Automatic Vehicle Accident Avoidance, Detection and Rescue System using Arduino

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project/internship titled **Automatic Vehicle Accident Avoidance, Detection and Rescue System**, submitted by **Nahid Hasan Sojeeb** ID No: **172-15-9765** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on.

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We hereby declare that this project has been done by us under the supervision of **Md. Zahid Hasan, Assistant Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for the award of any degree or diploma.

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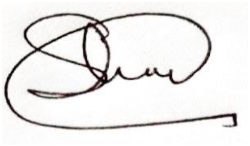

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ABSTRACT

“Automatic Vehicle Accident Avoidance, Detection, and Rescue System” is an IOT-based project where any kind of vehicle accident is detected by Sensors and sends notifications on the system to take necessary actions against the Incident. Nowadays vehicle accident is becoming a curse for our country as well as worldwide. Whenever an accident occurs it takes too much time to inform the rescue unit to take the necessary steps. When the accident happens, many people died and were also injured a lot. But if it becomes possible to detect the accident as early as possible then it will have a lower cost of lives and injures. That is the target of our project. Our project's aim is especially to reduce the inform time of the rescue unit which will help the rescue unit to detect where the accident happened and show them the location through the map. As soon as any Accident is found in any area, it will send the notification to the rescue unit with a location. So that it’ll be easier for rescue units to take necessary steps against the incidents. The project is built with Arduino and some important components.

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CHAPTER 1
INTRODUCTION

1.1 Introduction

In modern society, the number of cars is increasing day by day. As a result, the number of traffic accidents is increasing by 6,686 road accidents in 2020 in Bangladesh. [1] Many lives were taken at every moment. Technology was not invented to avoid accidents. We do not know when and where the accident occurred. Often the lives of victims depend on the mercy of others. Sometimes people don't want to get involved in police work to help victims. Sometimes people don't have time to help the victims. There are many reasons why people are not helping or not helping victims. Meanwhile, the victim died. This is because the victim does not arrive at the hospital on time. Often, residents of the victim's house are unaware that is news at the right time. Tracking the location of an accident in a big city is not easy. We are working to address all of these issues.

I am currently focusing on an automated IOT-Based Accident avoidance, detection, and rescue system that will notify parents or related in time. There are also notify the nearest police station. The nearest ambulance also gets reports with the location of the accident via the Internet. I can ensure that the victim arrives at the hospital on time without any other mercy.

1.2 Motivation

Due to road accidents, a significant number of people lose their lives. Nothing beats the cost of taking 6,686 lives. "No one dies in traffic accidents" is our motto. We can use technology to improve the way we live. So, we need to find a way out of this situation. This project uses the concept of the Internet of Things (IoT) to save the lives of victims endangered by a road accident.

1.3 Rationale of the Study

Bangladesh is recognized as a developing country economically and socially by graduating from Least Developed Countries (LDC). The country is thriving with information and communication technology (ICT). [2] Government and private institutions are progressively advancing using the latest technologies such as Industrial Automation. In addition to business and technical development, the style goes further. We tend to use fashionable technology in all aspects of our lives for a smart and comfortable life.

By using intelligent accident detection in vehicles, we can contribute to the continued evolution of education systems. It will also reduce the city's most important traffic congestion problem and a common problem for everyone around the world. This study is designed to make accident detection systems smarter and could provide a solution for the loss of 6,686 precious lives.

1.4 Research Questions

Accidents are critical in our country. Road safety is also an important concern for our country. When an accident occurs, most people do not know the exact time and place. Sometimes the lives of victims depend on other graces. Road traffic accidents are estimated to kill 5.25 million people every year. About 6,686 people died in traffic accidents in Bangladesh last year (2020). The victim cannot arrive at the hospital on time because the ambulance does not reach the site on time. As the ambulance sometimes reaches the location late, the victim dies on the spot or on the way to the hospital.

The most important factor in this system is the ambulance driver. The driver needs to know the exact scene of the accident. Using a smartphone is convenient for the driver to drive the location at.

1.5 Expected Outcome

My main goal is to develop a real-time rescue system to ensure accident victims arrive at hospitals on time. The system will know if anything happens to the vehicle it automatically provides notification to other people by SMS service. Determine the exact location of the crash site ensuring the safety of the victim's life.

1.6 Report Layout

This report consists of six chapters, and this section provides insight into all six chapters.

- Chapter 1 contains the introduction, motivation, and expected outcome of the study.
- Chapter 2 related research work is discussed. It also provides a field of study for Questions.
- Chapter 3, the requirements of the proposed system, system diagram.
- Chapter 4 describes my proposed system design.
- Chapter 5 contains implementation & testing.
- Lastly, chapter 6 provides the conclusion, future study, references.

CHAPTER 2
BACKGROUND

2.1 Introduction

In this age of technology, the Internet connects to almost everything from computers to cell phones. Due to the high demand and modernization of civilization, inventors, researchers connect more to the Internet. This trend is giving rise to a new concept called the Internet of Things (IoT).

Communication is no longer limited to human-to-human interactions. (IoT) introduced machines for machine communication. Without direct human intervention via the Internet, machines would interact with other machines [3].

Today we are using the (IoT) concept to connect our appliances and other necessities to the internet, so why not use some kind of vehicle? This study aims to develop an intelligent collision detection system by connecting all vehicles to the Internet.

2.2 Related work

This is not the original plan. Many similar systems have been implemented since the smart city concept began, but new initiatives for intelligent incident detection and rescue systems have emerged with proper navigation and real-time map visualization.

This article [4] proposes a system that detects an accident when a switch is pressed. After an accident, the airbag is opened and the brakes are automatically engaged. Then the buzzer will sound. The microcontroller uses the GPS module to get the coordinates of the location. GSM then sends information about the incident to the victim's family. They can take immediate action just like an ambulance.

This article [5] describes the accident that will be detected by GPS, GPRMC, MCU by speed monitoring algorithm. In case of an accident, where the accident happened, speed before the accident, date, time, every which will be available by SMS using GPRS.

This article [6] proposes an intelligent rescue system using Android applications. If the user can turn off this system if they wish, the user will always be in an automatic monitoring state. This system detects all kinds of jerks and provides warnings. If false, the user can cancel it. If the user does not cancel this notification within 15 seconds, the victim's location is received via the API. The nearest rescue team will then drop the victim.

This article [7] proposes a system that can detect accidents using the 3-axis accelerometer sensor on a cloud server. It automatically sends the nearest ambulance by processing GPS coordinates and providing a specific route to a specific accident site. Ambulance drivers can quickly reach the location using GPS. The database stored the accident information.

After a thorough review of the documents, it can be concluded that most of the systems used multiple sensors to detect accidents, which increased the cost of the project. But in this proposed Model, I want to reduce the cost of the project and also reduce the complexity of the interface.

2.3 Research Summary

In my study, my main goal is to develop a real-time rescue system to make sure people who have an accident get to the hospital on time. We will look at the economic and overall state of our country. It will take time to replace all vehicles with smart vehicles and it will be very expensive. Therefore, we will use the existing facilities in the current system using some useful sensors.

For better support, I use the Arduino board and GSM module.

2.4 Scope of the problem

The development of automobiles is a decisive factor in population growth. As a result, this becomes a disaster due to a traffic accident. This research focuses on finding ways to develop smart accident detection and rescue systems to reduce the risk of life for victims after an accident.

Tracking Easily:

This system makes it easy to identify the location of the accident using GPS. To this end, the ambulance will receive up-to-date information about the accident and rescue the victim as soon as possible.

Reduce waiting time:

The ambulance at point knows the location and time of the accident, so the victim does not have to wait for an ambulance for long.

Cost efficiency:

The cost of this project is usually lower than other systems.

Easy to use:

The system offers a design with advantages of low cost, portability, and a small footprint. It consists of accelerometers, GPS, and GSM sensors, and interfaces reduce the chance of an accident.

2.5 Challenges

In our country, there are many problems when an accident happens.

Traffic challenge:

The condition of the road cannot be accurately predicted. So, after receiving the accident data, the ambulance cannot reach this place due to unpredictable traffic jams.

Network issues:

In our country, the network connection system is a bit slow compared to other countries. There was a problem when connecting to the Internet in dynamic media.

Crowd control:

When an accident happens too many crowds are there for recording or to watch what happened it makes the traffic jam.

CHAPTER 3
REQUIREMENT & SPECIFICATION

3.1 Introduction

Requirements analysis includes several approaches taken to determine a particular attribute, needs, and expectations by interacting with the users of the system. It requires a combination of hardware, software.

In the software industry, requirements analysis is also known as functional analysis. Functional analysis should be understandable, relevant, and actionable for any application. Before implementing a project, the project team must have a clear understanding of which features are used. This requirement is a type of description of the properties and characteristics of any application.

3.2 Working Explanation

For operating the project, an Arduino board is used to manage the entire operation along with two modules such as a GPS receiver and a GSM module. In case of any emergency, the accelerometer named ADXL335 is set to detect accidents or sudden changes in an axis. The ultrasonic sensor is used to detect if an object is found in front of the sensor the system cut off the engine. Unrequired LCD 16x2 is also utilized to display the status messages or coordinates. The GPS receiver determines the vehicle's coordinates, and the GSM module is utilized to send an emergency SMS containing the coordinates and a Google Maps link. GPS module SIM28ML and GSM module SIM900A were used to perform the operation.

In fig-3.1, the architecture of the proposed system consists of Arduino, GPS, and GSM modules with some sensors.

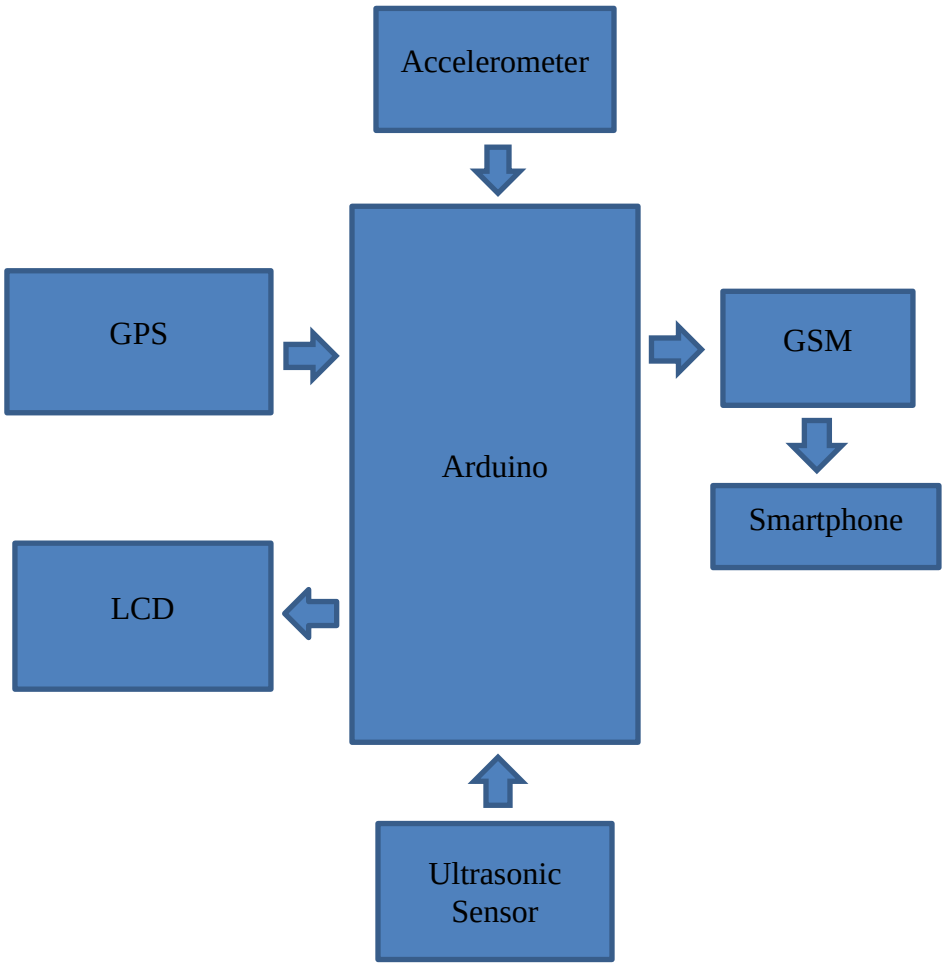

Fig-3.1: The architecture of the proposed system

3.3 Overall system activity diagram

The sensor first checks for a collision. Then checks whether a crash has occurred. If there are no conflicts, no action is started. However, when an alarm occurs, the sensor receives the location and sends it to the microcontroller. After that, the microcontroller sends an SMS to the rescue unit.

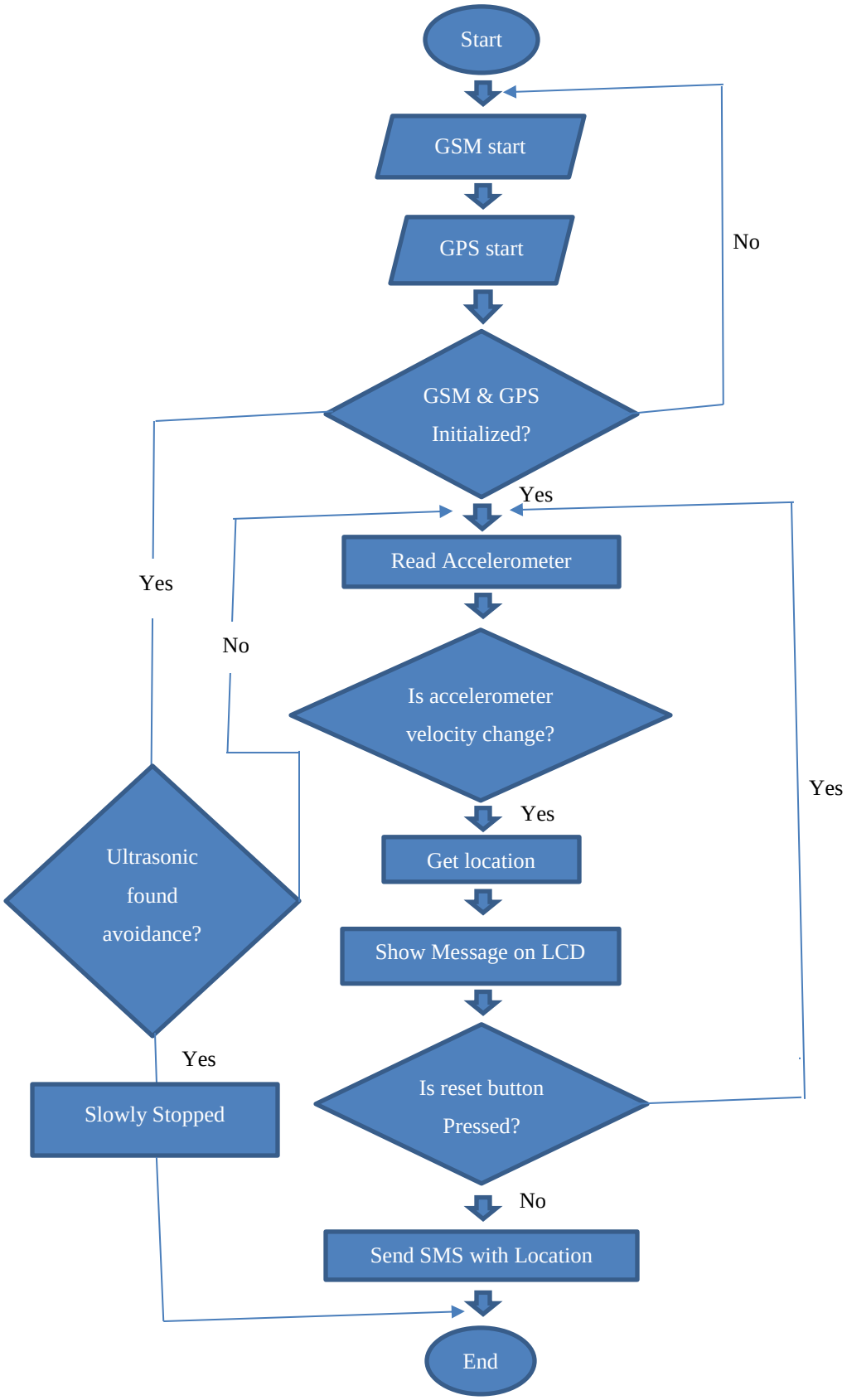

Fig-3.2: Overall system activity diagram

3.4 Equipment for Proposed System

- Arduino
- GSM module
- GPS module
- Accelerometer
- Ultrasonic
- Connecting Wires
- Power supply

3.4.1 Arduino IDE

Arduino is a corporation, initiative, and user community. They make single-board microcontrollers and microcontroller kits for making different automated digital devices using open-source hardware and software. Arduino consists of a programmable physical board (microcontroller) and software addressed as IDE (Integrated Development Environment) that runs on the computer. The software is usually used to write code and load that into the physical device. Arduino boards can be ordered directly from the Arduino website or through authorized dealers. [8, 9]

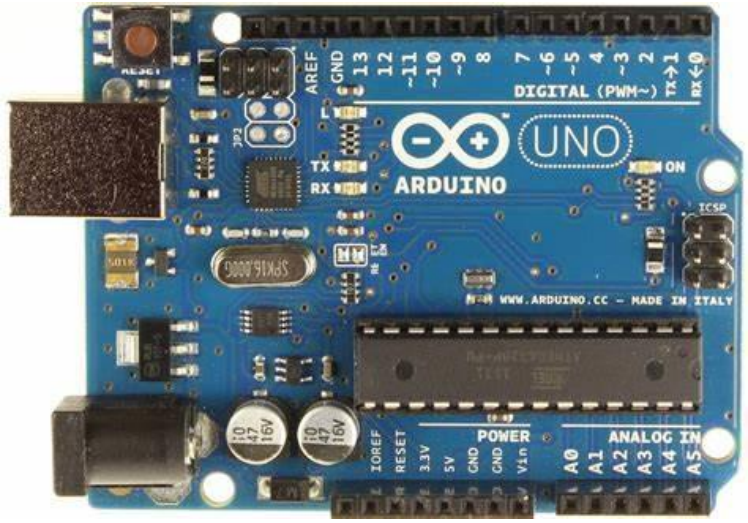

Fig-3.3: Arduino

3.4.2 GSM Module

GSM module SIM900A is used for GPRS/GSM communication. It is the smallest and cheapest module available. The module is used for Arduino and microcontrollers in most embedded applications. It provides GPRS/GSM technology for communication using a mobile SIM card with 900 and 1800 MHz frequency bands. The users can perform mobile calls and SMS, along with receiving them. There are also other modes such as command mode, and data mode. Command mode helps developers change the default settings to suit their needs. However, each country has specific GPRS/GSM technology and certain protocols/frequencies. [10]

Fig-3.4: GSM Module

3.4.3 GPS Module

To find a location on Earth, the whole area is sectioned into some coordinates and you can easily determine your location using a system called the GPS module. For that purpose, GPS SIM28ML is used here. This module finds the vehicle's location and, the data received from the GPS receiver is received through coordinates, later the received data is first transmitted to the Arduino, and then it is transmitted to the stored pin. With the GSM

module, the frequency operates in the 1575.42 MHz band, and the GPS module output is in NMEA format with data such as the real-time location. [11]

Fig-3.5: GPS Module

3.4.4 Accelerometer

The accelerometer is a micro-machined structure built on a silicon wafer that serves as the sensor. It is suspended by polysilicon springs, hence, when the sensor is under acceleration in any of the directions in 3D courtesan coordination such as the X, Y, and/or Z axes, the structure moves seamlessly in any direction. As the structure deflects, the capacitance between fixed plates and plates attached to the suspended structure changes. This change in capacitance on each axis is converted to an output voltage which is proportional to the axis's acceleration. [12]

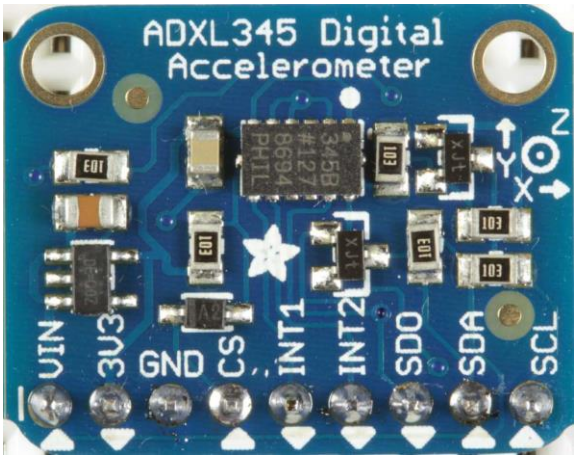

Fig-3.6: Accelerometer (ADXL335)

3.4.5 Ultrasonic sensor

Unlike laser-based distance measuring tools, ultrasonic sensors not only provide distance measurement without physical touch but also without noise and light. Furthermore, even in daylight, where laser-based devices lose efficiency, these equipment are less expensive and more reliable. Distance measuring tools have been in use for centuries, and with the passage of time, their designs have improved. [13]

Fig-3.7: Ultrasonic sensor

CHAPTER 4
SYSTEM DESIGN

4.1 Introduction

In this section, we'll talk about the practical technique we used to tackle the problem. The proposed system demonstrates the desired outcome. When an accident happens, the accelerometer will be the first to be detected. The situation of the accident is known to the system. The system then tracks the ambulance driver and sends an offline SMS. The SMS will contain the accident location, and the driver will be directed to that site. Other users whose phone numbers are stored in the database will receive an SMS containing accident information. They can see where the accident occurred and choose a different route.

4.2 System Design

The goal of this research was to develop a smart rescue system in the event of an accident. The vehicle's location coordinates are manually measured using a GPS sensor. These coordinates, which are made up of latitude and longitude data, will display where the vehicle is located. In Figure-4.1 smart car component is shown.

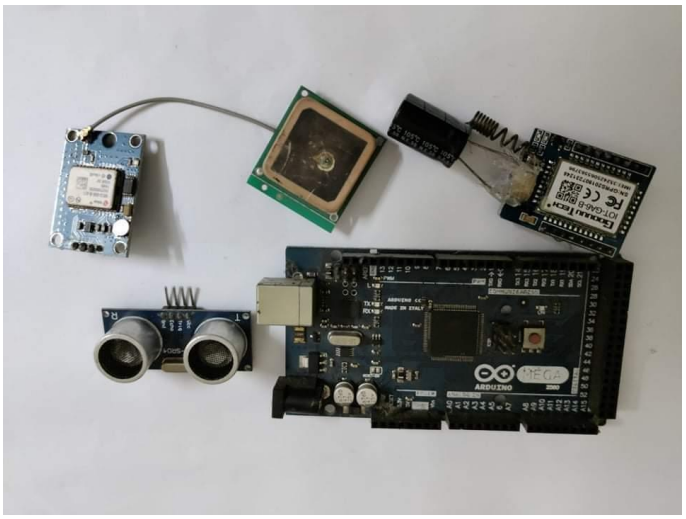

Fig-4.1: Smart Car component

Figure 4.2 depicts a smart automobile. In the front of the car, there will be an ultrasonic sensor. Inside the car, there is also a GPS sensor. An accelerometer sensor was installed on the car's roof. The accelerometer and GPS have a relationship, and the GPS will be able to properly pinpoint the location of the accident. Following the detection, the GSM module sends a request for assistance to a previously stored number.

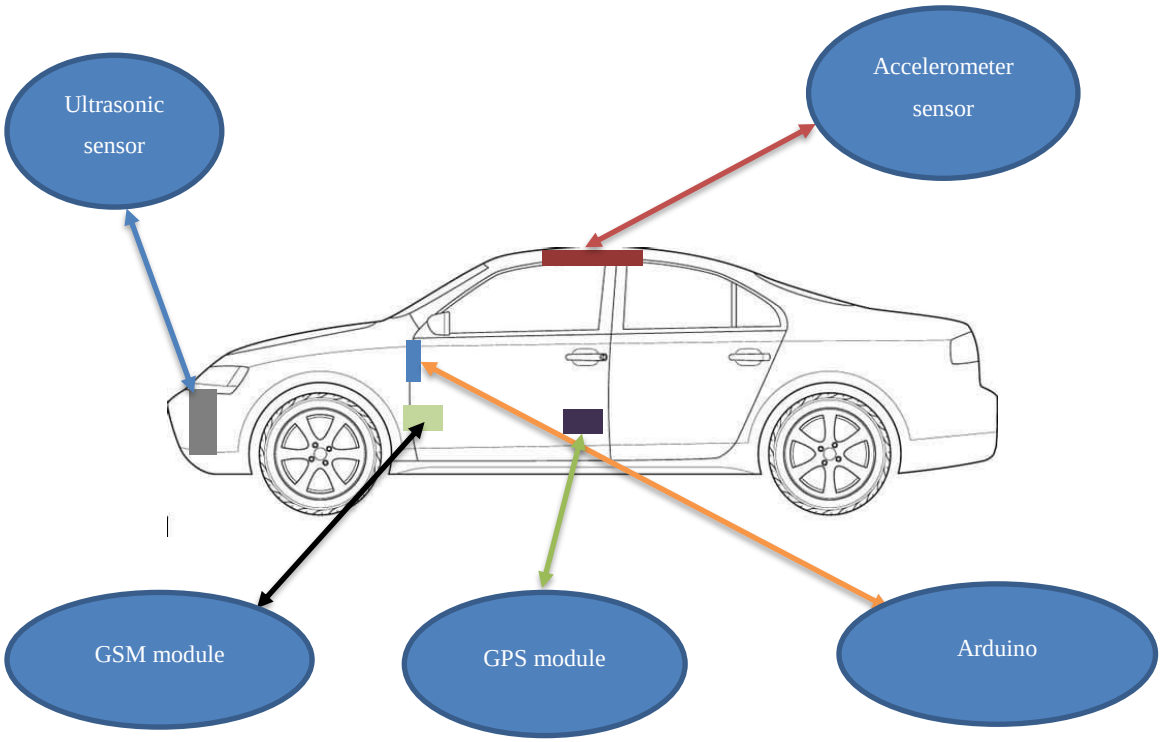

Fig-4.2: Smart Car

CHAPTER 5
IMPLEMENTATION & TESTING

5.1 Introduction

Implementation is the process of taking action on a developed plan. Before proceeding with implementation, the plan must be completed and the goals must be clear. Implementation testing is testing each of the steps in the plan to make sure they work. [14]

Software testing is the process of evaluating software to identify bugs, or errors, and to determine whether or not the software meets its intended purpose. The purpose of this test is to make sure the system is working correctly. The process of testing the system to ensure that it meets the specified requirements. [15]

5.2 The Proposed System's Implementation

Before Collision

I have used an Ultrasonic sensor to avoid Accidents. In the fig-5.1 second car has the smart component in front of the car that has a minimum safe distance set in case of a car slows down or brakes to avoid the accident by slowing the engine and lastly stop the engine.

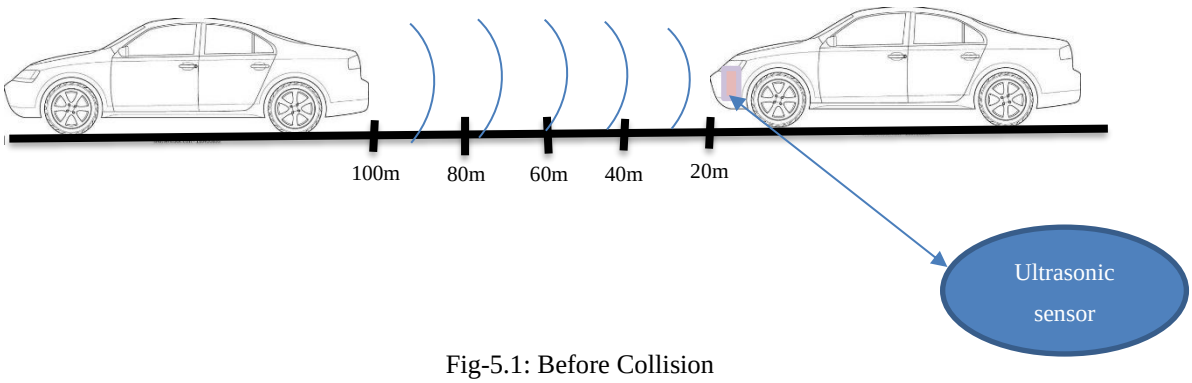

Fig-5.1: Before Collision

Collision detects

If in case an accident happened then the device detects the Collison with the help of the accelerometer sensor. In the fig-5.2 the car rooftop has the sensor when a collision happens the sensor axis changes and it notifies the other module to take the necessary step.

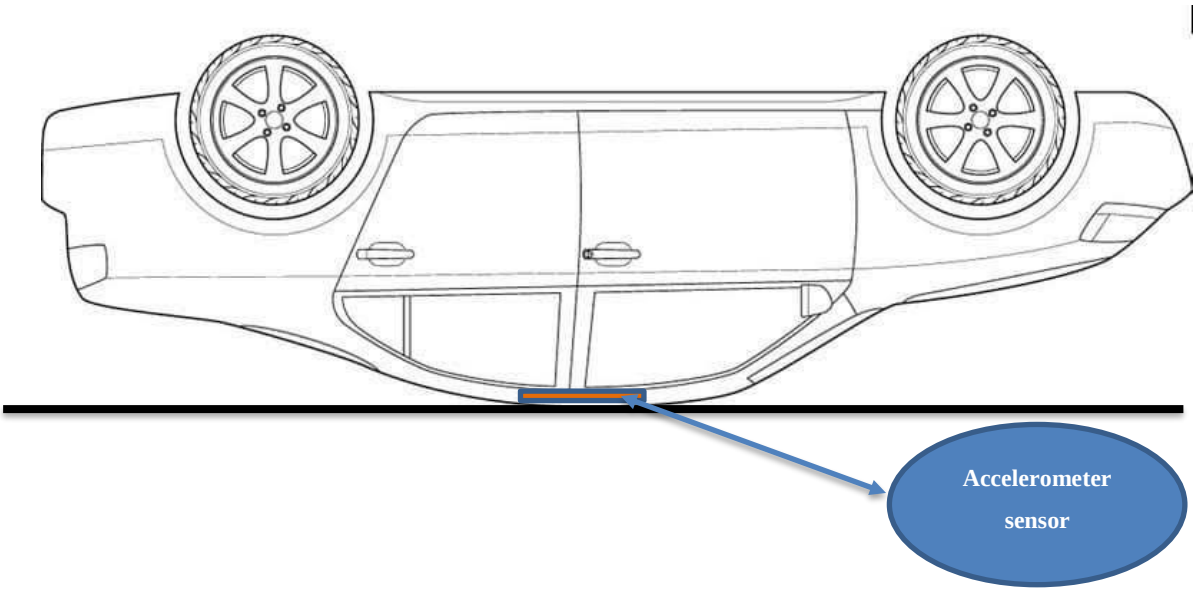

Fig-5.2: Collision Detects

Location detection

After the collision, the GPS sensor detects the current GPS position of the vehicle then it refers the message to the other module for the next step. A GPS module is built into the vehicle to easily locate the accident location. In figure-5.3 shows the GPS module.

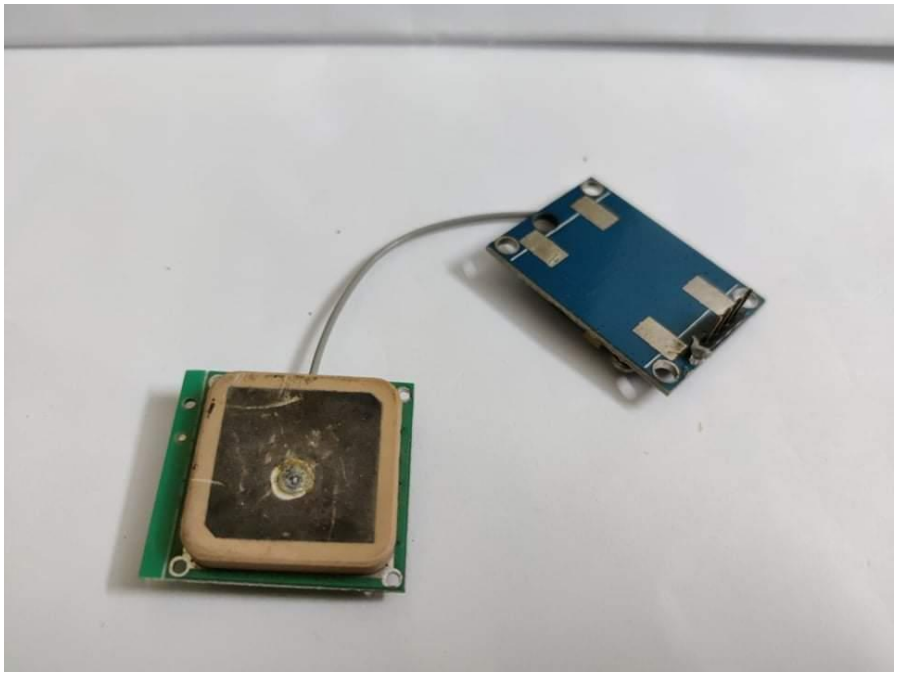

Fig-5.3: Location Detection

Sending text messages

This system's SMS sending system is depicted in Figure-5.4. When the system collects the users' stored contact numbers, the GSM Module sends an SMS with the accident location link to the users. The GSM Module is used to send SMS, make phone calls, and so on.

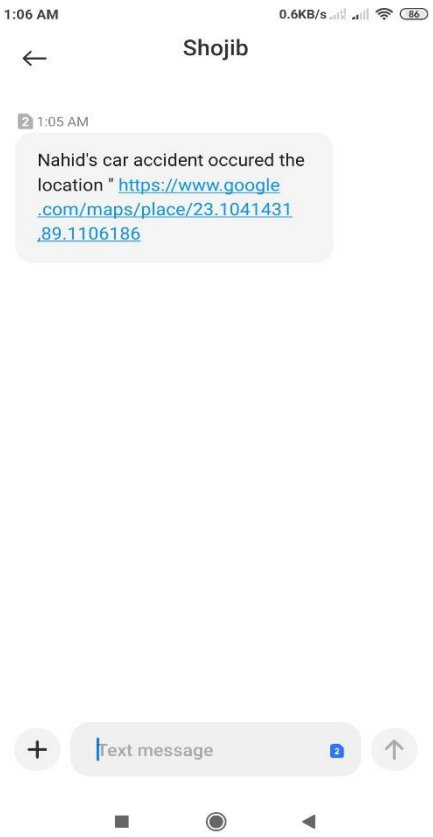

Fig-5.4: Sending Text Message

Identify the location

The map is presented in figure 5.5. When a user clicks the accident location link, a Google map of the accident location appears. Knowing the location allows them to alter their course to get to the destination, and an ambulance will arrive at the accident site to save the victims.

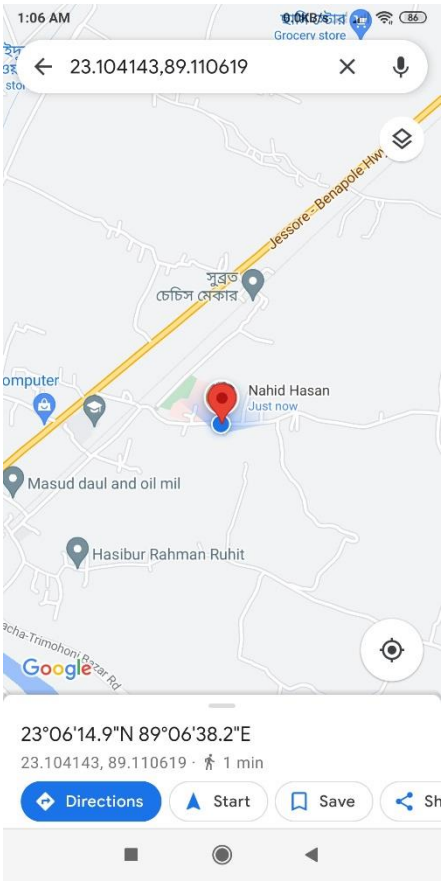

Fig-5.5: Identify the location

5.3 System testing of the proposed system

Integration Testing

Integration testing is the process of testing several components of a software project as a whole. This decides whether they work together as a system or as a whole in a seamless manner. The purpose of the integration test is to troubleshoot communication between integrated devices. [16]

For each module of this system, Table 5.1 displays test cases, expected results, and observed results.

Test Case	Expected Outcome	Observed Outcome	Test Result
Ultrasonic Sensor able to detect an obstacle	Obstacles can be detected	Obstacle detected	Pass
If an accident occurs accelerometer able to detect the accident	Accidents can be detected.	Accident detected	Pass
This system's GPS module should be able to accurately detect vehicle location.	The location should be precise.	Location exact	Pass
This system's GSM module should be able to transmit SMS.	A text message will be sent.	The text message has been sent	Pass

TABLE 5.1: INTEGRATION TEST

System Testing

System testing is a type of validation technique that is done on an entire integrated system to see if it meets its criteria. All the passed integrated components by integrated testing are fed into system testing. Integration testing is used to identify discrepancies between the linked units (called assemblages). [17]

Table 5.2 displays system testing test scenarios, expected results, and observed results.

Test Case	Expected Outcome	Observed Outcome	Test Outcome
The user should be able to successfully receive SMS from this system.	Can receive SMS	SMS Received	Pass
The user should be able to see where the accident occurred.	Can see the Location	See location	Pass
The ambulance should be able to acquire directions to the accident site.	Will be guided in the right route.	Guided in the right route.	Pass

TABLE 5.2: SYSTEM TESTING

CHAPTER 6
CONCLUSION & FUTURE WORK

6.1 Conclusion

The proposed system deals with accident alerts and reveal. Arduino is the core of the system and helps Send messages to different devices in the system. The Accelerometer sensor will be activated when an accident occurs and the information is transmitted to the registered number via the GSM module. The location can be sent with GPS through a tracking system to cover the geographical area Coordinates over the area. The accident can be recognized by an accelerometer sensor, which is used as the main module in the System. The system offers a design that is low in cost, portable, and tiny in size. It is made up of an accelerometer sensor, GPS, and GSM interface, all of which work together to lessen the risk of an accident. It also solves a number of issues with an automated approach for detecting accident locations. As a result, it decreases the time spent searching for the location as quickly as possible, allowing the individual to treat the patient right away, potentially saving many lives. The accident system project's major goal is to reduce the number of people killed or injured in such events. This innovation is even more useful for accidents that occur in deserted areas or at night. In the future, this system will play a significant part in daily life.

6.2 Future Work

Accident detection is the focus of the proposed system. However, by administering treatment to accident victims on the scene, this can be extended. We may also avoid accidents by boosting technology by offering alert systems that can stop the car to avoid collisions. A buzzer could be used to notice an accident. If an accident occurs, the alarm sound warns the surrounding area. This is a single-stage shock sensor that detects any type of hard impact. These sensors are installed on all sides of the vehicle to detect any hit. This can be converted in the future using the program.

REFERENCES

1.Learn more, available at << https://www.dhakatribune.com/bangladesh/2021/01/09/report-18-people-killed-every-day-on-average-in-road-accidents-in-2020#:~:text=As%20many%20as%206%2C686%20people,accident%20monitoring%20report%20for%202020 >>. Last accessed on 10/11/2021 06:06PM

2. Learn more about, available at << https://www.thedailystar.net/frontpage/news/becoming-developing-nation-bangladesh-reaches-milestone-2052161 >>. Last accessed on 10/11/2021 06:10 PM

3. Learn more about IOT, available at << https://www.internetsociety.org/resources/doc/2015/iot-overview/?gclid=Cj0KCQiAkNiMBhCxARIsAIDDKNUJU3woJbdBJtgw0XUzr6X0wZ1Q5dTPPf6BKsCqBlMqtiBmj6wkifYaArcZEALw_wcB >>. Last accessed on 11/11/2021 06:10 PM

4. Prof. Pankaj A Bhoite, Koli Gopal, Wadile Saga, Tejaswini Sisodiya, Patil Satish "Accident Detection System Using Arduino". International Science and technology journal- Volume 7, Issue 4, 2018.

5. S.George Fernandez, R. Palanisamy, K. Vijayakumar "GPS & GSM Based Accident Detection And Auto Intimation". Indonesian Journal of Electrical Engineering and Computer Science. Vol.11, No.1, July 2018, pp 336-361.

6. Arsalan Khan, Farzana Bibi, Muhammad Dilshad, Salman Ahmed, Zia ullah, Haider Ali "Accident Detection and Smart Rescue System using Arduino Smartphone with Real-Time Location Tracking". (IJACSA) International Journal of Advanced Computer Science and Application. Vol 9 No 6, 2018.

7. Karmokar, Pranto & Bairagi, Saikot & Mondal, Anuprova & Salehin, Md.musfaq-Us & Nessa, Nazmun & Karim, Asif & Yeo, Kheng Cher. (2020). A Novel IoT based Accident Detection and Rescue System. 10.1109/ICSSIT48917.2020.9214296.

8. Learn more about Arduino, available at << https://learn.sparkfun.com/tutorials/what-is-an-arduino/all >>. Last accessed on 16/11/2021 11.30 PM

9. Learn more about Arduino, available at << https://en.wikipedia.org/wiki/Arduino >>. Last accessed on 15/11/2021 12.00 AM

10. Learn more about sim900a, available at << https://microcontrollerslab.com/sim900a-gsm-module-pinout-examples-applications-

datasheet/#:~:text=SIM900A%20GSM%20Module%20is%20the%20smallest%20and%20cheapest,allows%20users%20to%20receive%2Fsend%20mobile%20calls%20and%20SMS. >>. Last accessed on 17/11/2021 02.07 PM

11. Learn more about sim28ml, available at << https://www.simcom.com/product/SIM28ML.html >>. Last accessed on 17/11/2021 03.44 PM

12. Learn more about accelerometer, available at << https://learn.adafruit.com/adxl345-digital-accelerometer >>. Last accessed on 17/11/2021 04.29 PM

13. Learn more about Ultrasonic sensors, available at << https://circuitspedia.com/arduino-ultrasonic-sensor-code/ >>. Last accessed on 18/11/2021 03.03 PM

14. Learn more about implementation testing, available at << https://www.tutorialspoint.com/software_testing_dictionary/implementation_testing.htm#:~:text=Implementation%20is%20the%20process%20of%20putting%20an%20action,the%20plan%20is%20said%20to%20be%20implementation%20testing. >>. Last accessed on 18/11/2021 06.37 PM

15. Learn more about system testing, available at << https://askinglot.com/what-is-system-testing-and-implementation >>. Last accessed on 18/11/2021 07.18 PM

16. Learn more about integration testing, available at << https://www.codecademy.com/resources/blog/what-is-integration-testing/ >>. Last accessed on 22/11/2021 06.41 PM

17. Learn more about system integration testing, available at << https://en.wikipedia.org/wiki/System_testing >>. Last accessed on 23/11/2021 09.53 PM

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