

# Proposed Model for the Smart Accident Detection System for Smart Vehicles using Arduino board, Smart Sensors, GPS and GSM

Pratiksha R. Shetgaonkar<sup>1</sup>, VijayKumar NaikPawar<sup>2</sup>, Rajesh Gauns<sup>3</sup>

<sup>1</sup>Shree Rayeshwar Institute of Engineering & IT  
Shiroda, Goa, India

<sup>2</sup>Shree Rayeshwar Institute of Engineering & IT  
Shiroda, Goa, India

<sup>3</sup>Shree Rayeshwar Institute of Engineering & IT  
Shiroda, Goa, India

## Abstract

Accidents on the road have been one of the major causes of unnatural and untimely death all over the world. This is one of the most important issues of concern all over the world. With the increase in road traffic day by day, all over the world, it may be little difficult to avoid such accidents on the road but with the advent of smart technology, there is an possibility to provide an on time and better health care or emergency services that would help us save the life of the people affected in the accident. So in this paper an attempt is made to propose a system for a smart car that will detect the accident, track the location of the vehicle met with accident and immediately deliver the message about the accident to the emergency services, with almost no delay, helping the people affected in the accident to get timely medical service which may even help to save their life

**Keywords:** smart sensor, arduino, smart car, GPS, GSM

## 1. INTRODUCTION

We often see that when an accident occurs the person or the people nearby have to manually call the emergency services. Sometimes it happens that one person waits for other to call which leads to waste of time. Hence there is a delay for emergency services to arrive at the location of the accident and providing necessary health care which may even lead to death of the people met in accident. Also there is no system to recognize the flames in the vehicle or smoke in the vehicle immediately when the driver is driving the vehicle.

The main motive behind coming up with this system is to increase the safety features of the vehicles and thus contributes in providing on time emergency service to the accident affected people.

The primary function of the system is

- To detect an accident and automatically generate and send an sms containing the location of the accident to the emergency services which can ensure that there is no delay in informing the emergency services about the accident thus helping to save the life of the people in some cases.

The second main function of the proposed system is

- To detect the flames and smoke in the car.

Whenever flame or smoke is detected in the car engine the user will be intimated about it.

The other secondary functions of the proposed system are

1. Monitoring speed of the vehicle
2. Real time tracking of the vehicle

These secondary features will help the owner of the vehicle at the time of theft of the vehicle or can also help the owner of the transport company to tack the vehicles of the company. All the user has to do is login through the app and start tracking the vehicle.

This system has the ability to detect accidents which will be detected due to the knock sensors present in the vehicle. Secondly, the mobile application will be used to get the real-time location of the vehicle, get notifications regarding the vehicle being monitored while the tracker system will be used for managing the information about the vehicle and the system as a whole.

## 2. THE PROPOSED METHODOLOGY

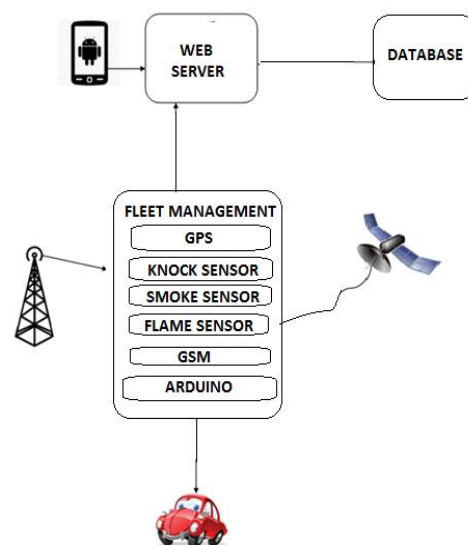
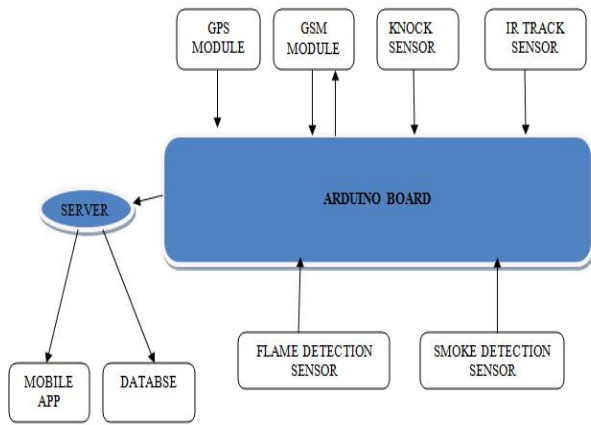


Fig 1: Overview of the Proposed System



**Fig 2:** Block diagram of the Proposed System

The proposed system consists of different modules which are interfaced to the arduino board.

**Arduino Uno:**

Arduino is a single-board microcontroller designed to make the process of using electronics in multidisciplinary projects more accessible. The hardware consists of a simple open source hardware board designed around an 8-bit Atmel AVR microcontroller, though a new model has been designed around a 32-bit Atmel ARM. The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller.

**GSM module:** The Arduino GSM Shield connects Arduino to the internet using the GPRS wireless network. We just have to plug this module onto Arduino board, plug in a SIM card from an operator offering GPRS coverage and follow a few simple instructions to start controlling world through the internet

**GPS module:** The GPS module for Arduino is a small electronic circuit that allows to connect to Arduino board to get position and altitude, as well as speed, date and time on UTC (Universal Time Coordinated). It uses the standard NMEA protocol to transmit the position data via serial port.

**3. BLOCK DIAGRAM DESCRIPTION**

Whenever an accident occurs, or a smoke or fire is detected the respective knock sensor or the smoke sensor or the fire sensor generates the signal above the threshold level.

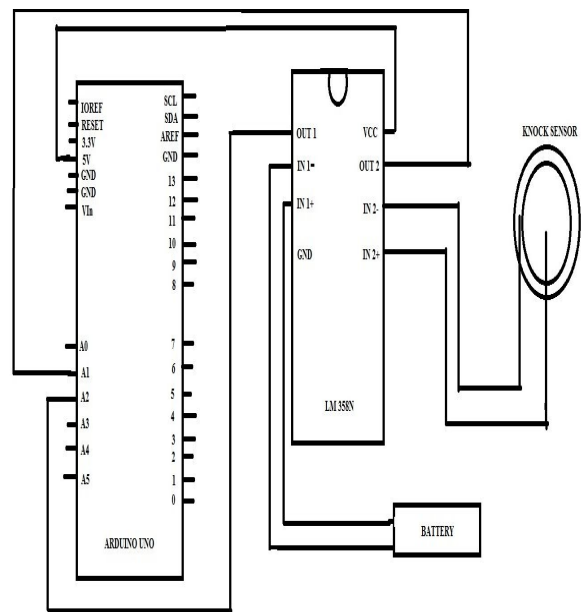
This signal is then passed to the controller on the arduino board which in turn light the indicator led on the board and also sends the signal to request location details to the GPS module.

On receiving these location details, the Arduino compiles alert message and the sends this to the GSM module which sends and alert message to the already stored emergency service mobile numbers and containing the location of the vehicle informing about the accident

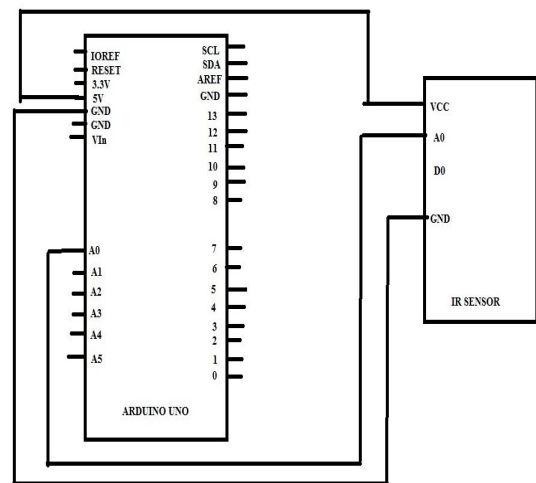
The GPS module on the board sms to the emergency service mobile numbers the and to the Android App installed on the relatives or the owners mobile number along with the location of the vehicle that is the latitude and the longitude details using the module present on the board using the GSM technology.

The functions that user or the owner of the vehicle (in case of transport company) will be performing are monitoring speed of the vehicle, real time tracking of the vehicle. This functions will help the user or owner of the transport company to the eye on the vehicles of the transport company or in the case of theft of the vehicle etc . All the user has to do is login through the mobile android app and start tracking the vehicle.

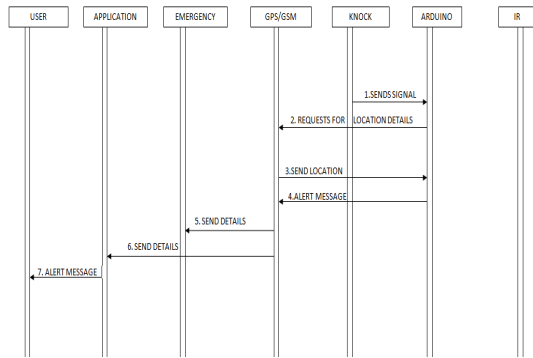
**4. DETAILED DESIGN**



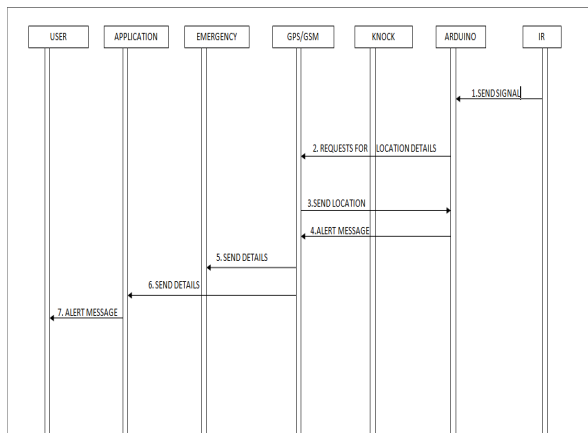
**Fig 3:** Block Diagram Showing Connection of Knock Sensor to Arduino



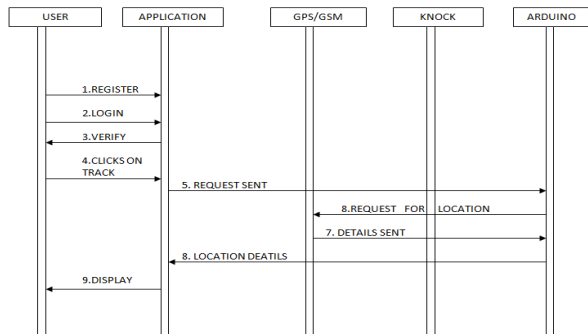
**Fig 4:** Block Diagram Showing Connection of IR Sensor to Arduino



**Fig 5:** Sequence diagram for accident detection

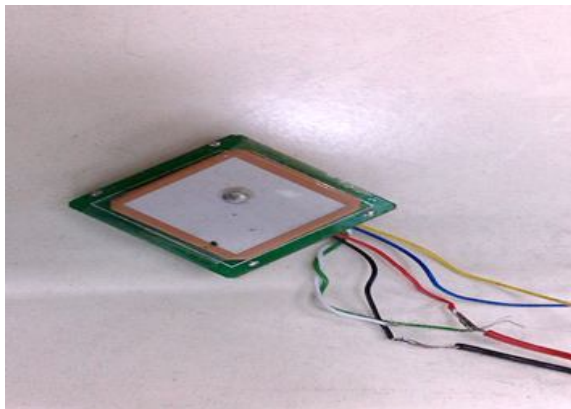


**Fig 6:** Sequence diagram for flame detection

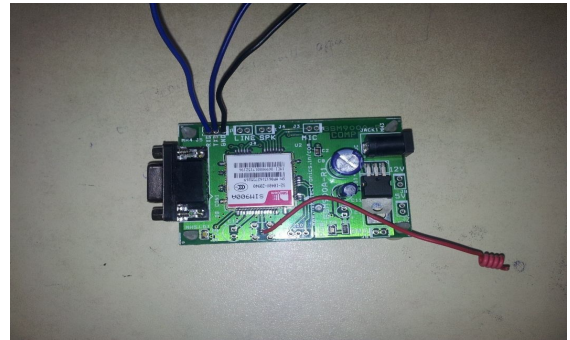


**Fig 7:** Sequence diagram for tracking of vehicle

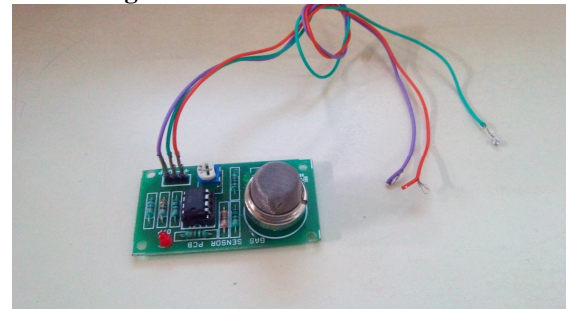
**5. PROPOSED EQUIPMENTS**



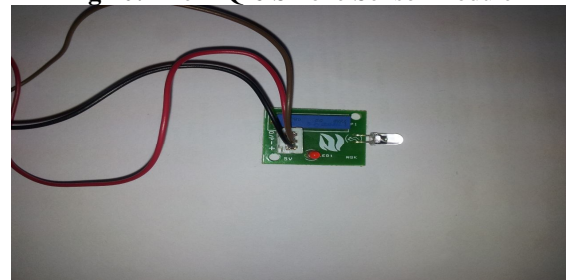
**Fig 8:** GPS-634R GPS module



**Fig 9:** GSM/GPRS Modem-RS232



**Fig 10:** The MQ-6 Smoke Sensor module



**Fig 11:** Flame Sensor



**Fig 12:** piezoelectric transducer/Knock Sensor

**6. IMPEMETATION AND RESULTS**

The diagram below shows some of the snapshots of the Hardware Implementation of the proposed system. It consists of all the sensors and GSM and GPS modules interfaced on the Arduino board implemented to test the working of the proposed model.



**Fig 13:** Snapshot of the full Connected Circuit of proposed system

Code to test the working of all sensors were developed and tested by using Arduino IDE.

An Android app was created using the IDE and installed on smart phone which was used to manage the fleet such as monitoring its speed and real time tracking of vehicles as mentioned above,

This app fetched the details of the vehicle and the users from the database created using Mysql of the WAMP server.

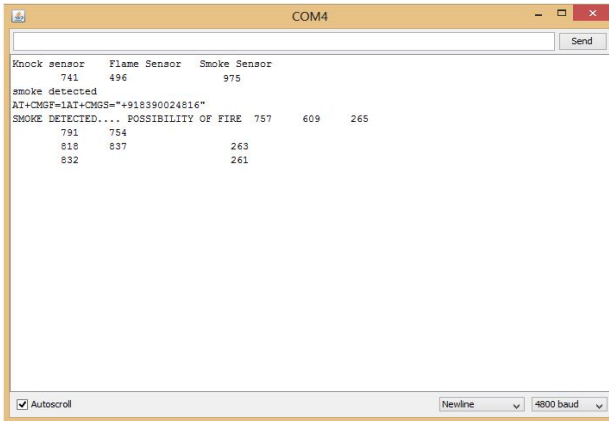
The figure below shows the snapshots of the results obtained while testing the implemented model of the proposed system.

**Test cases**

**6.2.1 Test cases for Smoke Sensor**

**Table 6.1:** Test cases for Smoke Sensor

Threshold value for Smoke Sensor = 380			
Sr. No.	Given Input	Expected Output	Observed Output
1	< 380	No Response	No Response
2	380	No Response	No Response
3	>380	Message Sent	Message Sent



**Fig 14:** serial monitor screen displaying smoke value above 380.

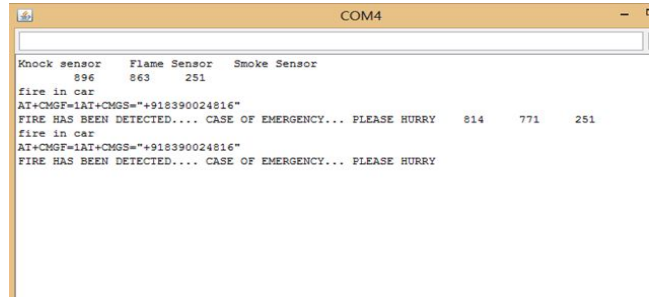


**Fig 14:** SMS received after the smoke detected on the registered mobile.

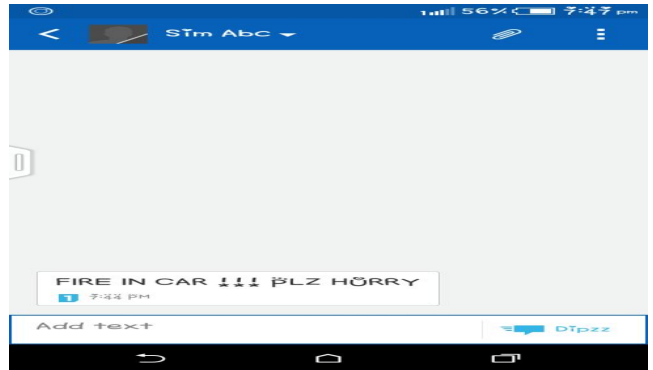
**6.2.2 Test cases for Flame Sensor**

**Table 6.2:** Test cases for Flame Sensor

Threshold value for Flame Sensor = 850			
Sr. No.	Given Input	Expected Output	Observed Output
1	<850	No Response	No Response
2	850	No Response	No Response
3	>850	Message Sent	Message Sent



**Fig 15:** serial monitor screen displaying flame sensor reading greater than 850.

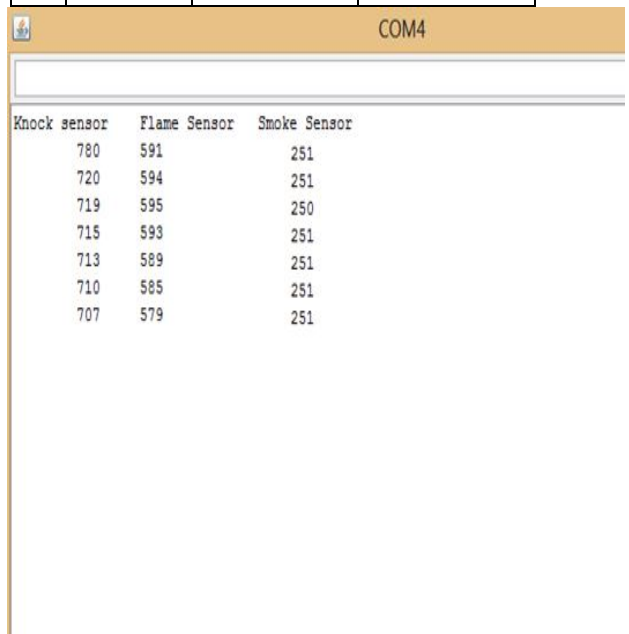


**Fig 16:** SMS received after the flames detected, on the registered mobiles

**6.2.3 Test case for Knock Sensor**

**Table 6.3:** Test case for Knock Sensor

Threshold value for Flame Sensor = 100			
Sr No	Given Input	Expected Output	Observed Output
1	<100	No Response	No Response
2	100	No Response	No Response
3	> 100	Message Sent	Message Sent



**Fig 17:** serial monitor screen displaying knock value greater than 100



**Fig 18:** SMS received after the knock/accident, on the registered mobiles

## 7. Conclusion

The proposed model for accident detection system can prove to be an important aid in constructing smart transport systems in near future if implemented properly. Also the system can be used by the owners of the transport companies etc to monitor the vehicle speed, track its real time location etc using the android app. These features can also help in case of vehicle theft etc.

## References

- [1] Real time based smart vehicle monitoring and alert using gsm By s.boopathi , k.govindaraju ,m.sangeetha ,m.jagadeeshraja ,m.dhanasu ISSN (Online) : 2278-1021 ISSN (Print) : 2319-5940
- [2] <http://www.mecs-press.org/ijisa/ijisa-v5-n9/IJISA-V5-N9-10.pdf>
- [3] <http://research.ijcaonline.org/volume119/number10/pxc3903835.pdf>
- [4] [WWW.AIRCCSE.ORG/JOURNAL/IJCSEA/PAPERS/3313IJCSEA04.PDF](http://WWW.AIRCCSE.ORG/JOURNAL/IJCSEA/PAPERS/3313IJCSEA04.PDF)
- [5] <http://www.ijcaonline.org/archives/volume119/number10/21107-3835>
- [6] <http://www.forefront.io/a/beginners-guide-to-arduino>
- [7] <http://www.instructables.com/id/Arduino-GSM-shield>
- [8] <http://www.freeasestudyguides.com/knock-sensor-symptoms.html>
- [9] <http://developer.android.com/guide/index.html>
- [10] <http://arduino.cc/>
- [11] <http://www.jeremyblum.com/>
- [12] <https://developers.google.com/maps/documentation/android/start>