

# CAR ACCIDENT DETECTION SYSTEM USING GPS AND GSM

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**Abstract-** India witnessed one road accident every minute in 2011 which claimed one life every 3.7 minutes, one of the highest in the world. Mint reported last year: As per the National Crime Records Bureau (NCRB), in the year 2011 there were 440,123 road accidents resulting in the death of 136,834 people. The incidence of accidental deaths increased by 44.2% in 2011 from 2001. This paper proposes a new dimension in order to allow early response and rescue of accident victims; saving lives and properties. Our system uses the capability of GPS and GSM along with the android phone to provide a solution which can be used to precisely detect the accident spot and to send the emergency notification to the nearby hospital's ICU and to the victim's relatives. The proposed system consist of two unit namely, Crash Detector Embedded Unit and Android Control Unit. Crash Detector Embedded Unit is responsible for detecting the accident condition using three-axis accelerometer sensor, position encoder, bumper sensor and one false alarm switch. Bluetooth module (HC-05) is used to send the accident notification to the victim's android phone where an android app will get the GPS location of accident spot and compare it with all the nearby hospital's location in order to calculate the shortest path and send the notification to the nearest hospital's ICU as mentioned earlier in the form of SMS.

**Keywords:** GSM, Crash Detector, Bluetooth, GPS, Android phone, sms notification to hospital

## I. INTRODUCTION

With the rapid development of society, there are some side-effects including the increasing number of car accidents. On average one out of every three motor vehicle accidents results in some type of injury. There are many solutions proposed to avoid the problem. We have avoided as well at some extent but still we can't avoid it completely. Many lives are lost due to improper post accident signaling and tracing out the exact location. Our project provides solution for the above stated problem which involves intimating the nearby hospitals and relatives by giving the accident location of vehicle using GSM and GPS technologies. Heart of our project is the android app where we can use the existing internal hardware modules like GPS, GSM etc. to get/send the required information to the concerned persons. This way we can also minimize the project cost as well. Our system as stated above consist of two units namely Crash Detector Embedded Unit and Android Control Unit. Crash Detector Embedded Unit is responsible for detecting the accident condition using three-axis accelerometer sensor, position encoder, bumper sensor and one false alarm switch details of which is mentioned in system architecture. Bluetooth module (HC-05) is used to send the accident notification to the victim's android phone where an android app will get the GPS location of accident spot and compare it with all the nearby hospital's location in order to calculate the shortest path and send the notification to the nearest hospital's ICU as mentioned earlier in the form of SMS. In order to calculate the shortest path we have developed a map like graph where every hospital will be the nodes of graph and the accident spot will be the source of graph. Now we calculate the distance of every nearby hospital from the source and then we fetch the mobile number associated with the node/hospital with minimum distance and intimate them. We also send the intimation to their relatives as well hence avoiding any chance of mislead and/or no communication after the accident.

## **II. PROBLEM STATEMENT**

Whenever accident being met, the nearby people call the ambulance. The problem associated with this is that the victims depend on the mercy of nearby people. There is a chance that there are no people nearby the accident spot or people who are around neglects the accident. This is the flaw in the manual system.

## **III. EXISTING SYSTEM**

There are many solutions proposed for the concerned problem and each one have some advantage over others. Among the other GSM and GPS solutions, some proposed the solution of finding the accident condition using only accelerometer sensor which may be a problem as it may lead to false alarm for some of the cases. Our system uses more than one sensor to increase the accuracy of the system and also we have provision to avoid the intimation in case of false alarm. The existing system also uses the external GPS and GSM modules hence increasing the cost of their project. Our system cut the unnecessary cost by using the already existing infrastructure like GPS; GSM built in the user's mobile phone.

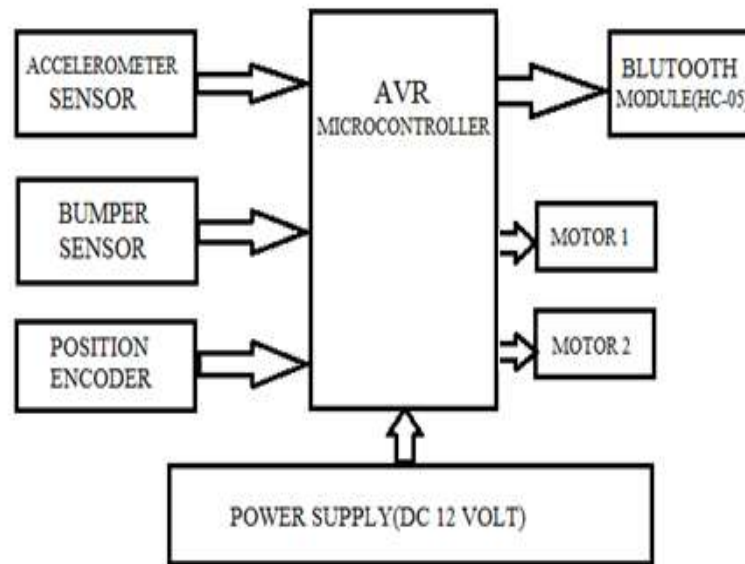
## **IV. PROPOSED SYSTEM**

In the proposed system, we have avoided the false alarm situation caused for some conditions, increased the accuracy of accident detection using more than one sensor, cut the project cost by using the already existing infrastructure available in the victim's mobile phone. To avoid the false alarm we have one manual switch in the vehicle itself which must be pressed within 10 second of false accident detection and hence avoiding any false intimation. We are using front bumper sensor, position encoder along with the accelerometer sensor in order to increase the accuracy of accident detection. Bumper sensor will tell the microcontroller how much force/pressure has been applied on it and its obvious the pressure will be more in case of accident. Position encoder is used for calculating the speed of vehicle and it is expected to change drastically when accident being met and adding another layer of reliability. The accelerometer sensor as usual tells the microcontroller if there is sudden change in the acceleration. Now a day's every android phone have inbuilt GPS, GSM modules which we are using in order to get the accident spot location and to send the SMS.

## **V. SYSTEM ARCHITECTURE**

Our proposed system consist of two units namely Crash Detector Embedded Unit and Android Control Unit. The Crash Detector Embedded Unit is being explained below:

### Crash Detector Embedded Unit:



## VI. LITERATURE SURVEY

After analyzing the requirements of the task to be performed, the next step is to analyze the problem and understanding its context. The first activity in the phase is studying the existing system and other is to understand the requirements and domain of the new system. Both the activities are equally important, but the first activity serves as a basis of giving the functional specifications and then successful design of the proposed system. Understanding the properties and requirements of a new system is more difficult and requires creative thinking and understanding of existing running system is also difficult, improper understanding of present system can lead diversion from solution. The proposed system design involved the following research paper analysis:

[1]“Wireless black box using MEMS accelerometer and GPS tracking for accidental monitoring of vehicles” by Watthanawisuth, N., IEEE conference in Jan, 2012:

This survey presents an overview of wireless black box using MEMS accelerometer and GPS tracking system is developed for accidental monitoring. The system consists of cooperative components of an accelerometer, microcontroller unit, GPS device and GSM module. In the event of accident, this wireless device will send mobile phone short message indicating the position of vehicle by GPS system to family member, emergency medical service (EMS) and nearest hospital. The threshold algorithm and speed of motorcycle are used to determine fall or accident in real-time. The system is compact and easy to install under rider seat. The system has been tested in real world applications using bicycles. The test results show that it can detect linear fall, non-linear fall and normal ride with high accuracy.

[2]“Development of vehicle tracking system using GPS and GSM modem” by Hoang Dat Pham, IEEE conference in Dec, 2013:

The ability to track vehicles is useful in many applications including security of personal vehicles, public transportation systems, fleet management and others. Furthermore, the number of vehicles on the road globally is also expected to increase rapidly. Therefore, the development of vehicle tracking system using the Global Positioning System (GPS) and Global System for Mobile Communications (GSM) modem is undertaken with the aim of enabling users to locate their vehicles with ease and in a convenient

manner. The system will provide users with the capability to track vehicle remotely through the mobile network. This paper presents the development of the vehicle tracking system's hardware prototype. Specifically, the system will utilize GPS to obtain a vehicle's coordinate and transmit it using GSM modem to the user's phone through the mobile network. The main hardware components of the system are u-blox NEO-6Q GPS receiver module, u-blox LEON-G100 GSM module and Arduino Uno microcontroller. The developed vehicle tracking system demonstrates the feasibility of near real-time tracking of vehicles and improved customizability, global operability and cost when compared to existing solutions.

**[3] "Traffic-incident detection-algorithm based on nonparametric regression"** by Shuming Tang, IEEE conference in March, 2005:

This paper proposes an improved nonparametric regression (INPR) algorithm for forecasting traffic flows and its application in automatic detection of traffic incidents. The INPR is constructed based on the searching method of nearest neighbors for a traffic-state vector and its main advantage lies in forecasting through possible trends of traffic flows, instead of just current traffic states, as commonly used in previous forecasting algorithms. Various simulation results have indicated the viability and effectiveness of the proposed new algorithm. Several performance tests have been conducted using actual traffic data sets and results demonstrate that INPRs average absolute forecast errors, average relative forecast errors, and average computing times are the smallest comparing with other forecasting algorithms.

**[4]"Automatic Accident Detection: Assistance Through Communication Technologies and Vehicles"** by Fogue, M., IEEE conference in August, 2012:

In this article, e-NOTIFY system is presented, which allows fast detection of traffic accidents, improving the assistance to injured passengers by reducing the response time of emergency services through the efficient communication of relevant information about the accident using a combination of V2V and V2I communications. The proposed system requires installing OBUs in the vehicles, in charge of detecting accidents and notifying them to an external CU, which will estimate the severity of the accident and inform the appropriate emergency services about the incident. This architecture replaces the current mechanisms for notification of accidents based on witnesses, who may provide incomplete or incorrect information after a long time. The development of a low-cost prototype shows that it is feasible to massively incorporate this system in existing vehicles.

## VII. IMPLEMENTATION AND RESULTS

The project is divided in two parts as said earlier.

### **Crash Detector Embedded Unit:**

It consists of Sensors which will sense the value of accident parameter. The sensor values are sending to microcontroller. Depending on the conditions microprocessor will send the notification to the Android Unit by using Bluetooth HC-05 device.

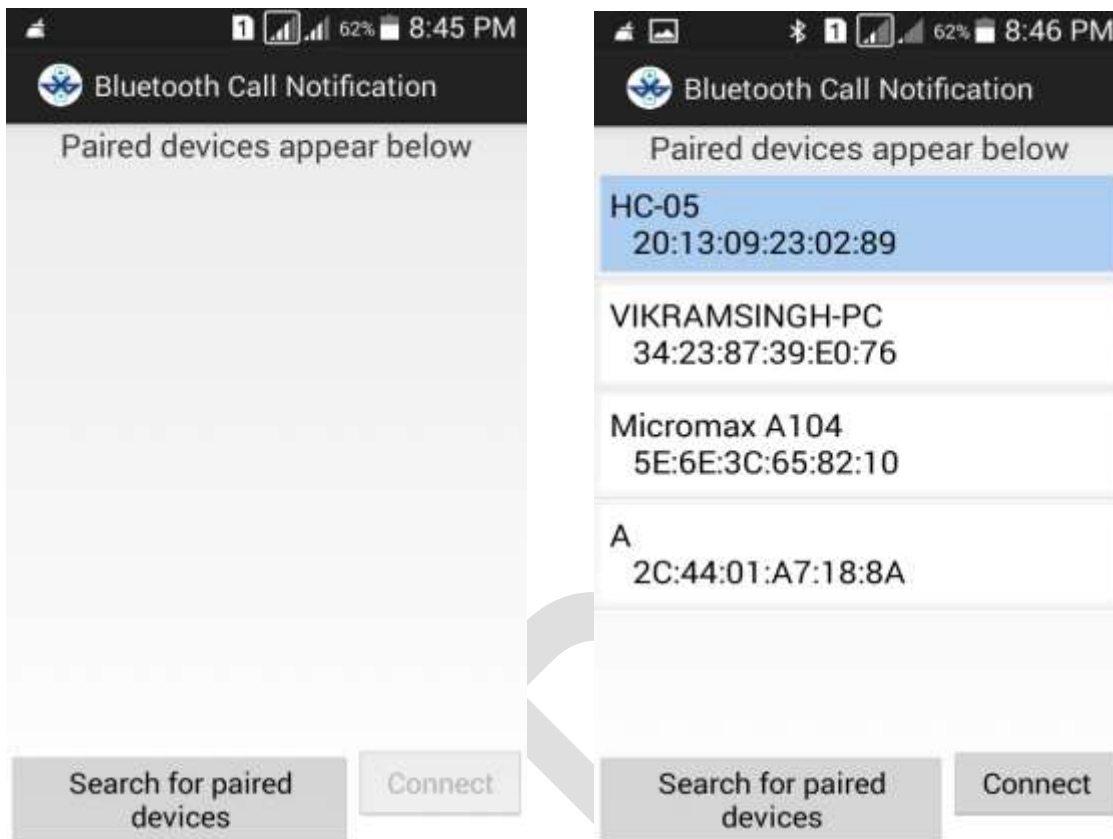
There are following sensors attached to CDE unit.

- Bumper Sensor: this sensor is nothing but the switch which will detect the high voltage when get crashed. If it pressed then sends the high voltage at pin number 2 of the atmega328 controller then it takes it as accident condition happened.
- Accelerometer: This is a sensor to detect the vibration or high change in position in XY-plan. The values given by this sensor is in digital values. If values are higher than xy\_min value or greater than xy\_max value then it takes it as accident condition met.
- Position Encoder: This will going to check the drastic change in the speed of vehicle. If speed changes from 100-150rpm to drastically 30-50rpm then the accident condition met.

### **Android Control Unit:**

This is the application designed to reduce the cost of GPS and GSM. The app will store the database of Hospitals their latitude & longitude values and Relatives name and number.

This was first GUI of our project. In this GUI, we can see the nearby Bluetooth device and paired with them. By clicking on Button “Search for paired devices”, we can see the available Bluetooth devices.



If your mobile Bluetooth is not on, then this message is shown by application and asking user permission to on the Bluetooth.

Here it shows the available Bluetooth devices. User should connect with the Bluetooth which was present in the car i.e. HC-05 in our case.

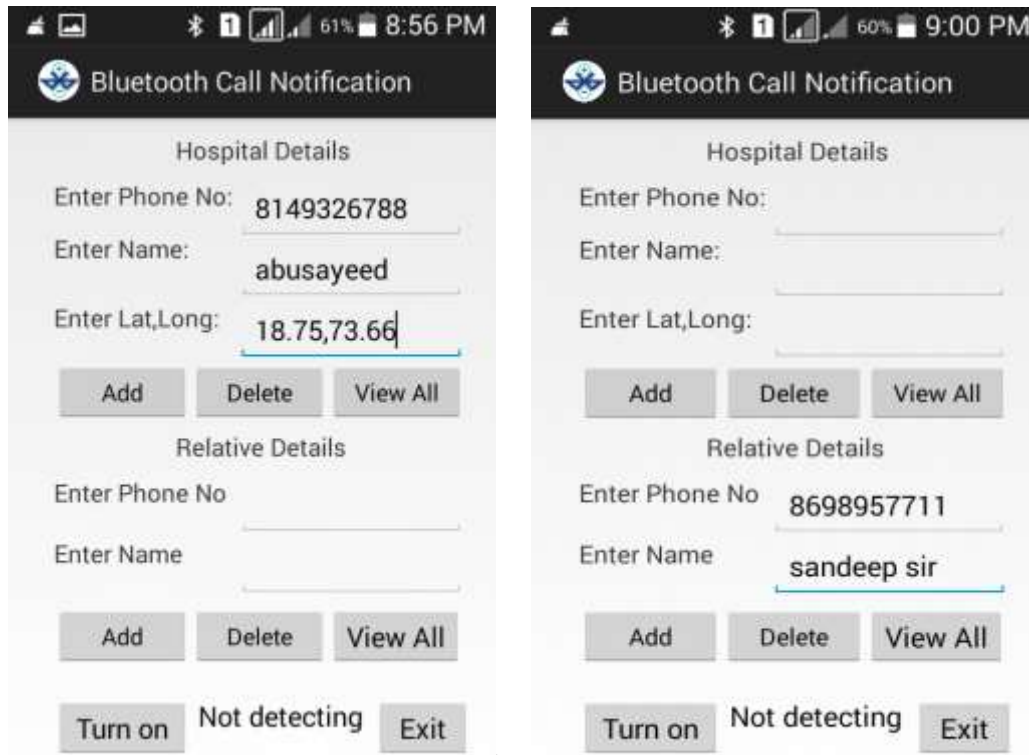
Here we click on HC-05 and by clicking on button “Connect”, we will connect with HC-05 Bluetooth devices.

This was main GUI of our project. In this GUI, we have to store the Hospital details like Phone No, Name and Latitude, Longitude.

We have to also store Relative details like Phone no and Name.

Now we have provided function to manipulate that Hospital and Relative Details.

And in last we have provided button “Turn on” through which our system is On.



Here we have added some data in database by clicking on Button "Add". For example,

Phone No-8149326788

Name- abusayeed

Lat,Long-18.75,73.66

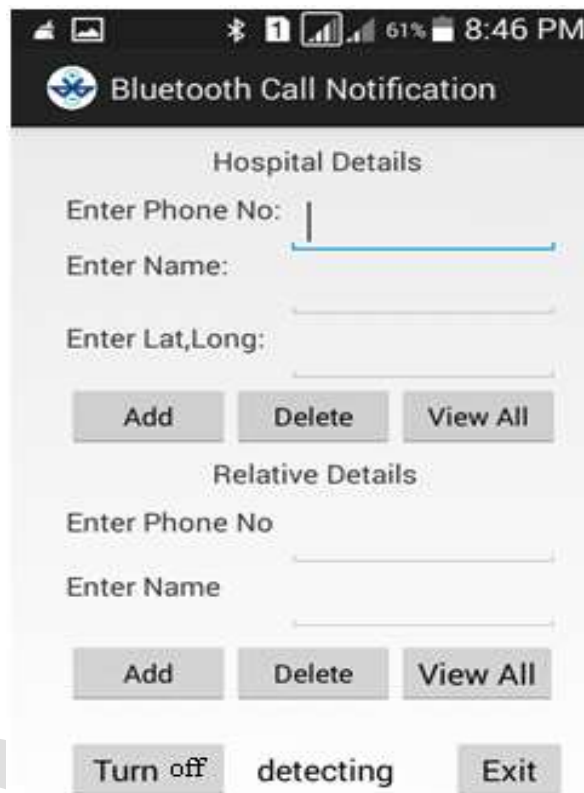
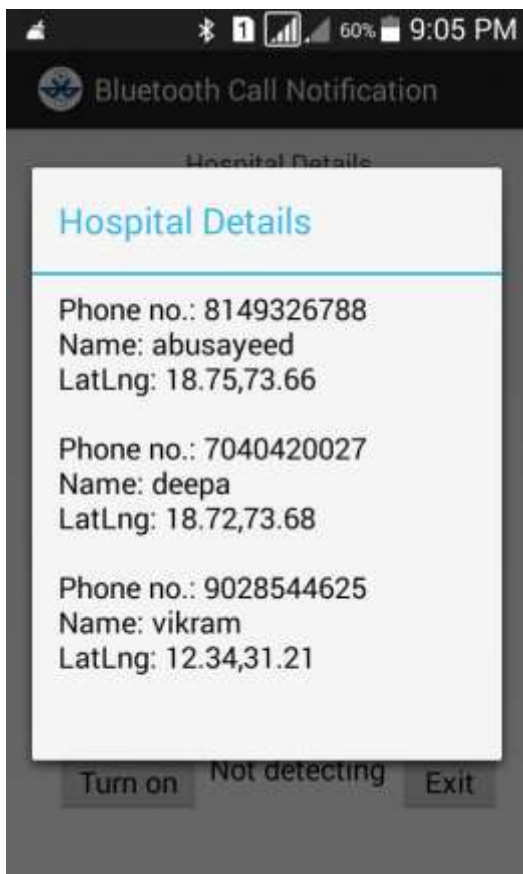
Here it shows a message that the above information is added in database.

Here we have added the relative details by clicking on button "Add". For example,

Phone No-8698957711

Name-sandeep sir

Here it shows a message that the above information is added in database.



Here we have show the Hospital Details which was added in database. It should show by clicking on Button “View All”.

Here we have show the Hospital Details which was added in database. It should show by clicking on Button “View All”.

For deleting the relatives or hospitals number, we have to put the name of hospital or relative in the respective field. The record will get deleted from the database.

Here we demonstrate that how to delete a record from Hospital database.

In first GUI, we show all the Hospital Detail which are added in database. Out of which we want to delete, it depends upon user. For example, we want to delete the hospital name- vikram.

So in next GUI, we have entered the Vikram name in Name session of Hospital Detail. Now to delete that record, we have to simply click on Button “Delete”. And it will show the message ”Record Deleted” which was shown in third GUI. And in last GUI, we should confirm that the record is deleted from Hospital Details by viewing all Hospital Details.

After having database about nearest hospitals and relatives, we can run the application to detect the accident parameters. For that we have to press the TURN ON button of app.

Before that you should do the following things:

1. Bluetooth should be ON (its ON by default while paring with HC-05 Bluetooth )
2. Turn on the mobiles packet data connection
3. Turn on GPS setting of mobile

#### 4. Working SMS plan else balance will b deducted

After that it will be waiting for the notification from HC-05 Bluetooth. Once it gets notification then app will find the nearest Hospital on the basis of current value (latitude, Longitude). And send the SMS to nearest one hospital and all relatives in database telling that “accident happened at this particular Latitude: Value, longitude: Value”.

### **VII. ADVANTAGE**

- Low power hardware components being used in our system.
- Uses some already existing hardware components of mobile phone hence lower the total cost/budget involved.
- Use of more than one sensor increases the accuracy of our system.
- False alarm switch can avoid any false intimation hence add more towards the reliability.

### **VIII. DISADVANTAGE**

- Bluetooth of phone monitors the accident regularly hence takes the power even if no accident being met.
- If the phone battery is dead by any means then we can't intimate to the concerned people.

### **IX. APPLICATION**

- Can be used in Car/Motor Vehicles to secure the driver.
- Can be used by health department of government to survey the number of accidents if deployed in larger scale.
- With slight modification, can also be used in LIFTs in case damaged being done.
- With some modification we can also use this system for traffic estimation.

### **X. FUTURE SCOPE**

We are finding the shortest path based on the distance of nearby hospitals but there may be chance that the traffic will be more in that path. So we need to come up with some algorithm which gets the nearby hospitals with minimal distance and traffic. We may add some modules which will also let the system know about the traffic details and then find out which node will take less time to reach from the accident spot. Another thing which we may add is 'first aid kit' for emergency medical treatment at the scene itself. We can also add some modules which will measure the injuries level or some additional information like blood group, heart beats, current glucose level which may be send to the hospitals in advance before the victims reaches the hospitals hence improvise the performance of the proposed system.



## **XI. CONCLUSION**

We have achieved greater performance and robustness by implementing and optimizing our proposed system. The design of Crash Detector Embedded Unit was little bit tricky as we had to increase the accuracy while cutting down the total cost. The system also uses the low power components in order to save the battery power which may be used for some other critical tasks. Sensors and the switches/other components used in our system is distributed throughout the car hence provides more flexibility while mounting into the vehicle. Using the open source android adds another advantage as we can work on top of some already built APIs for GPS and GSM interfacing hence decreasing the total project completion time. Overall we have increased the system performance from every perspective which we could. The proposed system can also be used for traffic estimation and accidents survey in the country by health department with slight modification as stated above.

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