JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Accident detection and Alerting system using GPS and IoT

Korra Uttam[1], Rahul Kumar Pandit[2], Vantari Akanksha[3], Nerella Rajeshwari[4]
[1]Assistant Professor, [2,3,4]Final year Students
Department of Electronics and Communication Engineering, MNR College of Engineering and Technology

Abstract
In the modern world, roads are crammed with vehicles, and for various reasons, accidents are increasing at an alarming pace. Many a time these accidents lead to not only disfigure of the vehicles but also to loss of life. Sometimes lives can be saved if timely hospitalization or timely first aid is provided. However, if the accidents take place at remote sites it is very difficult to find the location of their occurrence, and critically injured people may require immediate medical support failing which may result in loss of life. In such circumstances, the Global Position System (GPS) and the Internet of Things (IoT) technologies can be deployed. In the present work, a prototype is used with GPS, and IoT modules are interfaced along with MEMS (Micro Electro Mechanical Systems) sensors and an LCD with an Arduino-Uno module.

Keywords: Global Position System, Internet of Things, Micro Electro Mechanical Systems

Introduction

In the present work, Arduino-Uno embedded platform is used. The accident results in a violent vibration that is sensed by the accelerometer sensor. The signal is processed by the controller ATMEGA-328 and displays the message on LCD and the signal is also processed to drive the buzzer which provides the alert sound indicating the occurrence of an accident. Further, the GPS module interfaced with the Arduino-Uno platform provides the location of the accident spot. The IoT module helps in transmitting information about the location in terms of latitude, longitude, and altitude using the internet. This vital information is sent to a server and then can be disseminated to the people related to the vehicle.

Literature survey

Research in the domain of Accident detection and alert system is being carried out by researchers using different techniques and features.

The authors [1]in this work used the eye closure ratio as an indicator to detect the drowsiness of the driver. If the eye closure ratio is less than the standard ratio, the buzzer cautions the driver. A Pi camera is employed to capture the driver's eye image. The Raspberry Pi platform is used in this work.

The work presented in this paper [2] focuses on setting up a fully automated system that will decrease the time lag between the occurrence of an accident and medical response. This is achieved by integrating accident detection with Medical Services. It makes use of an accelerometer and a piezoelectric sensor to interrupt the microcontroller, which retrieves the user's location through the GPS. GSM/GPRS module is used for Communication between the IOT device and the database.

Authors [3] have adopted a Wireless system for Vehicle accident detection. In this work, an Accelerometer sensor is used to detect a crash, and vehicle location is given by GPS.

Sleeplessness of the drivers often leads to road accidents. Various investigations have been carried out on this to alert the drivers.

Poor visibility during winter is one of the major causes of road accidents. In the work proposed by authors, [4] mobile traffic sensors are directly installed in vehicles. In this work, they have discussed an IOT Cloud based system for traffic monitoring and alert notification.

Poor visibility during winter is one of the major causes of road accidents. In the work proposed by authors, [5] mobile traffic sensors are directly installed in vehicles. In this work, they have discussed an IOT Cloud based system for traffic monitoring and alert notification.The authors [6] have proposed an emergency alert module that alerts the Telematic Operator Server when it detects the highest alcohol level. This system interacts with other ECUs by CAN in the vehicle. This system is used to detect accidents caused by alcohol consumption.
Accident prevention and alert system based on IoT for night drivers is presented by the authors [7]. In this paper, the driver is alerted based on eye blink due to drowsiness. Smart helmet intelligence safety for motorcyclists using raspberry pi and open CV is presented by the authors[8]. The work in this paper explained the safety systems for the motorcyclist to wear the helmet properly.

The authors [9] have explained advanced Embedded Systems for Vehicle Accident Detection and Tracking Systems. The main objective of this work is to first detect the accident location and inform the emergency services. Vehicle accident detection is achieved with the help of sensors. GPS and GSM modules are used to trace the vehicle.
The authors [10] in their work used an automatic detector that includes a microcontroller based on ADU that has both GPS & GSM. The ADU calculates the acceleration based on which accidents are detected. Further, it notifies the emergency services for immediate help. However, this has applications only for two-wheelers.

Present work

The block diagram of the present work is shown in Fig.1. D a t a f r o m t h e s a t e l l i t e

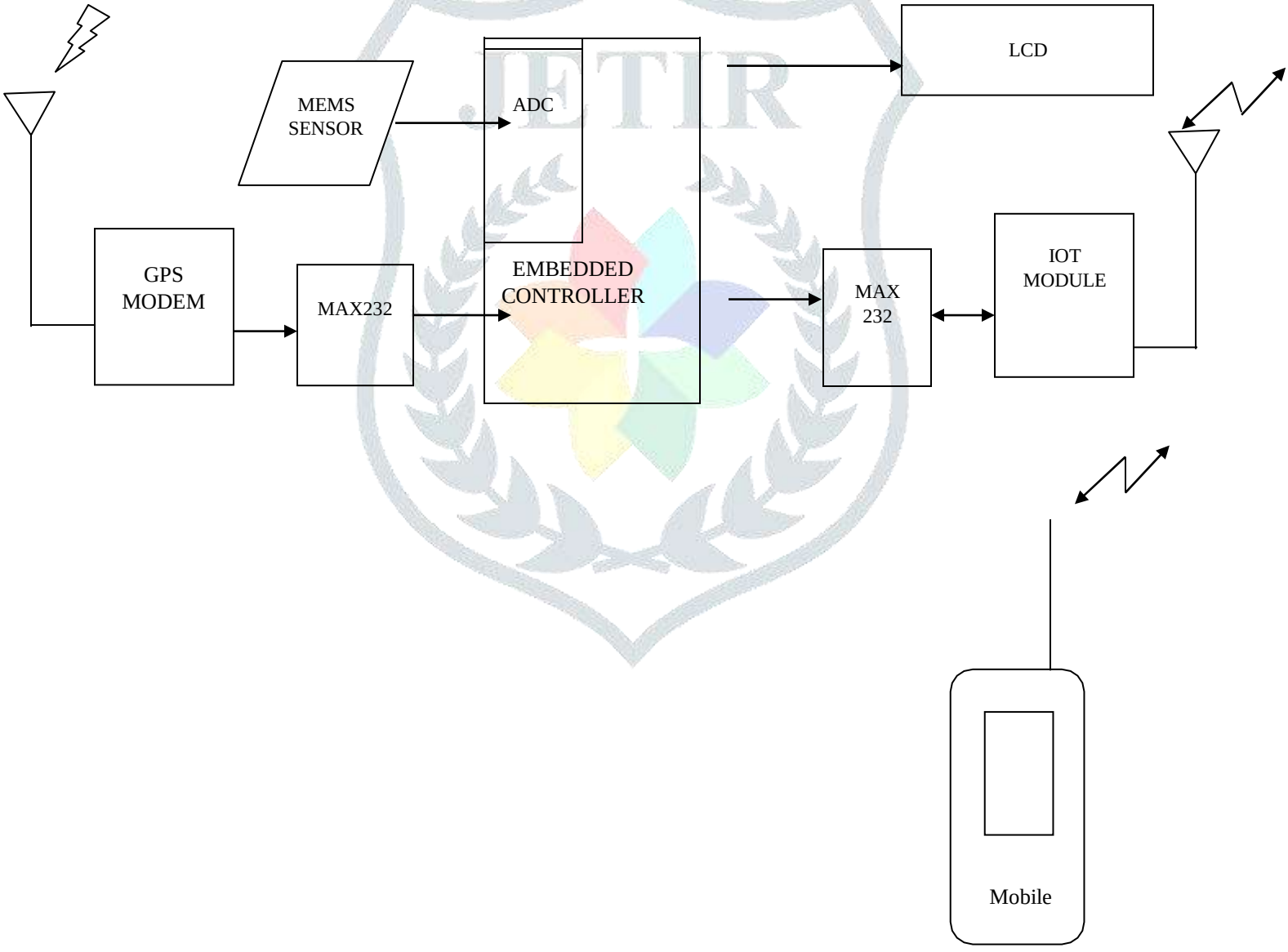


Fig.1 Block diagram of the proposed work

The Global Positioning System (GPS) is a satellite-based navigation system. It provides location and time information. GPS receiver facilitates communication with at least four GPS satellites. A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites. GPS has become an integral part of gadgets like smartwatches, smartphones, vehicles, etc. In the present work, the NEO-6M GPS module is used. The

features of this GPS module are:

1. The position update rate of 5Hz.
2. The cold and hot start times are 38s and 1s respectively.
3. Baud rates range from 4800 to 115200 with a default rate of 9600.
4. Tracking sensitivity of -162dBm.
5. Support SBAS (WAAS, EGNOS, MSAS, GAGAN)
6. Separated 18×18mm GPS antenna.

Arduino UNO platform is used in present work which is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic systems. It uses a Microchip Atmega328P microcontroller. The board is facilitated with digital and analog (I/O) pins that can be interfaced with various expansion boards and other circuits. The board has 14 digital I/O pins (six capable of PWM output), and 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by a USB cable or a barrel connector that accepts voltages between 7 and 20 volts.

The MAX232 converts signals from an RS-232 serial port to signals suitable for use in TTL-compatible digital logic circuits.

MEMS technology sensors are inexpensive with high precision that can be used for diversified applications. They have a very important advantage in space constraints as they use compact micromachine components. They have an IP67 seal which enables them to withstand temperatures in the range of 40^0 to $+85^0$C. In the present work, ADXL345; a 3-Axis Digital Accelerometer MEMS sensor is used.

The IoT module extends Internet connectivity from computers and related devices to other physical devices or common objects and leverages technologies such as embedded systems, wireless sensors, and automation. The ESP8266 is a system-on-a-chip (SOC) Wi-Fi microchip for Internet of Things (IoT) applications, used in the present work. The prototype is shown in Fig.2.

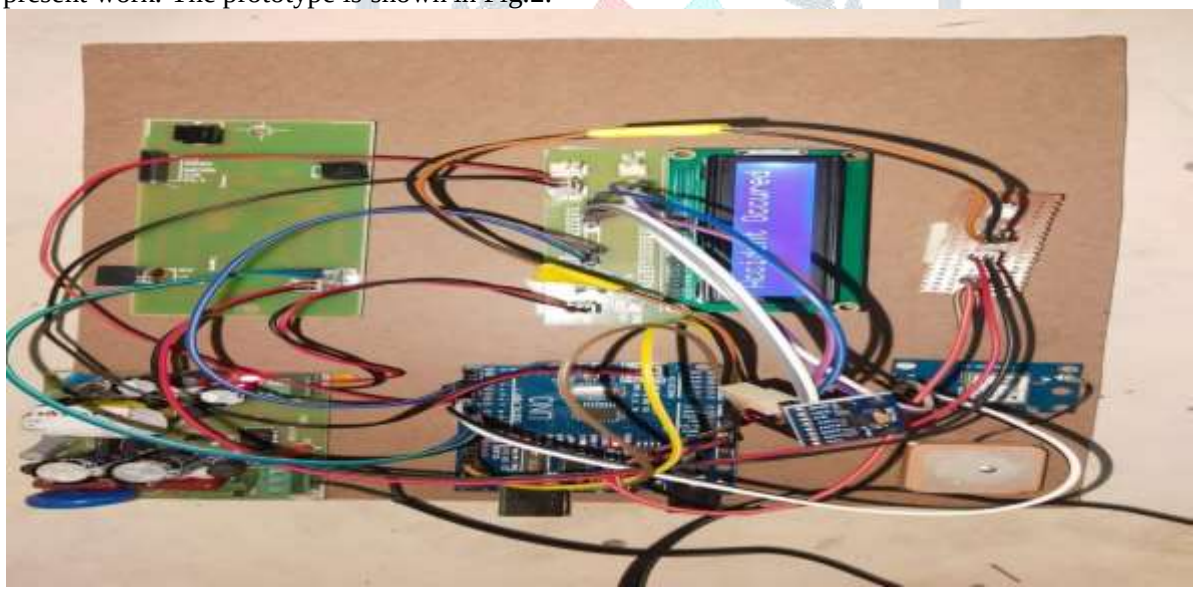
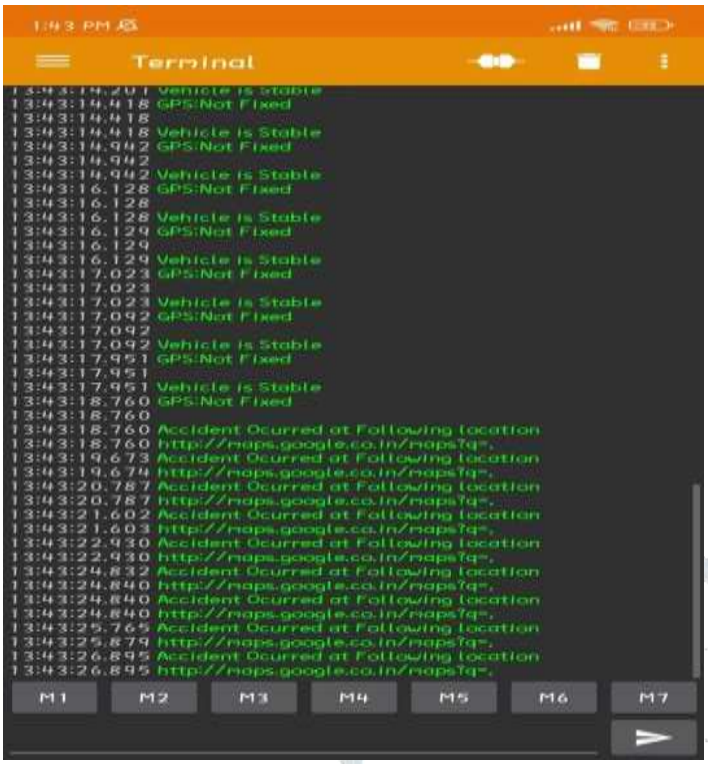


Fig.2 Prototype of the Vehicle accident detection and Alert system

Test results results



Results are displayed on the Blink App of the mobile of the owner.

Conclusion and Future Work

The prototype is successfully designed and demonstrated. The designed system is useful in saving the lives of the people during golden hour. The test results have shown a good level of location accuracy of the accident. However, when the accident takes place in a place with no internet connectivity may result in loss of lives as the information cant be disseminated to the related people and medical services. In such cases, vehicle-to-vehicle communication could be the possible solution whereby the vehicle passing through the same path can pick up the information and can send the information related to the accident location and other vital information to the related people and medical services when it enters the internet signal zone.

Acknowledgments: We express our sincere thanks to MAGNI5 & Team for helping us technically in making the prototype.

References

1. Vikas Desai, “Design and Implementation of GSM and GPS Based Vehicle Accident Detection System”, IJIT, Vol 01. Issue 03, pp. 1- 4,2013.
2. C.Prabha, R.Sunitha, R.Anitha, “Automatic Vehicle Accident Detection and Messaging System Using GSM And GPS Modem”, IJAREEIE, Vol. 3, Issue 7, pp. 1-5, 2014.
3. Amit Meena, Srikrishna Iyer, Monika Nimje, Saket JogJekar,” Automatic Accident Detecting and Reporting Framework for Two Wheelers”,2014, International Conference on Advanced Communication Control and Computing Technologies, 2014.
4. Aishwarya S.R, Ashish Rai, Charitha, Prasanth M.A, and Savitha S.C “An IoT based vehicle accident prevention and tracking system for night drivers” proc. IEEE, vol.3, no.4, pp.2320-9798 2015.
5. Aboli Ravindra Wakure, Apurva Rajendra Patkar, “Vehicle Accident Detection and Reporting System Using GPS and GSM”, International Journal Of Engineering Research and General Science, Volume 2 Issue 5, 2015.
6. Vikram Singh Kushwaha, Deepa Yadav, “Car Accident Detection System using Gps, Gsm and Bluetooth” in IJERGS May-June 2015.
7. Sadhana B Shabrin, Bhagyashree Jagadish Nikharge, Maithri M Poojary and T Pooja, “Smart helmet-intelligent safety for motorcyclist using raspberry pi and open CV”, proc.IEEE, vol.03, no.03 pp.2395-0056 2016.
8. Jagdish A. Patel, Aringale Shubhangi, Shweta Joshi, Aarti Pawar, and Namrata Bari discussed “Raspberry Pi- based smart home”, Proc. IEEE, vol.6, no.3, pp.2321-3361 2016.
9. Dr. Pankaj Tomar and Preeti Mehta focused on “ An Efficient Management System based on Face Recognition using Matlab and Raspberry Pi 2”, Proc-IEEE, vol.3, no.5, pp.239 2016.
10. DarwinNesakumar A, T Suresh, M Aarthi, K Gomathi, G Aarthi, P Mugilan,” Accident Detection, Alert and Tracking System Based on IoT”, European Journal of Molecular & Clinical Medicine, Volume 7, Issue 4, 2020.