Autonomous Accident Detection and InformationSystem

K. R. Tharani* and A. Jeyapriya

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Department of Computer Science and Engineering, Sri Ramakrishna Engineering College, Coimbatore - 641002, Tamil Nadu, India; kr.tharani@gmail.com, jeyapriya.a@srec.ac.in

Abstract

Now-a-days accident happens frequently, due to poor emergency facilities there are loss of human lives. The proposed system provides a solution to this drawback. An accelerometer sensor monitors the acceleration of the vehicle. A threshold value is fixed. If there is any change in vehicle's tilt position, orientation and if it is acceleration value is above the threshold value. Immediately it sends signal to the microcontroller. A GSM module is activated and it sends the pre-stored message to the emergency contacts such as relatives, hospitals, police station.

Keywords: Accelerometer Sensor, Accident Detection, GSM Module

1. Introduction

In Internet of Things, things include people, location, time information and condition. Where in all can be connected with the real world, anytime and anywhere¹⁰. Intelligent Transport System (ITS) is used to represent the application to road transportation of advanced technologies includes sensors, communications and controls. It provides safety, efficiency. Thus the proposed system based on ITS9 The objective of this paper is the system in the vehicle itself. It also projected to inform the emergency contacts of the victim about the accident by sending the pre-stored message. In³ introduced automatic accident detection of the vehicle and remote alarm device. In this paper an automatic alarm device is introduced. The design of this system is to detect the accident in a lesser time, to send the basic information to the emergency contacts or first aid centre and to send the location using the longitude and latitude provided by the GPS. An ARM microcontroller has been chosen to design the system. Sensors like vibration sensor and MEMS sensor are used to find the changes in the tilt, orientation and position of the vehicle⁷

When the vehicle is detected to be unusual, then it is decided that accident has happened. An accident is confirmed by acceleration of the vehicle using vibration and MEMs sensor. It overcomes the difficulties of absence of an automated accident detection place. Efficiently, the time taken for searching the place of the accident is reduced and the victim can be treated sooner, which will save many lives.

A Fall Accident Detection based on a Smartphone was introduced⁴. The proposed system is integrated by using the cascading classifier. The fall detection algorithm works through the sequential manner. Once it confirmed by the existing state it can continue to the following state. Else the procedure rearranges to the beginning state. This system works only with the 3G network and above. Vehicle Identification During Collisions using RFID has been reported⁶. Collision sensors are placed on the frontal and back of the cars to find the collision. So during the mishap, the output of the collision sensor starts the readers on both cars to message the details of the other car. During the collision information of both cars are interchanged and the place of the accident is identified by the microcontroller.

^{*}Author for correspondence

Using AVR, Vehicle Collision Recognition and Monitoring System has been reported in². If the vehicle rolls over or changes its position it can be identified by means of the accelerometer message which is sent through the GSM and GPS is used to find the location. This work was implemented in the AVR platform.

2. Proposed System

An accelerometer sensor is used to detect the accident. When accident happens, this sensor will be activated and the information is sent to microcontroller built on the Arduino Uno hardware. At the same time GSM modem will also gets activated. Using GSM modem, a message like "Accident has been detected" is sent to the predefined mobile numbers be minimized. Architecture diagram of the submitted system is shown in Figure 1.

An accelerometer sensor and GSM module is connected to arduino uno hardware. With an external power supply which is shown in Figure 1.

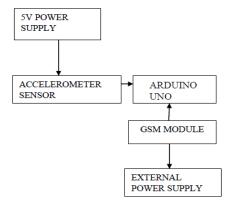


Figure 1. Architecture diagram.

2.1 Advantages of Proposed System

- Delay is reduced.
- Automatically sends the message without human intervention.
- It will save the precious time required to save the accident victims.

2.2 Modules

In this section modules used in the proposed system are described.

2.2.1 Accelerometer Sensor

An accelerometer sensor is used to sense the element and also measures the vector that has magnitude and direction. There are single axes, two axes and tri axis accelerometers are available. In this paper we used tri axis accelerometer. And it is used to measure the sense orientation, vibration, tilt and shock. The device output will be zero during the freefall; the reason is the acceleration exactly follows the gravity. Figure 2 shows the triple axis accelerometer sensor.



Figure 2. Accelerometer sensor.

The sensor is used to detect the accident. This sensor is connected to the Arduino Uno hardware. And a threshold value is fixed by performing several experiments. It regularly monitors the acceleration value of the vehicle and a threshold value is set. The effect of the acceleration is indistinguishable from any other acceleration. It is used to detect the accident3.



Figure 3. GSM module.

2.2.2 GSM Module

GSM module is used to transfer mobile voice and data services; it is an open digital cellular technology. GSM is broadly used. It is a change of Time Division Multiple Access. It's information sending speeds of up to 9.6 Kbit/s, along with the SMS (Short Message Service)⁵. Figure 3 shows GSM module.

Benefit of utilizing this GSM module will be, it can use its own RS232 port to transfer and obtain fixed functions. Such functions are message transfer, controlling remotely developed hassle free. GSM module can alternatively be coupled to PC sequential gate directly or to any microcontroller over MAX238. AT commands are used to provide communication. It specifies the GSM module technology are related to message service. If an accident occurs, the GSM module is used as the automated emergency system1.

In this project GSM module is used to send the message to the emergency contacts and it is connected to Arduino uno hardware with external power supply.

2.2.3 Accident Detection Module

This module contains of a three-axes accelerometer sensor (ADXL335) along with sensitivity +/- 3g and also together digital output. It is integrated into the control unit of the hardware. It is lesser cost and has high shocks survivability. And also have lesser current consumption and power consumption analog voltage. Incline direction detection can be done precisely.

A three-axes accelerometer sensor is connected to the Arduino Uno and it will continuously monitor the acceleration of the vehicle. If there is any change in the acceleration and beyond the threshold value. The Microcontroller of the hardware gets activated and at the same time, GSM modem will also get activated. And the previously stored message is sent to the emergency contacts of the victim. The data flow of the suggested system shown in the Figure 4. To check whether an accident happened or not a threshold value is fixed. Suppose if an acceleration value is better than or equal to fixed value automatically a message is sent to the emergency contacts as "Accident Detected". If the acceleration value is less than threshold value than it means "No accident".

3. Results and Discussions

The aim of the project is obtained using the accelerometer, GSM module integrated with the Arduino Uno. Arduino software was used to incorporate coding onto the microprocessor. A real time accident can be detected and message will be sent from the system in-built in the vehicle. Table 1 describes the time taken to send the message. Success rate depends on the network. Results obtained were accurate. It supports the design which has the benefit of lesser cost, compactness and easy expansibility.

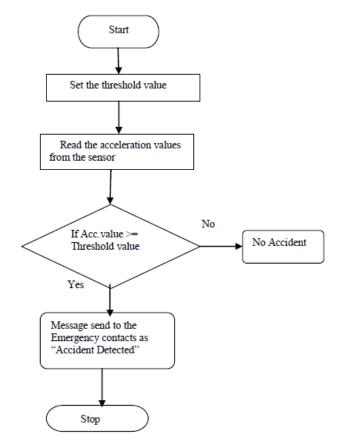


Figure 4. Data flow.

Table 1. Test results

SNO	Location	Time taken	Success
		to receive	rate
1.	Loc 1	message 30 sec	94%
2.	Loc 2	45 sec	91%

4. Conclusion

The proposed system has achieved greater performance and robustness. And also uses the lesser power components in order to recover the battery power. With the advancement of science and technology in day today life the importance of vehicle safety has been increased. The main priority is being given when accident happens, so that the wounded lives can be attended in lesser time by the saving team. Thus the system was developed to detect the accident and provide help to the injured party by rescue system.

The future work of the proposed system is to identify the location of the accident and preventive measures are taken to avoid the accident.

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