ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 6, June 2016

Arm 7 Embedded Controllers for Vehicle Obstacle Detection and Safety System

Pooja Kothale[1], Prof. S.M. Kulkarni[2]

Department of ENTC (VLSI & EMB), Genba Sopanrao Moze College of Engineering, Balewadi, Pune, India

Department of ENTC, PVPIT College of Engineering, Bavdhan, Pune, India

ABSTRACT: The main objective of our project is to detect driver's drowsiness when driver is in vehicle to avoid accidents. In this paper our system controls the speed of vehicle to avoid accidents.In case of accidents, the system sends alert message and location (Latitude and Longitude) to the family member of the driver through GSM module through Vibration Sensor and GPS.Here we detect the temperature of engine to avoid accidents through temperature LM 35 sensor. Ultrasonic sensor detects the distance between 2 vehicles on LCD if distance is less than 400 Meter then buzzer will be activated. Currently almost of the public having an own vehicle, accident is happening while in driving. The safety of vehicles is extremely essential for public vehicles. Vehicle security and accident prevention is more challenging. So in order to bring a solution for this problem this system can be implemented. Vehicle security and accident prevention system can be developed through the application.

KEYWORDS: Embedded System, Sensors, Microcontroller, GPS, GSM, Motorsand LCD.

I. INTRODUCTION

Technological approaches for detecting and monitoring fatigue levels of driver continue to emerge and many are now in the development, validation testing, or early implementation stages. Previous studies have reviewed available fatigue detection and prediction technologies and methodologies. As the name indicates, this project is about making cars more intelligent and interactive which may notify or resist user under unacceptable conditions, they may provide critical information of real time situations to rescue or police or owner himself. Driver fatigue resulting from sleep deprivation or sleep disorders is an important factor in the increasing number of accidents on today's roads. In this project, we describe a real-time safety prototype that controls the vehicle speed under driver fatigue. The purpose of such a model is to advance a system to detect fatigue symptoms in drivers and control the speed of vehicle to avoid accidents. We propose a driver drowsiness detection system in which sensor like eye blink sensor are used for detecting drowsiness of driver. If the driver is found to have sleep, vehicle will be stopped and vibration motor will turn on so that the driver could wake up. By using ARM7 this system becomes more efficient, reliable & effective. There are very less number of systems implemented on human behaviour detection in or with cars. In addition to this, the system also includes a vibration sensor that detects accidents and an SMS alert is sent to the registered mobile number. The purpose of such a model is to advance a system to detect fatigue symptoms in drivers and control the speed of vehicle to avoid accidents. The main components of the system consist of number of real time sensors like eye blink, Temperature, Vibration sensors, ultrasonic range finder sensor with software interface.

II. OBJECTIVES

1. The main objective of our model is to detectdriver's drowsiness when driver is in vehicle to avoid accidents.
2. To control the speed of vehicle to avoid accidents.
3. In case of accidents, the system sends alert message and location (Latitude and Longitude) to the family member of the driver through GSM module through Vibration Sensor and GPS.
4. To detect the temperature of engine to avoid accidents through temperature LM 35 sensor.
5. Ultrasonic sensor detects the distance between 2 vehicles on LCD if distance is less than 400 Meter then buzzer will be activated.

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III. RELATED WORK

[1] M. Abinaya "Intelligent Vehicle Control Using Wireless Embedded System in Transportation System Based On GSM and GPS Technology" IJCSMC, Vol. 3, Issue. 9, September 2014, pg.244 – 258

The safety issue of level crossings has been concerned persistently in our society. Several function requirements such as high detection probability, low false alarm rate and short warning latency should be taken into account in order for precise and reliable detection at level crossings. In this paper, modern technologies, including Lidar and digital wireless image transmission, are used in a safety control system. The Lidar is an acronym for "LIght Detection And Ranging", or for "Laser Imaging, Detection and Ranging". When an obstacle intrudes the level crossing and is detected by the high resolution Lidar sensor, the real-time images from surveillance cameras will be transmitted through wireless channel to the receiver installed at drive's cab on the incoming train. Therefore, the driver of the train can judge if the train has to be stopped immediately or just slowed down. Two important modules, the Lidar sensor and the wireless transmitter will dominate the performance figures of this system. To validate the detection capability in the practical situations, several testing scenarios were conducted, including various obstacles such as bicycles, motorcycles, vehicles, and different weather conditions, such as sunny day and rainy day. Furthermore, field tests are also done by installing the system at a real level crossing. The result shows that the transmission time of streaming images is less than three seconds, which proves the feasibility of our design.

[2] Ho-Hsing Hsieh, Chi-Yao Hsu, Po-Yu Ke "Appling Lidar-Based Obstacle Detection and Wireless Image Transmission System for Improving Safety at Level Crossings" 49th IEEE International Conference

Autonomous dump trucks Suncor Energy will try Komatsu's Autonomous Haulage System (AHS) in the mining industry in northern Canada. Each autonomous dump truck is equipped with vehicle controllers, a high-precision global positioning system (GPS), an obstacle detection system, and a wireless network system. These features allow the dump truck to safely operate though a complex load, haul, and dump cycle and to integrate with the dozers, loaders, and shovels that are also part of the autonomous system. Komatsu claims that AHS reduces the number of drivers working in hostileand remote conditions, increasessafety on mine sites, reduces operating costs, increases productivity and efficiency, and reduces fuel consumption and emissions.

[3] Elisabeth Uhlemann "Active Safety Vehicles Evolving toward Automated Driving" IEEE vehicular technology magazine | december 2015.

In this paper we present a vehicle safety method for reversing speed control based on obstacle detection and sparse representation. The proposed system consists of three main steps, namely, binocular camera obstacle detection and segmentation, obstacle tracking and recognition, and vehicle reversing speed control algorithm. First of all, a binocular camera system is used to detect obstacles as a vehicle is reversing. Using disparity computation and triangulation, we can get all objects' distance information in the rear of a vehicle. Second, the framework of particle filter and sparse representation are used to track and identify the main obstacles such as human or animal bodies, vehicles, or any other objects. Finally, the vehicle reversing speed control algorithm, which controls the electronic throttle opening and automatic braking prior to collisions, makes the reversing control safer and more reliable. This system has been field tested on a Dodge sport utility vehicle by which the final performance evaluation demonstrates the validity of the proposed vehicle reversing speed control.

[4] Zutao Zhang, Member" A Novel Vehicle Reversing Speed Control Based on Obstacle Detection and Sparse Representation" IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS 2014

Human life is more valuable than anything else, timely help is more important than lending a helping hand. In during accidents, people lose their lives due to delay of proper medical facilities at the right time. This proposed system senses any accident in the vehicle and intimates pre-programmed numbers like the owner of the vehicle, ambulance, police

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International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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etc. The GSM technology is used to send the position of the vehicle as a SMS to those numbers and the position of the vehicle can be obtained by the owner of the vehicle and also only car meet with in accident but
human life is safe so there is no needed emergency at the place in proposed method, we are using small switching function(reset) for disconnecting the signal and when a car meets an accident ,wait for some mines and immediately the car and the GPS co-ordinate of the location are messaged to the nearby hospitals ,thereby ensuring timely help to the needy.

[5] S.Boopathi1, K.Govindaraju "REAL TIME BASED SMART VEHICLE MONITORING AND ALERT USING GSM" International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 11, November 2014

Unifying the Global Positioning system technology this article designs and realizes one kind of embedded wireless system named intelligent vehicle control for critical remote location application using ARM 7 microcontroller from the hardware and software. In terms of the hardware completed the design and connection of ARM embedded system, GPS module, obstacle testing module, different parameter monitoring sensor modules and the GSM module. The system can achieve the purpose of long distance real time monitoring and control of vehicle. The executive results of laboratory tests show that the system fulfils real time control and functional parameter monitoring of a vehicle.

[6] Sawant Supriya C "An Intelligent Vehicle Control and Monitoring Using Arm" International Journal of Engineering and Innovative Technology (IJEIT) Volume 2, Issue 4, October 2012

Technological approaches for detecting and monitoring fatigue levels of driver fatigue continue to emerge and many are now in the development, validation testing, or early implementation stages. Previous studies have reviewed available fatigue detection and prediction technologies and methodologies. As the name indicates this project is about advanced technologies in cars for making it more intelligent and interactive for avoiding accidents on roads. By using ARM7 this system becomes more efficient, reliable & effective. There are very less number of systems implemented on human behaviour detection in or with cars. In this paper, we describe a real-time online safety prototype that controls the vehicle speed under driver fatigue. The purpose of such a model is to advance a system to detect fatigue symptoms in drivers and control the speed of vehicle to avoid accidents. The main components of thesystem consist of number of real time sensors like gas, eye blink, alcohol, fuel, impact sensors and a software interface with GPS and Google Maps APIs for location.

[7] S.P. Bhumkar" ACCIDENT AVOIDANCE AND DETECTION ON HIGHWAYS" International Journal of Engineering Trends and Technology- Volume3Issue2- 2012

Automotive Electronics sector is now a day's becoming more in demand due to its increasingtechnology. Most of luxurious cars consist of automatic controls for different parameters present in the car surrounding. As more and more applications are available of on-vehicle information system, the connection between the vehicle bus network and information system is becoming a trend. Basically in automobile industries CAN protocol is used for communication. The proposed system presents the development and implementation of a digital driving system for a semi-autonomous vehicle to improve the driver-vehicle interface. The system is able to monitor Road lane violation, Drowsiness and Alcohol with the help of camera and sensors. The main objective of the system is to provide safety and to avoid road accidents. The system uses two ARM controllers i.e. Master for detection and Slave for controlling the parameters. The use of CAN protocol is used for communication between ARM controllers. A model is developed on which camera is mounted for lane detection, Sensor for alcohol and drowsiness detection and a GSM and GPS modulesare mounted for tracking purpose. Whenever the lane is departed a warning is displayed to driver. A tracking system is also used to keep the track, which uses a GPS module. These detected data by controllers is displayed on the PC.

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Vol. 5, Issue 6, June 2016

[8] Ashutosh U. Jadhav" Intelligent Vehicle System for Driver Assistance" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 7, July 2015

Currently almost of the public having an own vehicle, theft is happening on parking and sometimes driving insecurity places. The safe of vehicles is extremely essential for public vehicles. Vehicle security and accident prevention is more challenging. So in order to bring a solution for this problem this system can be implemented. Vehicle security enhancement and accident prevention system can be developed through the application of ignition control (tracking and locking), fuel theft, accident detection and prevention, driver fatigue, pollution control and speed limiting with efficient vehicle management system. The need for this project is to provide security to the vehicles by engine locking system which prevents the vehicle from unauthorized access. This technique helps to find out the exact location of the accident and with the help of server an emergency vehicle can be sent to the exact location to reduce the human life loss. It also detects the behaviour of the driver through sensors whether he/she is drowsy or drunk, so that occurrence of accident can be prevented. The place of the vehicle identified using Global Positioning system (GPS) and Global system mobile communication (GSM).
This is more secured, reliable and low cost.

IV. PROPOSED DESIGN

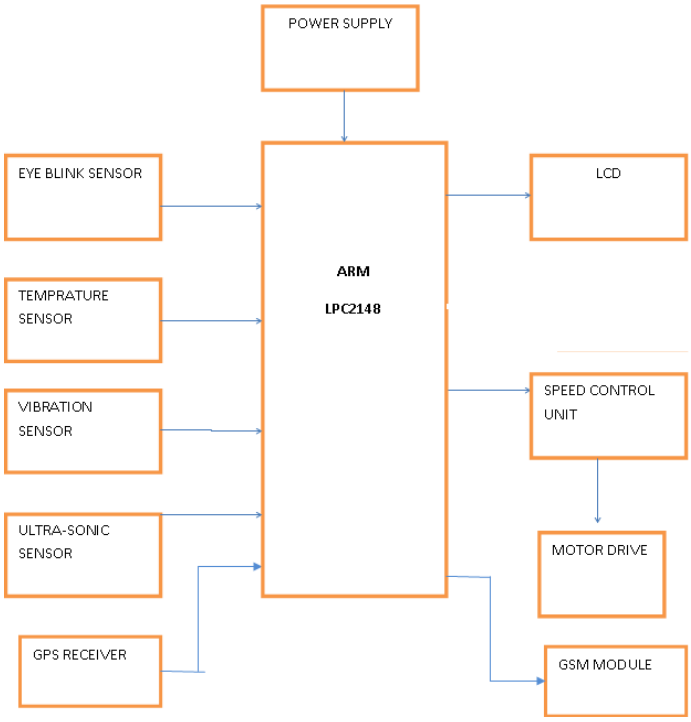

Fig No 01 PROPOSED DESIGN

EXPLANATION-
The main objective of the project is to detect accidents and send an alert SMS to the registered phone number. The system also detects driver's drowsiness and alerts the driver in order to prevent accidents. The system uses the following main components in order to accomplish the above tasks:

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1. Eye blink sensor
2. Vibration sensor
3. GSM module
4. GPS receiver
5. Ultrasonic sensor
6. Temperature sensor
7. ARM7 LPC2148 microcontroller
8. LCD 16x2 module
9. Vibration motor
10. DC motor
11. Motor driver IC
12. Power supply

The eye blink sensor is basically an IR sensor. When the eyes of driver remain closed for longer duration, the vehicle is stopped for some time and vibration motor is used to alert the driver. This is a preventive measure to avoid accidents. In case of accidents, vibration sensor detects an occurrence of accident and sends an SMS and location to the registered phone number. Temperature sensor shows the temperature of engine and ultrasonic sensor shows the distance between two vehicles.

Description of Component:

1. Eye blink sensor

The eye blink sensor is basically an IR sensor.

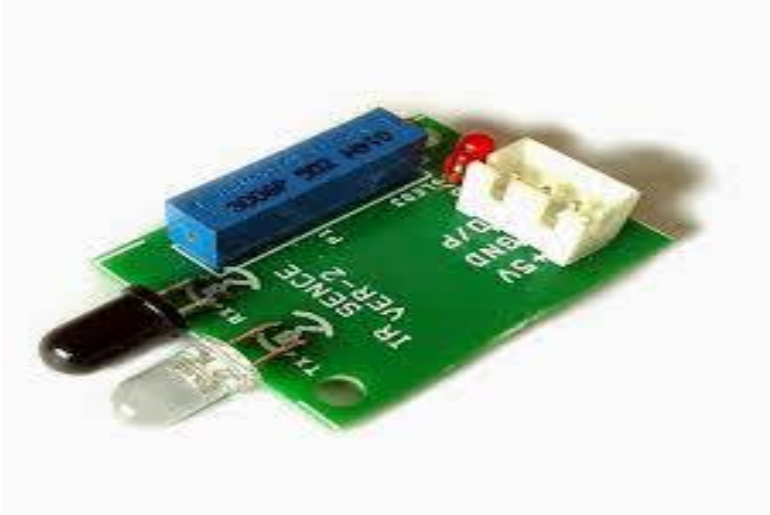

FIG 2: IR SENSOR

Infrared radiation is the portion of electromagnetic spectrum having wavelengths longer than visible light wavelengths, but smaller than microwaves, i.e., the region roughly from 0.75µm to 1000 µm is the infrared region. Infrared waves are invisible to human eyes. The wavelength region of 0.75µm to 3 µm is called near infrared, the region from 3 µm to 6 µm is called mid infrared and the region higher than 6 µm is called far infrared.

Principle of operation:

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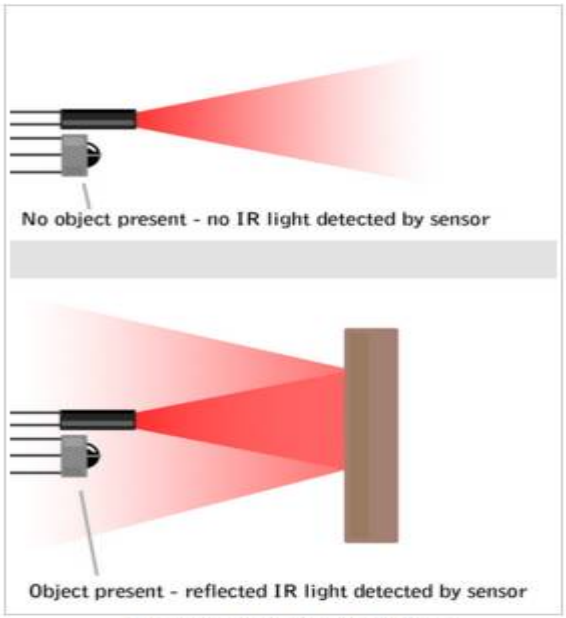

Depiction of the operation of an IR Sensor

Fig No 03 IR Sensor Operation

IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

Detecting Brightness

Since the sensor works by looking for reflected light, it is possible to have a sensor that can return the value of the reflected light. This type of sensor can then be used to measure how "bright" the object is. This is useful for tasks like line tracking.

2. Vibration Sensor

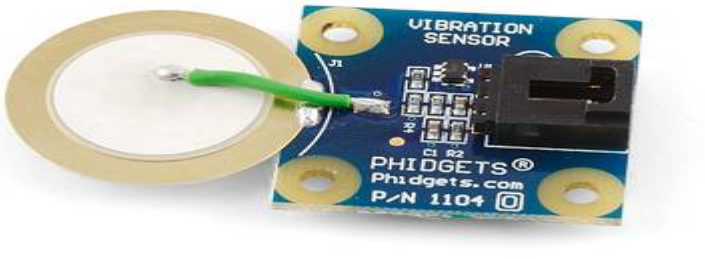

Fig No 04 IR Sensor Operation

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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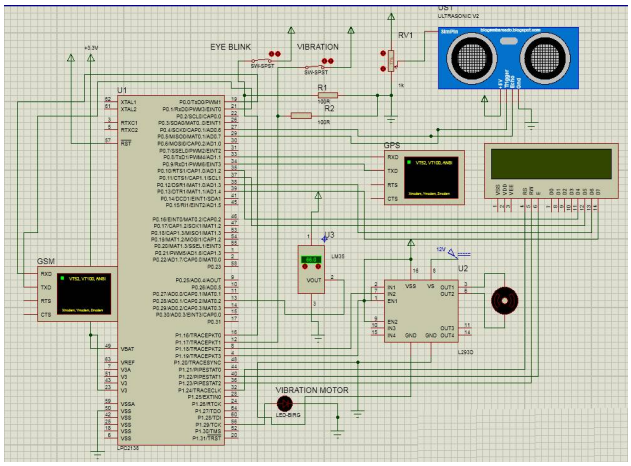
Vol. 5, Issue 6, June 2016

The piezoelectric sensor is used for flex, touch, vibration and shock measurement. Its basic principal, at the risk of oversimplification, is as follows: whenever a structure moves, it experiences acceleration. A piezoelectric shock sensor, in turn, can generate a charge when physically accelerated. This combination of properties is then used to modify response or reduce noise and vibration. Vibration sensors are important because vibration and shock can shorten the life of any electronic and electromechanical system. Vibration or shock sensors are commonly used in alarm systems to activate an alarm whenever the devices to which they are attached are touched, moved, or otherwise vibrated. Commercial vibration sensors use a piezoelectric ceramic strain transducer attached to a metallic proof mass in order to respond to an externally imposed acceleration. Piezoelectric vibration sensors used for detecting vibration from various vibration sources are generally classified into two large types, resonant type and no resonant type. Vibration sensors are very useful in detecting collisions or accidents.

V. PROJECT DESIGN



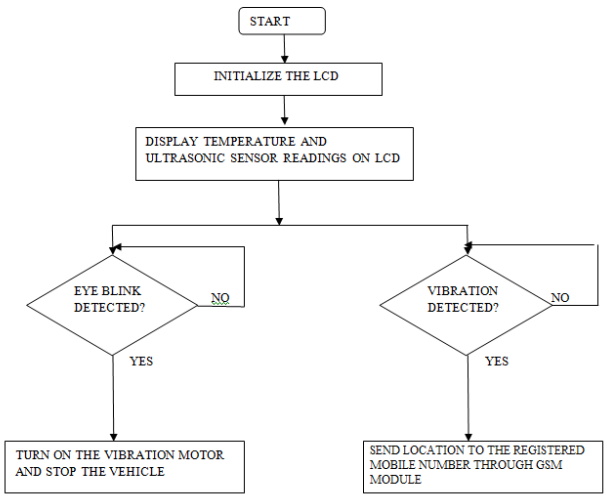


Fig. 05 Flowchart

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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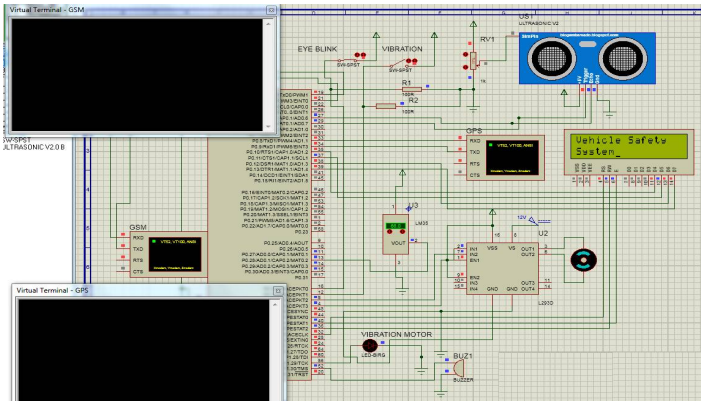
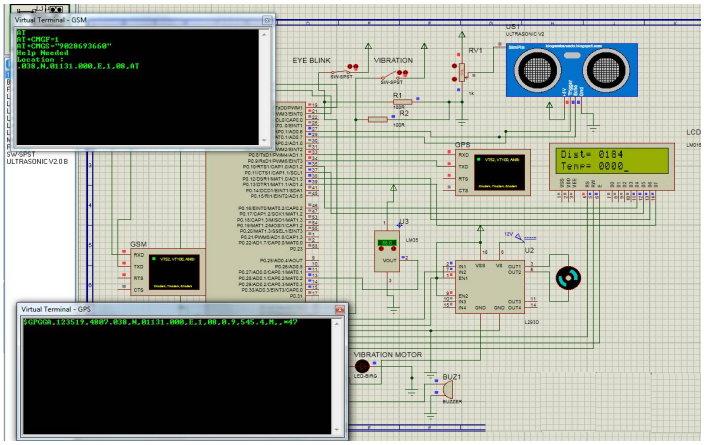
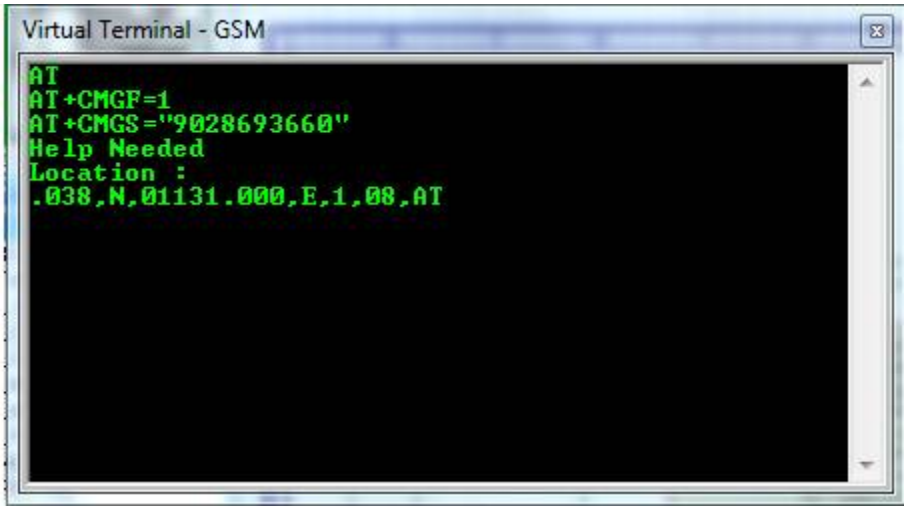
VI. SIMULATION RESULTS







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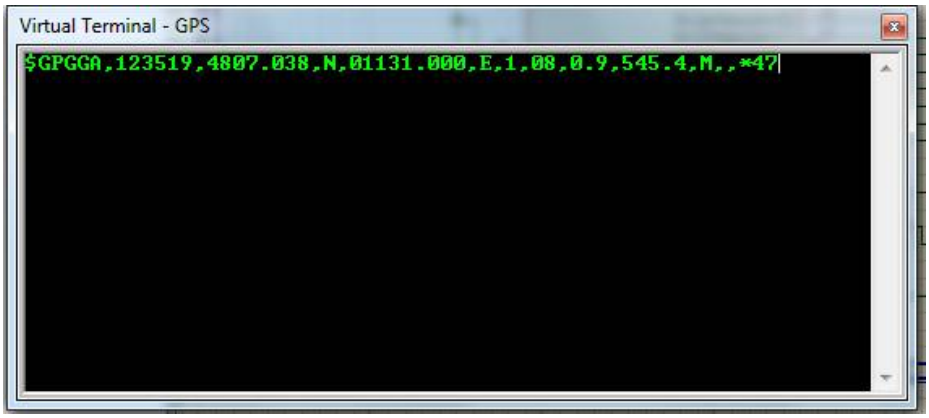
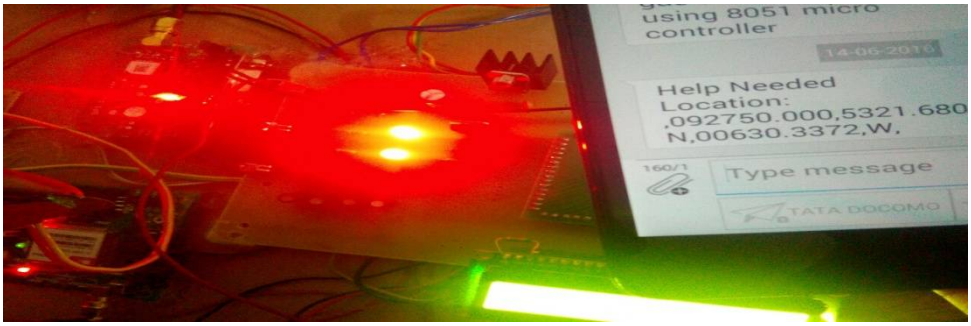


GRAPHICAL ANALYSIS OF THE RESULT:

SRNO	TEMPERATURE	ULTRASONIC SENSOR
1	35	85
2	34	3
3	35	10
4	34	85
5	35	4
6	34	10

OUTPUT ON MOBILE:



ADVANTAGES:

1] Maintenance is less
2] Its safe
3] Reduces the accident
4] Easy to operate.
5] Sophisticated security.
6] Simple and Reliable Design.

DISSADVANTAGES:

1] It does not work without network.
2] The systems fail in the absence of power supply.

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APPLICATION

I. Automotive application
II. Modern cabs, cars, auto rickshaw and trucks
III. Public transport system

VII. CONCLUSION

In this paper, we present a new driver fatigue detection method for driving safety. Driver drowsiness detection is a car safety technology which helps prevent accidents caused by the driver getting drowsy. Various studies have suggested that around 20% of all road accidents are fatigue-related, up to 50% on certain roads. The system successfully alerts the driver by vibration if his eyes are closed for longer time. The vehicle is stopped immediately. Moreover, the system also detects accidents and sends location to the registered mobile number. The experimental results show validity of our proposed method for driver fatigue detection and accident avoidance under realistic conditions.

FUTURE SCOPE

There is a scope for improvement and as a future implementation we can add a wireless webcam for capturing the images which will help in providing driver`s assistance. We can extend this project in future by adding anti-theft detection, control and security features.

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