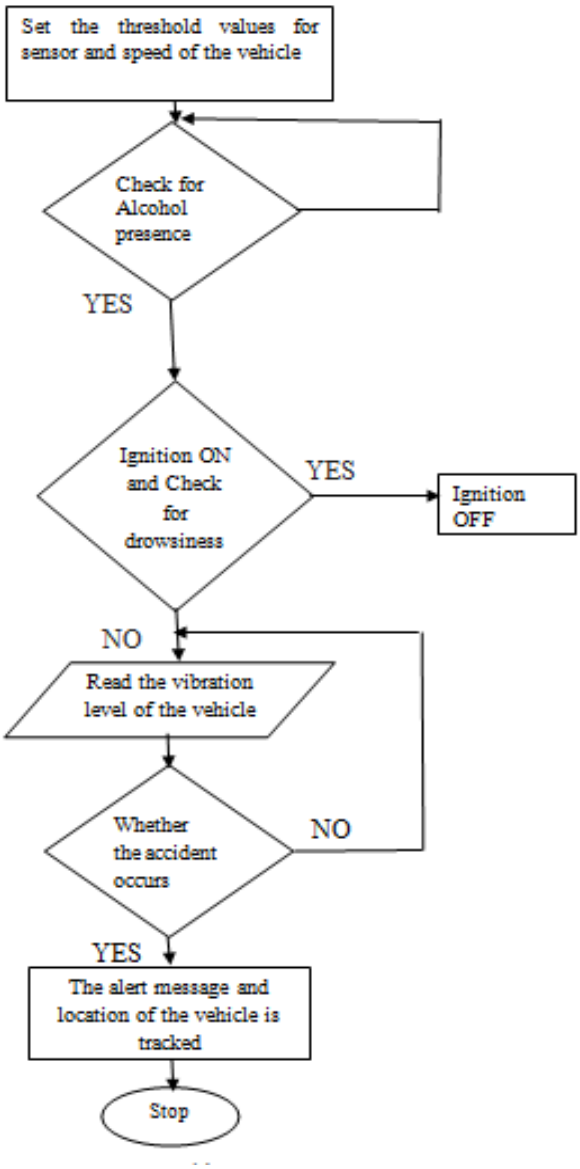

Figure 3-- System Flowchart

C. SAMPLE CODE

```
// GAS SENSOR
int sensorValue;
void setup()
{
  Serial.begin(9600);
}
void loop()
{
  sensorValue = analogRead(0);
  Serial.print(sensorValue, DEC);
  Serial.print(" ");  delay(100);  }
```

The KEIL IDE is used to execute the programs and to check errors and WILLAR software is used to burn the program into microcontroller using microcontroller IC burner.

A. SYSTEM HARDWARE BOARD

The Figure 4 shows the hardware board that consists of all the components fixed in it.

Figure 4-- Hardware Board

VI. EXPERIMENTAL RESULTS

The Figure 5 shows the output of the alcohol and IR sensor, eye blink sensor and vibration

Figure 5-- Sensor Output

The alcohol detection (A) when exceeds above the 50ppm and IR sensor (I) value is increased due to the absence of helmet which is given in the analog value for 5V is 255. The eye blink (E) sensor value remain high (130) and goes to low state (0) and the motor is stopped.

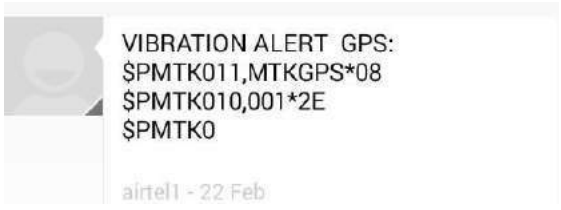

Figure 6-- GPS Location

The vibration level (V) when exceeds 100 in the Figure 5, then the message is sent through the GSM as in Figure 6, which indicates the vibration alert and locates the latitude and longitude along with message sent to the predefined mobile number set by the driver.

Figure 7-- Regulated Speed 1

The speed of the motor can be regulated as displayed in the LCD display in Figure 7 and Figure 8, such that the speed can be varied to 40kmph and 20kmph with the means of relay which accepts the signal from the RF receiver and thus the speed variation is achieved.

Figure 8-- Regulated Speed 2

The Figure 8 depicts the regulated speed of 20kmph of the motor.

Figure 9-- Red Signal

Similarly the motor can be made to stop as when red signal is indicated in the traffic as soon as the signal received from the RF-TX sign boards as in Figure 9.

Figure 10-- No Horn Region

The Figure 10 depicts the disabled mode of horn in the prohibited area.

VII. CONCLUSION

Thus by implementing our system the safety of the vehicle driver is ensured and drunk and drive accident of the vehicle can be prevented. In case of when the accident occurs, the message is sent automatically including the location of the vehicle. Even though the driver feels drowsiness the vehicle is made to stop and if the vehicle speed is violated in the particular zone, the speed of the vehicle can be regulated.

VIII. REFERENCES

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