AUTOMATIC CAR CRASH NOTIFICATION SYSTEM

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ABSTRACT

Road Accident victims usually rely on the onlookers to report the accident and call the emergency services. They might or might not be able to explain the exact location of the crash site to the emergency services. Hence emergency services do-not reach the crash site on time and are most of the times unable to revive the accident victim. We propose a system that helps solve this problem. The system we propose uses sensors, Global Positioning System and Bluetooth technology. The system uses an accelerometer to track the stability of the car

If the orientation of the car changes rapidly, the system recognizes this abnormality and sends an alert message to the relatives of the victim alerting them of the accident and it also sends them the exact location of the crash site. Our system uses and android application to use the GPS of the cellphone to detect the location and send the coordinates of the crash site to the relatives

Keywords: *Global Positioning System, Internet of Things (IoT), Wi-Fi, SMS.*

1. INTRODUCTION

The global population is on a rise and with that, the transportation needs of the people are increasing. India had an increase of 30% in car registrations over the past two years. The car manufacturers are producing cost effective cars targeting the middle class. These cost effective cars have airbags which protect the front passengers from the crash. These cars do-not have any system that detects and sends the accurate location of the location where the crash has taken place. Due to this the accident victims rely on the onlookers to report the accident and call the nearby hospital.

The system that we propose constantly checks the orientation of the car using an accelerometer. If there is an abrupt change in the acceleration of the car, then the system detects a crash and finds the location of the accident victim and sends the location in the form of an SMS to the relatives of the accident victim. System consists of: an accelerometer, Arduino Board, Bluetooth module and the android application. The Car crash is detected by the accelerometer and that data is transmitted to the android app through the Bluetooth module and the Arduino board. The android app will then find the current location and send its coordinates to the relatives of the accident victim in the form of an SMS.

2. LITERATURE REVIEW

The system proposed in this project is a simpler version of more complex system. In the literature, example [2]-[5] proposes complex emergency call systems. It is described as a system which sends vehicle data to a centralized database after an accident occurs. When an accident occurs, it is detected by the sensors which in turn generates trigger signal. In [3] the data of a moving car is studied with respect to the images of its surroundings, this data is transmitted to the third party via a radio link if any collision occurs. In [4], the author presents a system which detects an accident with inclination sensors and a decision unit and sends it to the third party. Along with the accident alert it also sends historic data of acceleration, speed and braking at the time of accident. However these system are available only in high-end cars. These cars are not affordable to the middle and lower economic class.

Automatic Car Crash Notification System solves this problem by providing a system which is cost efficient. It provides almost the same functionalities as the high end car accident detection system but in a much more cost effective way. It detects the collision of the car and sends the accurate location of the accident to the third party within negligible time. It uses sensors like accelerometer to detect a crash and sends an alert to the third party via the Android App.

3. COMPARISON OF VARIOUS TECHNOLOGIES FOR HEALTH MONITORING SYSTEMS

The table 1 given, gives a comparison of the various technologies used in Automatic Car Crash Notification System and highlights the drawbacks such as ,the accuracy of the sensor's readings, latency in arrival of alerts due to network delay, and efficiency. These flaws can be overcome by using Bluetooth technology as the connection technology.

An Android App is developed to send the alerts of accident to the third party and the crash itself is detected by onboard sensors.

Table 1: Comparison of various technologies for Automatic Car Crash Notification System

Name of paper	Authors	Journal of publication	Year and month of publication	Technology used	Drawbacks
Crash Notification System for Portable Devices	Sneha R. Sontakke; Dr. A. D. Gawande	International Journal of Advanced Computer Technology (IJACT)	March 2015	Sim808 GPS GSM GPRS module, accelerometer	Uses a web server and sim808 is costly
Emergency information notifying system, and apparatus, method and moving object utilizing the emergency information notifying system US 7133661 B2	Yasuhiko Hatae, Shuji Usui, Yoshifumi Nakamura	Jorunal for research	Nov 7, 2006	Android, Arduino, Ethernet shield	Ethernet shield is costly.

ACCIDENT DETECTION AND REPORTING SYSTEM USING GPS, GPRS AND GSM TECHNOLOGY	T. Baranidharan	International Journal on Engineeering Technology and Sciences.	September 2015, Vol 02, Issue 09	PIC16F877A processor, temperature sensor, heartbeat sensor, buzzer, ZigBee unit, ARM LPC2368	System is very complex with various devices used and hence costly.
Car Accident Detection and Notification System Using Smartphone	Hamid M. Ali , Zainab S. Alwan.	International Journal of Computer Science and Mobile Computing	4, April 2015	Smartphone, Android Application	The system has no sophisticated hardware attached to the car. The phone accelerometer cannot be relied.
MOBILE APPLICATION FOR AUTOMATIC ACCIDENT DETECTION AND MULTIMODAL ALERT	Bruno Fernandes	Vehicular Technology Conference (VTC Spring), 2015 IEEE 81st	May 2015	Android Application	No hardware device attached to the car, which can affect the accuracy and efficiency of the system.
AUTOMATED CRASH NOTIFICATION VIA THE WIRELESS WEB: SYSTEM DESIGN AND VALIDATION	Hampton C. Gabler, James DeFuria, and John L. Schmalzel	Rowan University United States Paper No: 71	March 2014	GPS system, microcontroller, Wi-Fi module	The system is difficult to implement.
Internet of Things for Smart Cities	Andrea Zanella, Nicola Bui, Angelo Castellani, Lorenzo Vangelista and Michele Zorzi	IEEE Internet of things Journal, vol.1, no.1	February 2014.	IOT	The system is complex and costly.

4. PROPOSED SYSTEM

The system we suggest has car crash detection mechanism and uses an Android app to find the coordinates of the current location and send SMS to alert the third party. The system uses accelerometer, a Bluetooth module and an android app.

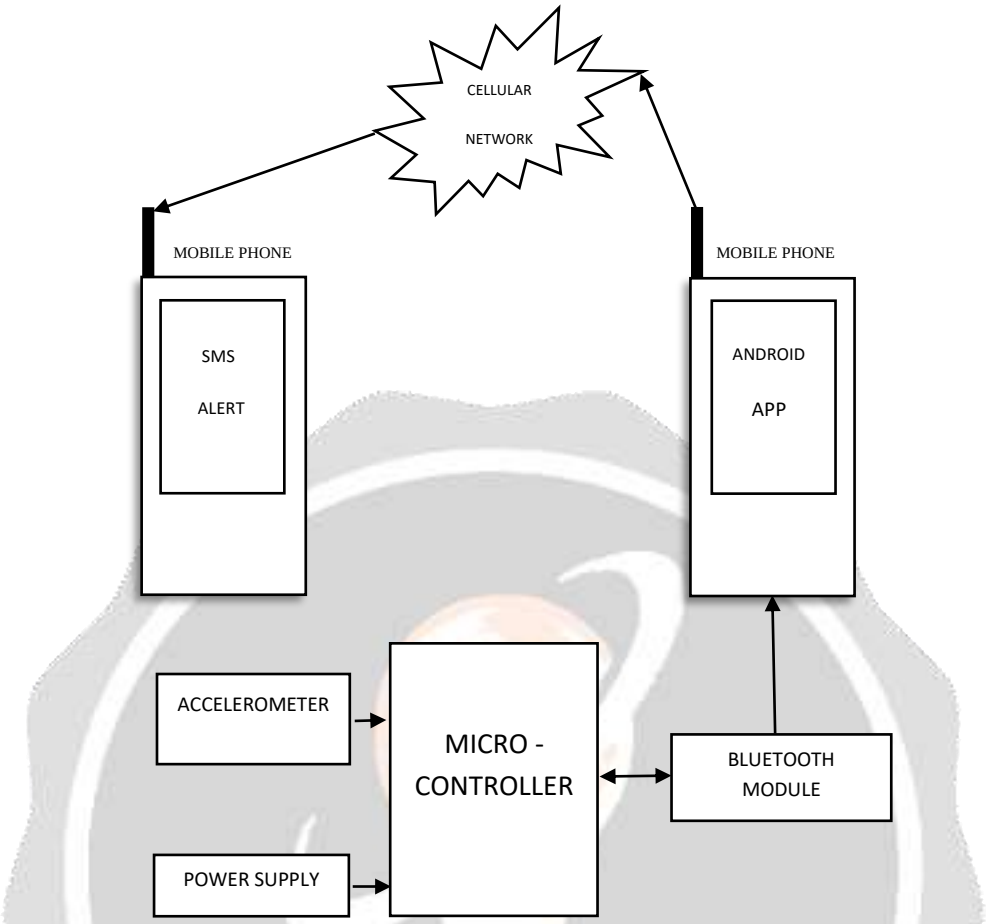

FIG 1: Block Diagram

As show in FIG 1, the automatic car crash notification system consists of three major parts, namely, the accelerometer, the Bluetooth module and the android app. The microcontroller controls and manages the accelerometer and the Bluetooth module. The accelerometer (MPU-6050) measures the alignment of the car with respect to X-axis, Y-axis and Z-axis on a continuous basis. If there is a drastic change in the values of alignment of the car within 10 readings then it is detected as an accident. This information is then sent to the android app via the Bluetooth module (Hc 05). Since the distance between the system and the mobile device is very less, Bluetooth module works perfectly in this situation, reducing the cost overhead of the system by not using a Wi-Fi module.
The android app, on receiving the crash notification from the microcontroller, finds the location of the device. It then sends this location to the relatives of the driver. This in turn saves time, in emergency situation like these, so that immediate medical assistance can be provided at the accurate location in much faster way.

5. IMPLEMENTATION

The actual working of the project includes the hardware specifications and sensors, power supply, microcontroller, and an Android Application.

5.1 Parameters used are shown in Table 2

Table 2: Parameters used in the project

Integrated Development Environment	Android studio
Micro controller	ATmega32P
Programming Language	Java

5.2 Hardware components

Hardware components include the ATmega32P Microcontroller (Arduino Uno), Accelerometer MPU-6050 and HC-05 Bluetooth module.

5.2.1 ATmega32P Microcontroller: Arduino Uno

Aduino Uno is a ATmega32P microcontroller board. It has total 14 input/output pins. Out of which 6 are PWM outputs and 6 are analog inputs. It also consists of a USB connection, a 16 MHZ quartz crsytal, a power jack, an ICSP header and a reset button. To get it started, connect it to a computer with a USB cable or power it with a battery or a AC to DC adapter. It has an operating voltage of 5V, recommended input voltage of 7-12V and input voltage limit of 6 -20V.

Fig.1: Arduino Uno

5.2.2 Accelerometer MPU-6050

MPU-6050 accelerometer are designed for motion tracking with low cost, low power and high-performance for small devices like smartphones, tablets and wearable sensors like watches and fitness bands. MPU-6050 processes complex 6-axis MotionFusion algorithms. It consists of a 3-axis gyroscope and a 3-axis accelerometer on the same silicon die together with an raw data format, rotation matrix, quaternion, or Euler Angle. It requires an input voltage of 2.3 – 3.4V.onboard Digital Motion Processor (DMP). It provides with a 12C digital-output of 6-axis MotionFusion data in

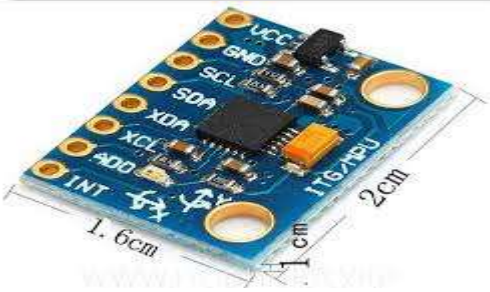

Fig.2: Accelerometer MPU-6050

5.2.3 HC-05 Bluetooth Module

- HC-05 is a Bluetooth serial port protocol module used for transparent wireless serial connection setup. HC-05 Bluetooth module can be set to be either Master or Slave, which is set up using only AT COMMANDS. It consists of a built-in chip antenna and a Bluetooth core V2.0 compliant. It works on a

frequency of 2.4~2.524 GHz and requires a power supply of 3.7-5V. Master mode can initiate connections to other devices while slave module cannot. Slave module can only accept connections.

FIG 3: HC-05 Bluetooth Module

5.3 Software Components

The android app was developed using android studio. The microcontroller or the Arduino was programmed using the Arduino IDE. Arduino IDE helps in uploading the code written in the Arduino to the microcontroller. The android application developed in the android studio is compiled and run in an emulator first. Later it is tested on a mobile phone. The application receives the accelerometer readings from the Arduino via the Bluetooth module and sends the notification with the GPS coordinates to the relative's hard coded mobile numbers in case of a crash.

6. RESULT

We have completed developing the software and integrating it with the hardware circuit board. This had led to a successful system where car drivers are monitored and their relatives are alerted automatically in case of an accident.

7. CONCLUSION

In this paper, an automatic car crash detection system using an accelerometer, Bluetooth module and an Android application is considered. This technology has the potential to offer immediate rescue operation to the victim of car crash by alerting the relatives immediately in case of a crash which increases the chance of survival of the victim.

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