

# Intelligent Accident Detection through Mobile Phone using Internet of Things

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## ABSTRACT

The Internet of Things (IoT) has been growing rapidly in recent years and widely used in variety of applications such as smart phone, smart health, intelligent transportation and smart city domains. The largest cost of unnatural deaths in the world today (other than diseases) is road accidents. With increase in population, as the usage of vehicles is increasing drastically, the hazard due to vehicles is also increased. The main cause for accidents is high speed, drunk and drive, diverting minds and over stress etc. An attempt has been made towards finding solutions for timely accident notification. The proposed system records the parameters of vehicle at regular intervals of time, through a smart device installed in the vehicle and sends these values onto the Android App, vehicle owner or a third party. The system will facilitate the users in a number of ways such as notification for immediate aid in case of accident, tracking the vehicle conditions in case of accident and disabling the vehicle remotely. The hardware components include the smart device installed in vehicle and a mobile phone for user interaction. The smart device which is installed in the vehicle does not interfere with the normal functioning of the vehicle or cause overheads.

**Keywords :** Internet of Things (IoT), Renesas Microcontroller, GPS, Accelerometer, Android application, LCD, Global System for Mobiles (GSM), Analog to Digital Converter (ADC).

## I. INTRODUCTION

IoT or Internet of Things refers upcoming technology. Today everything is based on IoT, it is the network of the physical objects that can be connected and exchange the message themselves without the human interaction. IoT has been formally defined as an “Infrastructure of Information Society” because it has been used in all kind of mediums such as Home Automation System, IoT home security model, raspberry pi, smart water metering.

According the most recent USDOT records, at the end of 2003, vehicle-related crashes in the U.S. exceeded 6 million with 3 million injuries and 42,643 deaths [NHTSA, 2004]. Based on a 2000 study of Crash Costs performed by the National Highway Traffic.[5]

In present days the rate of accidents can be increased rapidly. Due to employment the usage of vehicles like cars, bikes can be increased, because of this reason the accidents can be happened because of over speed. People are going under risk due to their over speed, because of unavailability of advanced techniques, the

rate of accidents can't be decreased. To reduce the accident rate in the country this attempts introduces an optimum solution. In the modern world, you can reach to any part of the world any time you wish with wide variety of the modern means of transportation system. According to WHO the number road traffic injuries is caused an estimated 1.25 million deaths worldwide. That is, one person killed every 25 seconds and there is one death every 4 minutes in India. The most common cause of road deaths is due to loss of oxygen supply. Nowadays accidents are a common reason for deaths. These are critical things to control so here we come up with a concept to reduce pollution and detect the location of accident and making sure necessary action is to be taken [4].

## II. METHODS AND MATERIAL

The proposed system uses the following components and methods:

### A. Global Positioning System (GPS):

The Global Positioning System is a global navigation satellite system deployed by the US department of Defense and maintained by the US Air Force. GPS is a space based radio navigation system that provides timing services and accurate location to anyone with a GPS receiver.

When the accident has occurred, alert message will be sent to the Android application installed in the smart phone of the caretaker along with three dimensional position (includes latitude, altitude and longitude) and time.

### B. Renesas Microcontroller:

Renesas microcontroller is 16-bit CPU core for embedded microcontrollers of Renesas Electronics introduced in 2010. It has 64 pins and its model name is R5F100LE. 58 pins are used as General Purpose

Input Output (GPIO) and 6 pins are reserved pins, out of 64 pins. Name of the reserved pins are VSS, VAD, V0, RW (Read-Write), E (Enable), RS (Reset). The Renesas micro controller also consist of 10-bit ADC, 8 channels, 8 timers and 12 interrupts. The speed of microcontroller is 32 MHz. The ROM size is 64kB and RAM size is 4kB. The input voltage is 12V and operating voltage is 5V. It has 11 ports, each contains some pins. The Universal Asynchronous Receiver and Transmitter (UART) protocol is used for serial communication. It consists of three sections namely: power section, control section and communication section.

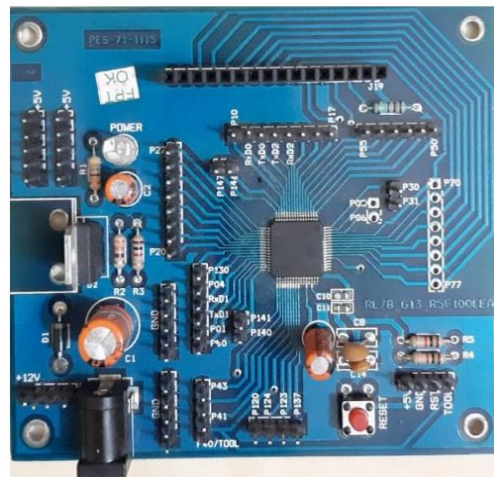


Figure 3.2.2 : Renesas Microcontroller

### C. Global System for Mobiles (GSM):

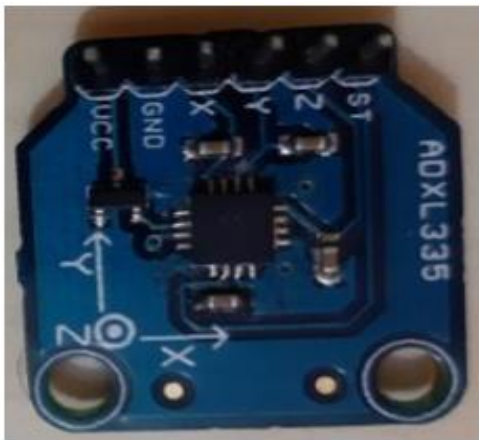
Global System for Mobile communication includes is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation digital cellular networks used by mobile devices such as mobile phones and tablets. GSM module is used to send alert messages to android application when accident has occurred.



**Figure 3.2.3 :** Sends alert messages to android application using GSM

**D. Accelerometer:**

The accelerometer is used to detect the accident. Whenever the accelerometer reading crosses the threshold, then the alert will be sent to the android application, meanwhile if you have not passed then it is the confirmation for the accident, then the alert message will be sent to the respective person through the GSM.



**Figure 3.2.4 :** Accelerometer for measuring vibrations in vehicle

**E. Liquid Crystal Display (LCD):**

To display the alphabets, numbers and special characters an LCD module with 16x2 alpha-numeric types is used. These modules are very preferred over seven segments and other multi-segment. Here 16x2 LCD means it can display 16 characters per line and there are 2 such lines. Each character is displayed in

5x7 pixel matrix in this LCD. This LCD has two register, they are namely Command and Data respectively.



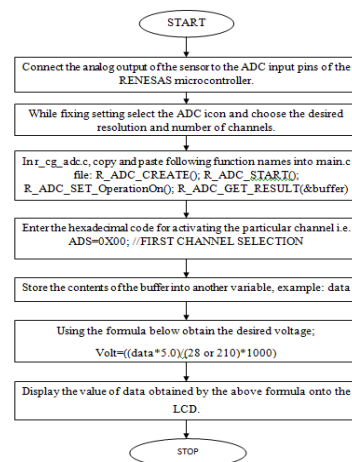
**Figure 3.2.5:** LCD to display the internal operations

**F. Switch and Buzzer:**

Switch is used to turn on/off the further process and buzzer is used to send make a noise to alert the nearby people. For example, if there is a minor accident the passenger will be pressed the switch that time there is no information send to the Android App that message is sent to the nearest hospitals.

**G. Analog-to-Digital conversion:**

The renesas microcontroller has a 10-bit Analog-to-Digital converter which converts the analog voltage value into digital voltage. The analog value will be in the binary form which is machine-readable form and not understood by humans. The proposed system detects the accident when the accelerometer is tilted either left or right. When the accelerometer is tilted the voltage value is converted from analog to digital by Analog to Digital Converter. Some threshold value is set to the accelerometer which is less than 145 and greater than 175. When the accelerometer crosses the threshold then, the accident is detected.



**Figure 3.2.7 :** Flowchart of Analog-to-Digital Conversion

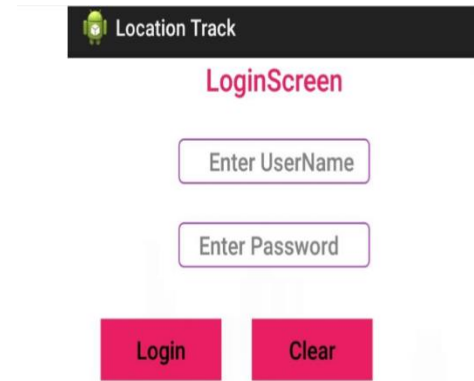
## H. Android Application:

An android application called “Location Track” is installed in the smart phone of the caretaker. When the accident has occurred then alert message will be sent on the android application of the caretaker through GSM installed in the vehicle. The android application consists of login page where the user must enter his/her username and password for authentication purpose. After the successful login, the page will be directed to main screen.

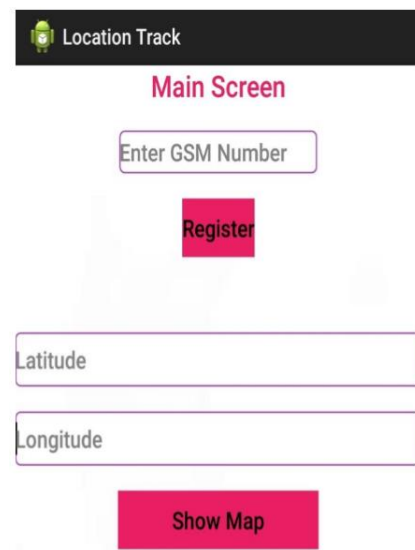
The exact location where the accident has taken place is tracked using the GPS and alert message will be sent to the android application along with longitude and latitude value. When the user clicks on Show Map button then the page will be directed to Google Maps. In the proposed system, the location will be shown at the distance of 100m.



**Figure 3.2.8 :** Android application named Location Track



**Figure 3.2.9 :** Login page of the caretaker



**Figure 3.2.10 :** Main screen of the android application which directs to Google maps when clicked on the Show Map button

### ADVANTAGES

- ✓ To reduce the human death ratio due to Road Accidents in India i.e. to save the people in a right time.
- ✓ If accident takes place, the quick transmission of message to preconfigured contacts.
- ✓ It shows the position in which the accident has occurred, i.e. we can find the location of the vehicle in small amount of time.
- ✓ Flexible and reliable.
- ✓ The application is easy to install and easy to operate.

## LIMITATIONS

- ✓ If the microcontroller fails, it leads to catastrophe.
- ✓ It works only when 5V power supply is given.

## III. CONCLUSION

The intelligent accident detection and rescue system can be successfully implemented using database Android app and also fulfills all the requirements to be an Android App based framework. The system provides the design which has the advantages of small size and portability. It consists of accelerometer sensor, GPS and GSM interfacing which decreases the accident, it reduce the time for searching location as soon as possible the person can treated immediately, it leads to save many lives.

## IV. REFERENCES

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