

# IoT based Automatic Accident Detection

S.Nivetha<sup>1</sup> and S.Ganesh<sup>2</sup>

<sup>1-2</sup> ME., Mount Zion college of Engineering And Technology / Department of Electronics And Communication Engineering,  
Pudukkottai, Tamilnadu

Email: Nivethaselvaraj.sr@gmail.com, ganezn@gmail.com

**Abstract**—Now a day, technology rapidly growth, but also people do not survive his/her life after road accident. Because there is no emergency facilities available in our country. So we design a technology which facilitates the emergency facility. This project inform about an accident that is occurred to vehicle to rescue team and family members of the travelling persons. It uses MEMS sensor which can detect the abrupt vibration when an accident is occurred and also used ultrasonic sensors.

**Index Terms**— Arduino, Accelerometer, Gas sensor, GPS, GSM, Zigbee.

## I. INTRODUCTION

IoT is a network in which all physical objects are connected to the internet through network devices or routers and exchange data. IoT allows objects to be controlled remotely across existing network infrastructure. IoT is a very good and intelligent technique which reduces human effort as well as easy access to physical devices. This technique also has autonomous control feature by which any device can control without any human interaction. “Things” in the IoT sense, is the mixture of hardware, software, data, and services. “Things” can refer to a wide variety of devices such as DNA analysis devices for environmental monitoring, electric clamps in coastal waters, Arduino chips in home automation and many others. These devices gather useful data with the help of various existing technologies and share that data between other devices. Examples include Home Automation System which uses Wi-Fi or Bluetooth for exchange data between various devices of home.

## II. LITERATURE SURVEY

[1] Due to the insecure environment the ratio of vehicle theft increases rapidly. Because of this is manufacturers of luxury automobiles has the responsibilities for taking steps to ensure the authorization for the owners and also in built the anti theft system to prevent the vehicle from theft. The proposed security system for smart cars used to prevent them from loss or theft using FIM5360 and PIC16F877A processor.

[2] A vehicle tracking system is an electronic device installed in a vehicle to enable the owner or a third party to track the vehicle's location. This paper proposed to design a vehicle tracking system that works using GPS and GSM technology, which would be the cheapest source of vehicle tracking and it would work as anti-theft system. It is an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM). This design will continuously monitor a moving Vehicle and report the status of the Vehicle on demand. For doing so an AT89C51 microcontroller is interfaced serially to a GSM Modem and GPS Receiver.

[3] The smart engine locking system is an embedded system based intrusion detection system designed and implemented to prevent unauthorized access of vehicles while parking in insecure places. The proposed system incorporates a micro controller along with GSM and GPS modules. This instrument is installed in the engine of the vehicle whose current position is to be recorded and locked the engine in real time. Main objective of this instrument is to protect the vehicle from any unauthorized access by providing two locking status, theft mode and user mode. These two modes are controlled by Arduino UNO and GPS technology is used for finding current location of the vehicle..

[4] In today's world safety and security plays an important role, hence we tend to provide a good safety and security system while travelling. Vehicles are important in today's fast-paced society. Hence, acquiring a vehicle nowadays is considered a necessity, compared to the past where it was considered a luxury. In this thriving society, more and more vehicles are produced to meet the increasing demands of people and businesses from all corners of the world. Here comes the necessity to provide more and more safety and security features to them. An IR Sensor is used to detect the static obstacle in front of the vehicle and the vehicle gets stopped if any obstacle is detected. This may avoid accidents due to collision of vehicles with any static obstacles.

[5] Currently almost of the public having an own vehicle, theft is happening on parking and sometimes driving insecure places. The safe of vehicles is extremely essential for public vehicles. Vehicle tracking and locking system installed in the vehicle, to track the place and locking engine motor. The place of the vehicle identified using Global Positioning system (GPS) and Global system mobile communication (GSM). These systems constantly watch a moving Vehicle and report the status on demand. When the theft identified, the responsible person send SMS to the microcontroller, then microcontroller issue the control signals to stop.

[6] An efficient automotive security system is implemented for antitheft using an embedded system occupied with a Global Positioning System (GPS) and a Global System of Mobile (GSM). The client interacts through this system with vehicles and determines their current locations and status using Google Earth. The user can track the position of targeted vehicles on Google Earth. Using GPS locator, the target current location is determined and sent, along with various parameters received by vehicle's data port, via Short Message Service (SMS) through GSM networks to a GSM modem that is connected to PC or laptop.

### III. IMPLEMENTATION

#### A. Architecture

The SMS would include time, date as well as the GPS coordinates with the information about ambulance and the ambulance driver which is directed to the accident site so there wouldn't be any complication for the relative as they are notified about every needed detail. Now the ambulance would reach on accident site and would take the critically injured individual for the casualty where the adequate treatment would be provided. All the information would be saved in the databases in cloud which would be only accessible to the admin who can retrieve maintain the data log and records for the usage.

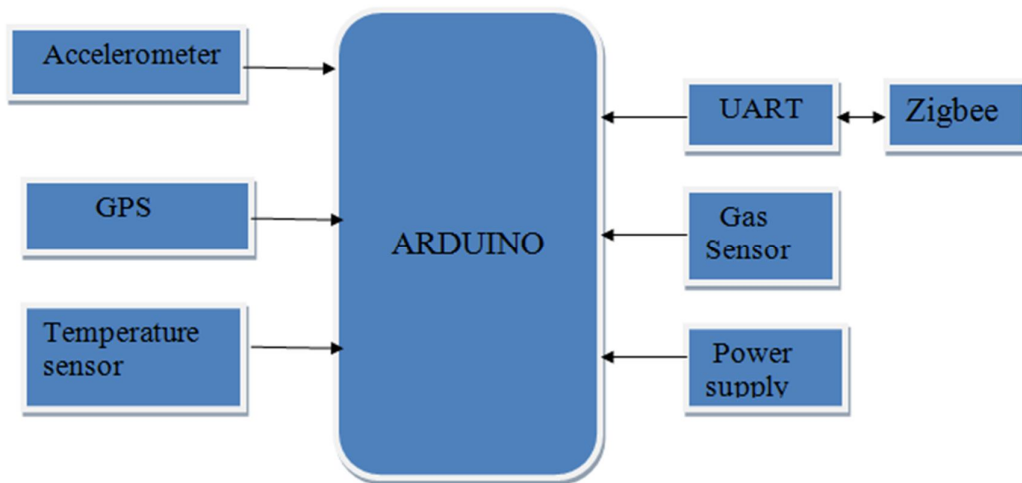


Fig 1.1 TRANSMITTER DESIGN

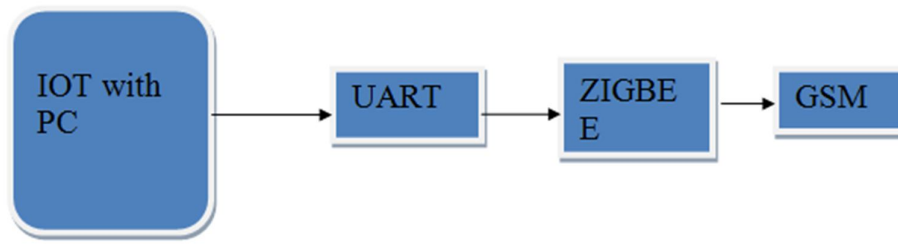


Fig 1.2 Receiver Design

### B. Arduino

Arduino Uno Any automatic system requires an intelligent chip such as microcontroller that controls the system components. Microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. The microcontroller unit used in this project is Arduino which is a platform for prototyping interactive objects using electronics. It consists of both hardware and software. Arduino is based on the Atmel AVR CPUs and being deployed in a wide variety of projects, ranging from sensors networks to robotic submarines. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get start.

### C. Pulse width modulation

Pulse Width Modulation, or PWM, is a technique for getting analog results with digital means. Digital control is used to create a square wave, a signal switched between on and off. This on-off pattern can simulate voltages in between full on (5 Volts) and off (0 Volts) by changing the portion of the time the signal spends on versus the time that the signal spends off. The duration of "on time" is called the pulse width. To get varying analog values, you change, or modulate, that pulse width. If you repeat this on-off pattern fast enough with an LED for example, the result is as if the signal is a steady voltage between 0 and 5v controlling the brightness of the LED.

### D. Radio Frequency

RF transmission Similar to Zigbee and Bluetooth technology, RF transmission requires a transmitter on the top of the handle bar and a receiver near the engine. A MCU will be equipped with each device to control the behaviour of the transmitter or the receiver. To realize this application, an RF device was chosen over Bluetooth, zigbee devices or infrared devices for the following reasons. First of all, various radio frequency transmitters and receivers are available off the shelf, Zigbee and Bluetooth devices on the other hand usually requires more development time, including PC board design, MCU coding and further testing. Some companies do offer evaluation boards or study boards for their zigbee chips, but using RF devices could save months of chip integration and reliability testing. Frequency Range of Zigbee 2.4GHZ

### E. Accelerometer

There are many different ways to make an accelerometer. Some accelerometers use the piezoelectric effect - they contain microscopic crystal structures that get stressed by accelerative forces, which causes a voltage to be generated. Another way to do it is by sensing changes in capacitance.

### F. Gas sensor

A gas is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect gas leak or other emissions and can interface with a control system so a process automatically shut down a gas detector can should an alarm to operations in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animal.

### G. Temperature sensor

The temperature sensors are highly accurate and flexible with its interchangeable sensors option ,that makes it easy for operators to change between measuring parameters on-site.as an additional feature ,a real time data option is available with the ellab sky module.

#### H. GSM

GSM is a digital mobile telephone system used across Europe and in other parts of world gsm is an abbreviation for 'global system for mobile communication'.

AT command → it is used to send and receive the message from user.

#### IV. RESULTS AND DISCUSSION

The IoT Based Vehicle Accident detection and rescue system is successfully implemented using database server and API and fulfils all the requirements to be an IoT based framework. This device is capable of reading and collecting the required data and sends them securely to the database stored in server. This system can do tracking of a vehicle which have this device. Besides, if an accident occurs this system can communicate nearest hospital and police station. Police station and hospital's authority can see the shortest route to reach the accident spot using this system which have a web application and mobile application. Web based real time data visualization makes this system more convenient to see all the data in a clean, formatted and user friendly way. So far, it has been implemented that the system can collect data successfully from sensors and communicates with web server. In near future, the system can be improved by using more sensors to detect accident with more accuracy and more different way of accident detection. This system will try to communicate at least three nearest hospitals if any major accident occurs and show the shortest path to reach the accident spot. Moreover, the system will integrate with other system. For example, an insurance company can use the project database to inquiry about an accident and provide money to the owner in time. In Bangladesh, traffic jam is very popular word. If people use this system, the system can collect traffic data and notify the driver about traffic and find out a way which have less traffic jam.

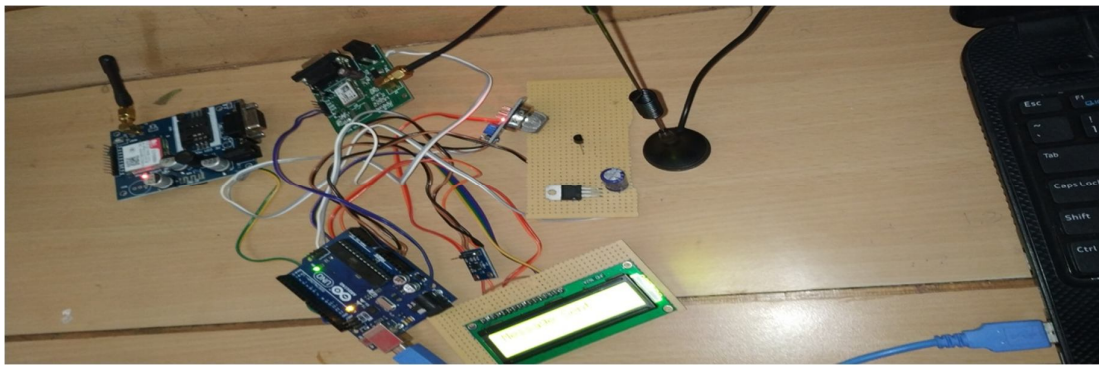


Fig. 2.1 Initial Setup

#### V. CONCLUSION

The IoT Based Vehicle Accident detection and rescue system is successfully implemented using database server and API and fulfils all the requirements to be an IoT based framework. This device is capable of reading and collecting the required data and sends them securely to the database stored in server. This system can do tracking of a vehicle which have this device. Besides, if an accident occurs this system can communicate nearest Ambulance. Ambulance and hospital's authority can see the shortest route to reach the accident spot using this system which have a web application and mobile application. Web based real time data visualization makes this system more convenient to see all the data in a clean, formatted and user friendly way. Future Work So far, it has been implemented that the system can collect data successfully from sensors and communicates with web server. In near future, the system can be improved by using more sensors to detect accident with more accuracy and more different way of accident detection. This system will try to communicate at least three nearest ambulance if any major accident occurs and show the shortest path to reach the accident spot. Moreover, the system will integrate with other system. For example, an insurance company can use the project database to inquiry about an accident and provide money to the owner in time. In Bangladesh, traffic jam is very popular word. If people use this system, the system can collect traffic data and notify the driver about traffic and find out away which has less traffic.

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