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Advanced Driver Assistance and Safety Warning System for Car Driving

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***Abstract*—** The quick advance in technology and infrastructure has made of lives more easy. Most accidents are occurring by making mistakes like rash driving, driving the vehicles without noticing traffic signs. In this work, efficient driver assistance system is developed by making use of ultrasonic sensors, MEMS, RF, GPS and GSM modules. An ultrasonic sensor is used to detect the obstacle in front of the vehicle and the vehicle gets stopped immediately to avoid the accident, alert the diver regarding the blind spots. Intimate the driver about the traffic signs (School ahead, Speed limit) to prevent the accident to occur.

Keywords- *Microcontroller, Global System for Mobile Communications(GSM), Global Positioning System (GPS) , Radio-frequency identification (RFID), Micro Electro Mechanical Systems (*MEMS*),Emergency Care Unit(ECU).*

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I. INTRODUCTION

The quick development of people's living standards and economic construction continues to improved , at the same time number of road accidents are increased. Which causes vast losses of life and property. Most of the road users are aware of safety measures and general traffic rules while using the roads. But because of negligence of road user causes accidents. The main cause of accidents are due to human behavior. Some of the common behaviors which resulting in accidents are.

1. Talking on mobile phone while driving
2. Over Speeding
3. Poor traffic sense
4. Drunk and drive
5. Lack of attention while driving
6. Jumping Red Light
7. Avoiding safety measures like Helmets and Seat belts
8. Overtaking in a wrong manner

A. Motivation

More than 1or 2 millions of people around the world die each year due to traffic accidents. Main reasons for accidents are because of overtaking other vehicles, rash driving, unaware of vehicles while lane changing and lack of concentration on traffic signs placed along the road. One of the most important factors which contributes to the traffic accident injuries is the time that takes place between accident occurred and the Emergency Care Unit(ECU) to reach the accident place. These situations could be more complicated mainly in rural areas, where people have less knowledge regarding indicating the exact place. When accident happen probability of being an accident witness who could alert the Emergency Care Unit(ECU) is very low. Because of that, reduction of time between the Emergency Care Unit(ECU) to reach the victim , alert the driver on sudden and harmful situations plays a very important role for avoiding accidents and deaths in traffic accidents.

B. Objective

The main objectives of this work are,

- To reduce the Human death ratio due to Road Accidents.
- To advise the driver on sudden and harmful situations.
- To send the accident location information to the Emergency Care Unit(ECU) on time .
- To provide utmost assistance even in rural area.

II. LITERATURE REVIEW

SeokJu Lee, Girma Tewolde, Jaerock Kwon [1] implemented a low cost vehicle tracking system for tracking the vehicle movement from any locality at any time. In this system they made use Smartphone application to monitor the vehicle location. The designed vehicle tracking system works using GPS to get geological coordinates at regular intervals of time and GSM to transmit and renew the vehicle current location to a database centre. The users with Smartphone application and Google map API can monitor a moving vehicle on demand, to determine the distance and time for the vehicle to arrive to a given destination.

Rajesh Kannan Megalingam, et al. [2] proposed a method to wisely detect an accident at any time and any place and report that accident location information to the nearby service provider. In this work they used RF transmitter module to transmit the accident information to the nearby Emergency Care Unit(ECU).Service provider at the other end will receive the information by using RF receiver module. Then the service provider uses this information to arrange for ambulance and also inform police and hospital. RF transceiver module used in this work has a working range up to 100 meters under ideal conditions.

Baharuddin Mustapha, Aladin Zayegh [3] developed an obstacle detection system based on Ultrasonic (US) and infrared (IR) sensors. The system is intended for use by the elderly and people with vision impairment.

Amit kumar, M. Manjunatha, et al. [4] developed an electronic system for blind people to navigate safely, consist of ultrasonic sensor and USB camera to detect obstacles. This System is capable of detecting the obstacles up to 300 cm using sonar and conveys feedback (beep sound) to alert the person. In addition, a USB web camera is used to capture the user's field of view, these data are used to find the properties of the particular obstacle. The main limitations for these algorithms run on embedded system are small image frame (160x120) having reduced faces, very less processing time and limited memory available to meet the requirements of image processing in real time.

III. PROPOSED SYSTEM

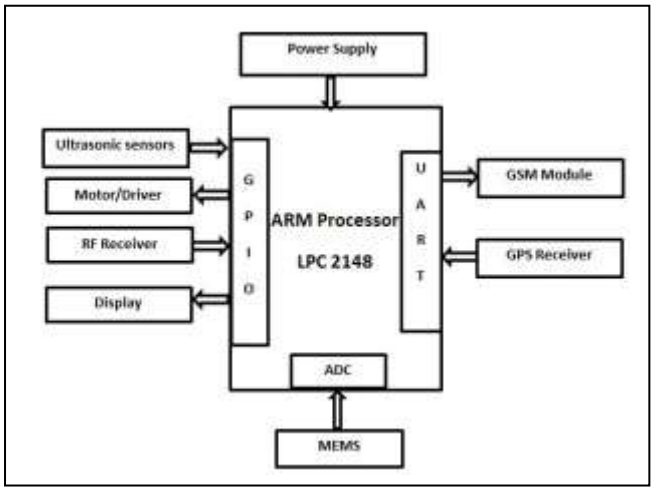

Figure 1. Block diagram of System.

The block diagram consist of Ultrasonic sensors (HC-SR04), GPS Module, GSM Modem(M12),MEMS sensor and RF Transmitter/Receiver, LPC2148 microcontroller. If any obstacle detected through Ultrasonic sensor microcontroller immediately slow down vehicle speed and come to rest till the obstacle in the path. To detect the obstacle in vehicle path the sensor is placed in such a way that it cover the maximum area in front of the vehicle to detect obstacles either small or big in size. The GSM modem interfaced with UART0, GPS module interfaced with UART1 of ARM processor to provide the location information. MEMS accelerometer is connected to ADC0 of ARM processor to detect the accident.

The detail description of all modules are as follows:

A. GPS Module

Global Positioning System(GPS) is a satellite based navigation system that provides location, time and speed information anywhere on the earth. The data received from the GPS receiver is in the National Marine Electronics Association(NMEA)format. GPS Module is connected with microcontroller using Universal Asynchronous Receiver/Transmitter (UART1).The latitude and longitude values are contained in the Global Positioning System Fix Date(GPGGA) sentence format. To communicate over UART mostly need three basic signals which are namely, RxD(receive), TxD(transmit), GND(ground).

Data received from the satellite to the Microcontroller by using GPS module, through UART1. Serial data which is taken from the GPS module is placed into SBUF register of LPC2148 microcontroller, through MAX32. The serial data from GPS receiver is taken back by serial interrupt of the Microcontroller. GPGGA sentence is identified and processed from sequence of NMEA sentences.

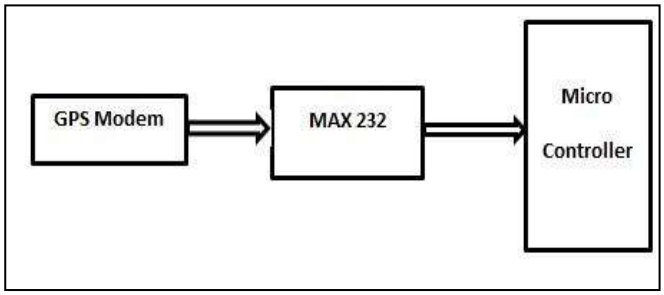

Figure 2. Interfacing GPS to Microcontroller.

B. GSM Module

Global system for Mobile communication (GSM) is the widely used wireless standard for mobile phones in the world. It operates at either at 900MHz /1800 MHz frequency band. The proposed system uses SIM300GSM module. GSM module operates on AT commands(Attention commands). Whenever a Microcontroller detects signal from the MEMS sensor Microcontroller send AT command set on its UART0. This AT commands used for sending SMS to predefined SIM number written in command.
E.g. AT+CMGS=”95XXXXXXXX” <GPS Data>.

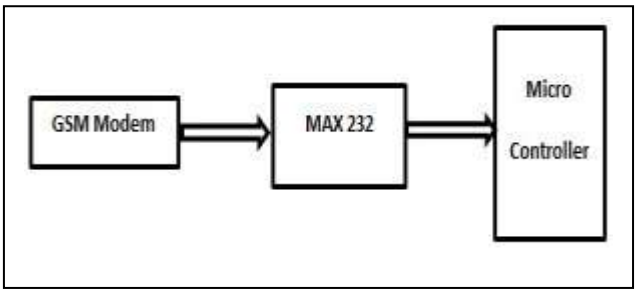

Figure 3. Interfacing GSM to Microcontroller.

C. Sensors

1) Ultrasonic sensor: SR-HC04 Ultrasonic sensor module has transmitter and receiver section. Ultrasonic sensor emits short, high-frequency sound pulses at regular intervals. These propagation in air at the speed of sound. If they hit an object and then reflected back as echo signals to the sensor, which in turn calculates distance to the object, based on the time stamp

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between the emission and reception of the echo signal. The ultrasonic measurement technique can be illustrated in Figure 4.

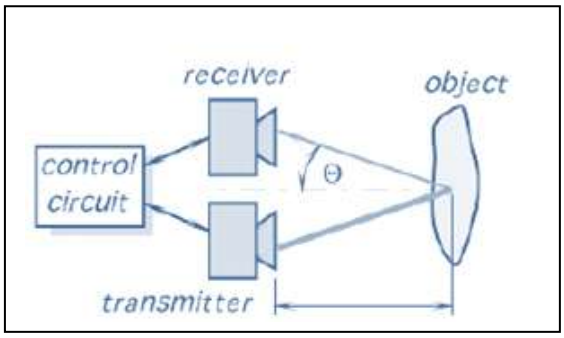

Figure 4. Ultrasonic sensor working principle.

2) MEMS sensor: The ADXL335 is a low power, thin, small complete 3-axis accelerometer. Accelerometer sensor is used to measure static or dynamic acceleration in all three axis. It can measure the static acceleration of gravity in flit sensing applications , as well as dynamic acceleration resulting from motion, shock or vibration.

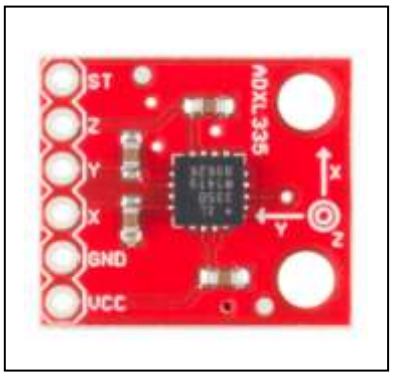

Figure 5. MEMS Sensor.

D. RFID Module

Radio Frequency(RF) transmitter/Receiver made by using HT12D decoder and HT12E encoder. The transmitter module used is TWS434A RF transmitter, transmits serial data modulated at 433.92MHz. There will be a specific RF receiver to receive serial data. It is a 8-pin module and can operate on in-out voltage ranging from 4.5 to 5.5 volts DC power supply.

IV. RESULTS

The system's results are shown in this section. The ARM7 Board which is shown in below figure, is the main control section of all functionalities in the system that is Obstacle detection, blind spot detection, accident detection, traffic sign board detection and taking necessary action based on the parameters given for individual sensors.

Figure 6. Overall system prototype setup

Upon detection of obstacle vehicle will be slow down to prevent the accident, when the microcontroller receive the signal from RF receiver, it will indicate the driver regarding specific traffic sign shown in Fig. 7 and whenever a accident is detected that location information is sent to the Emergency Care Unit(ECU) as shown in the following below Figure. 8 and Figure. 9.

Figure 7. Traffic sign board Indication.

Figure 8. Accident Detected.

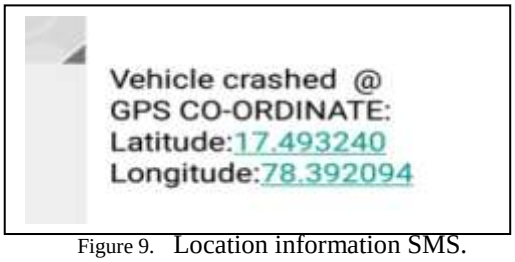

Figure 9. Location information SMS.

V. CONCLUSION

Developed a driver assistant system, to detect the obstacles in the path and alert the driver to prevent accident. In this work, the in-vehicle device is composed of a microcontroller and GPS/GSM/GPRS module to acquire the vehicle's location information and transmit it to a Emergency Care Unit(ECU) through GSM. With the help of RFID alert message regarding the traffic sign boards is intimated to the driver.

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