



SABARAGAMUWA UNIVERSITY OF SRI LANKA

FACULTY OF APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES & TECHNOLOGY

Bachelor of Science (special) Degree in Computer Science and Technology

Independent Project in Computer Science and Technology

PST 41236

Name	:- P. D. M. I. Pathirage
Supervisor	:- Dr. J. B. Ekanayake
Reg. No	:- 12/AS/074
Index No	:- EP1477
Dept.	:- P. S. T
Date	:- 10/10/2017

Accident Tracker

Supervisor: - Dr. E. M. U. W. J. B. Ekanayake

**Report submitted in partial fulfillment of the requirement for
Bachelor of Science (Special) Degree in Physical Sciences & Technology**

**DEPARTMENT OF PHYSICAL SCIENCES AND TECHNOLOGY
FACULTY OF APPLIED SCIENCES**

SABARAGAMUWA UNIVERSITY OF SRI LANKA
October 2017

P. D. M. I. Pathirage
12/AS/074
EP1477

Declaration

This project has been done as the mini project for the fourth year first semester, Department of Physical Sciences and Technology, Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka. Project was supervised and guided by Dr. E. M. U. W. J. B. Ekanayake and our department head has given great support at progression of the project. All the work relating to this application including designing, programming and development has been done by P. D. M. I. Pathirage (12/AS/074) and I was able to collect a vast knowledge about arduino with new modules and asp.net development with new keywords and MVC architecture. I did my best to get this program up to the expectations and the goals I elaborated in the project proposal. This document is the final report of this project which includes abstract, system requirements, planning, system analysis, design, development and testing.

.....

Name of the Student

.....

Signature of the Student

Date:

Certificate of Approval

I hereby declare that this project is from the student's own work and effort, and all other sources of information used have been acknowledged. This project has been submitted with my approval.

.....

Supervisor

Dr. E. M. U. W. J. B. Ekanayake.

Department of Physical Sciences and Technology,

Faculty of Applied Sciences,

Sabaragamuwa University of Sri Lanka.

.....

Signature of Supervisor,

Date:

.....

Head of the Department

Prof. G. M. L. P. Aponsu.

Department of Physical Sciences and Technology,

Faculty of Applied Sciences,

Sabaragamuwa University of Sri Lanka.

.....

Signature of Head,

Date:

Acknowledgement

I have taken many efforts in this project. However, it would not have been possible without the kind support and help of many individuals. I would like to extend my sincere gratitude to all of them. In the first place I would like to record my heartfelt gratitude to my supervisor Dr. E. M. U. W. J. B. Ekanayake exemplary guidance, monitoring and constant encouragement throughout the course of this project. I am highly indebted to her for his support in completing the project.

My heartfelt gratitude first goes to my parents for their moral, spiritual and financial support during the preparation of this work, and family members and my friends who helped not only in resources but also in guidance and encouragement.

I take this valuable opportunity to express our sincere gratitude and appreciation to all those who supported me towards making this project a success. I offer my special thanks to Dr. Jayalath Ekanayake and all staff members of Sabaragamuwa University who delivered us an invaluable support in both academic and nonacademic aspects. I also would like to thank all friends for extending their hand of friendship and providing moral support during preparation of interim report.

Finally we thank all those whose names were not mentioned for their help and encouragement in completing my project.

Abstract

An accident tracker is very useful for inform relations automatically when accident happen and tracking the location of vehicle at any time. Accident tracker is based on Arduino and ASP.NET. This system implemented with Global Positioning System (GPS), Global System for Mobile communication technology (GSM), Force Sensitive Resistor (FSR) and Flame sensor. FSR and flame sensor use to identify an accident, GPS module provides geographic coordinates. Then the Global system for mobile communication module transmits the geographic coordinates of vehicle and information about accident to accident tracker web application. Then web application send information about accident to owner's predetermine relation's phone. And also owner can find his or her vehicle through accident tracker web application or sending specific SMS to accident tracking device. And also owner can find details about accident history from the accident tracker web application. The proposed accident tracker is user friendly and ensures safety and surveillance at low maintenance cost.

Keywords - GPS, GSM, FSR, Flame sensor, Arduino.

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Chapter 1

1. Introduction

1.1. Definition of the problem

Every day millions of people are facing different types of unexpected vehicle accidents therefore they need easy and cost effective way to get recovery. Even some one feels safety due to having a phone with them, but there exists several problems regarding safety.

It's difficult to find and contact nearby Hospital, Police Station, Fire brigade or Insurance Company at once using a phone.

- It takes more time to inform nearest Police Station, Hospital, and Fire Brigade, when unable to find the contact number directly.
- if the person who faced the accident get unconscious, he/she won't be able to inform the relevant authorities and his/her relation who need to be informed in an emergency.

When we call emergency numbers like 119,118, it takes more time to gather information about damage, location of accident and how many people are get damaged etc.

And also it's difficult to contact and inform nearby relation and Insurance Company quickly.

Apart from all these things, the normal procedure is not reliable, efficient and trustworthy.

In my application, the client does not need to find contact numbers and inform the authorities manually. Accident Tracker improve the efficiency, reliability and trustworthy of the recovery.

1.2. Business process

Initially, I am planning to introduce this system to vehicles, hospitals, police stations and fire brigade around the Colombo city. The hardware device of this system is implementing to compatible with every type of light weight motor vehicles. We are charging initial payment for installing this hardware device and we offer three months of free service of mobile network. After that we are charging fix payment in every month for the service which gave by service provider.

Insurance company need to register with us to provide ultimate service. Accident Tracker web server must have good security and better resistance to traffic jam. The server cannot shutdown even for a while. Because that shutdown may effect very badly to the service, provide by the system.

1.3. Aims and objectives

The goal of this project is to implement an automated accident tracking device with arduino four wheel robot car and web application.

When accident happen, FSR take the force, flame sensor take the fire as true or false, GPS receiver take the coordinates and GSM send those information to the web application.

Web application's database store the accident information and it send the accident information to the user's predefine relations through SMS and user can track his/her vehicle at any time.

1.4. Scope of the system

The primary purpose of this accident tracker is automatically detect an accident (after accident happen) and inform user's relations about the accident.

The secondary purpose is tracking vehicle at any given time. Therefore this device can act as a theft prevention and retrieval device.

Chapter 2

2. System analysis

2.1. High level diagram for existing system/process

In here we don't have any existing system to detect an accident based on arduino and web application. This system will help to detect accident and inform it to his/her relations and this application will provide needed output according to the request.

2.2. Software requirement specification

Through several number of requirement gathering methods we have collected number of requirements which are users expecting from a detecting an accident. Among those requirements we have selected some requirements which are in our scope.

- Detect the accident using FSR and flame sensor.
- Accident tracker device can implement on any vehicle, because it is stand-alone device.
- Accident tracker application can run on any platform, because it is web application.

We have gone through these requirements and have considered things mentioned above and when developing needed requirements will be included.

2.3. Cost benefit analysis

2.3.1. Hardware cost

We want arduino boards, motor control, four wheel arduino robot car, Bluetooth sensor, external battery, FSR, flame sensor, SIM card, SIM808 EVB V-3.2 module and smart phone to control the robot car.

2.3.2. Software cost

To develop this application we need advanced IDEs like Visual Studio development tool and Arduino IDE etc. When we considering about hardware cost in this project we can clearly see that using arduino modules, actuators and sensors. When we come to software cost, to develop asp.net applications we do not need to bother about software cost. Because Visual Studio is an open source project and software that need to code are all free. But still they offer free set of tools.

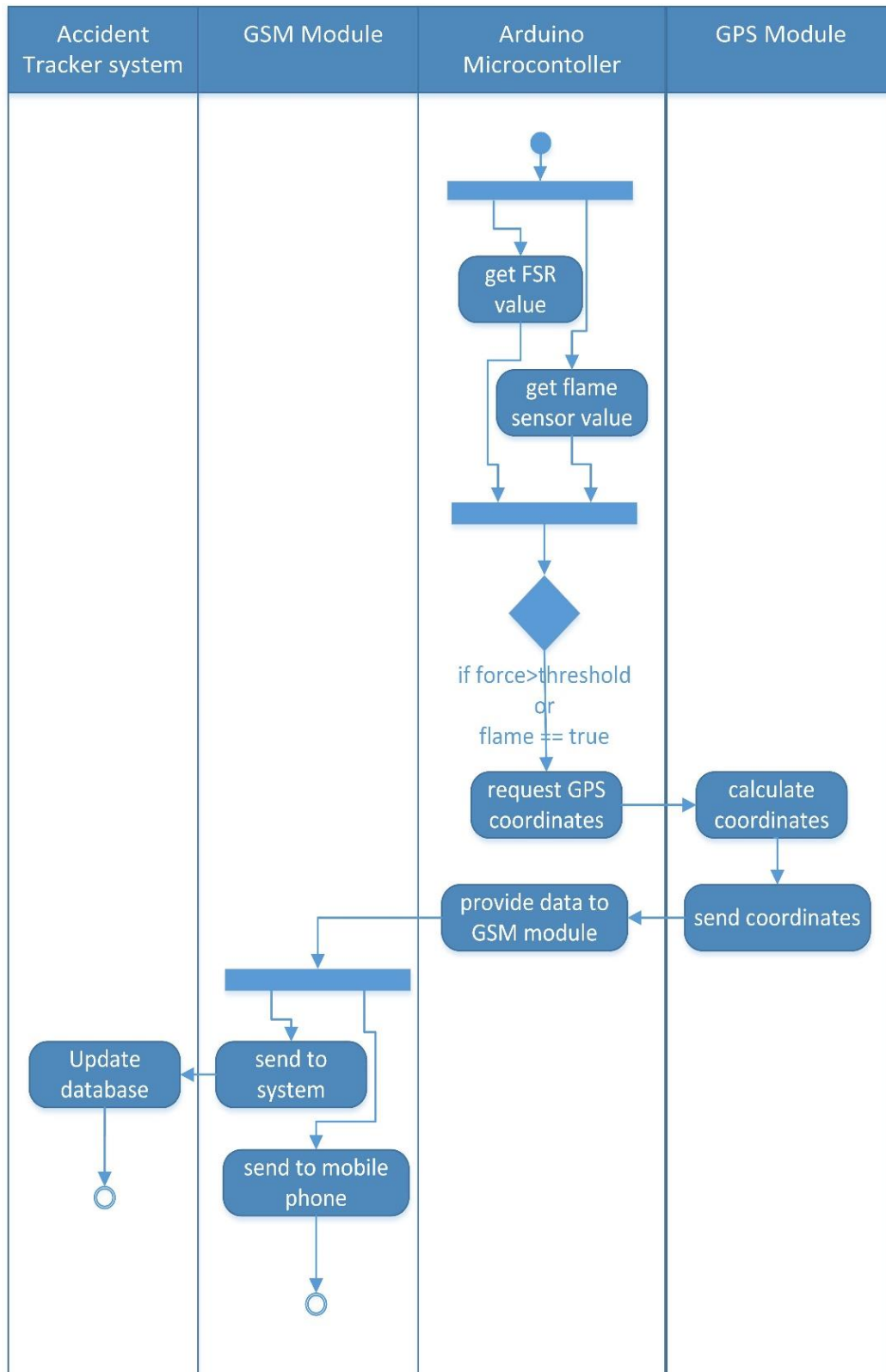
Chapter 3

3. System Analysis

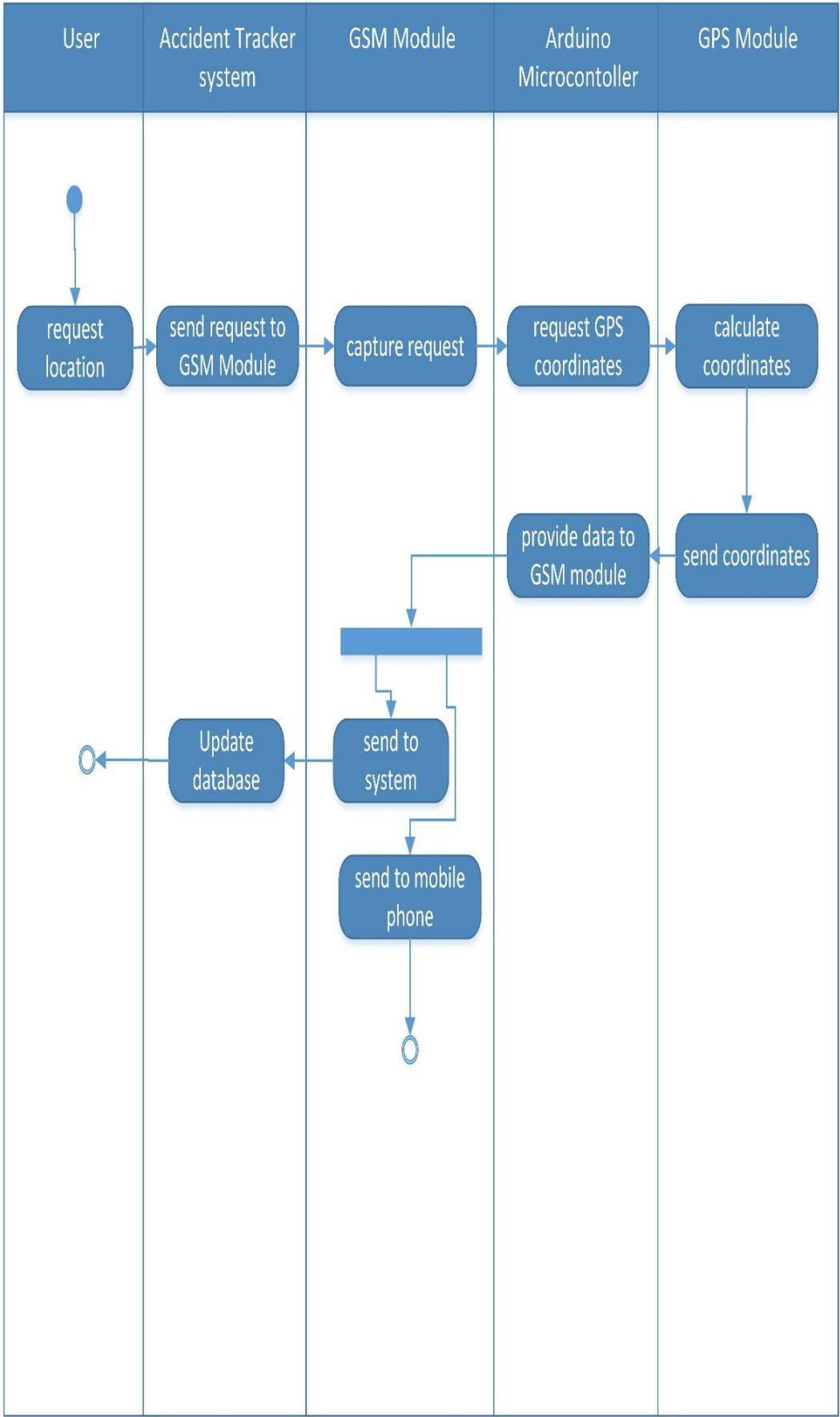
3.1. High Level diagram for existing system/process

3.1.1. Activity diagram

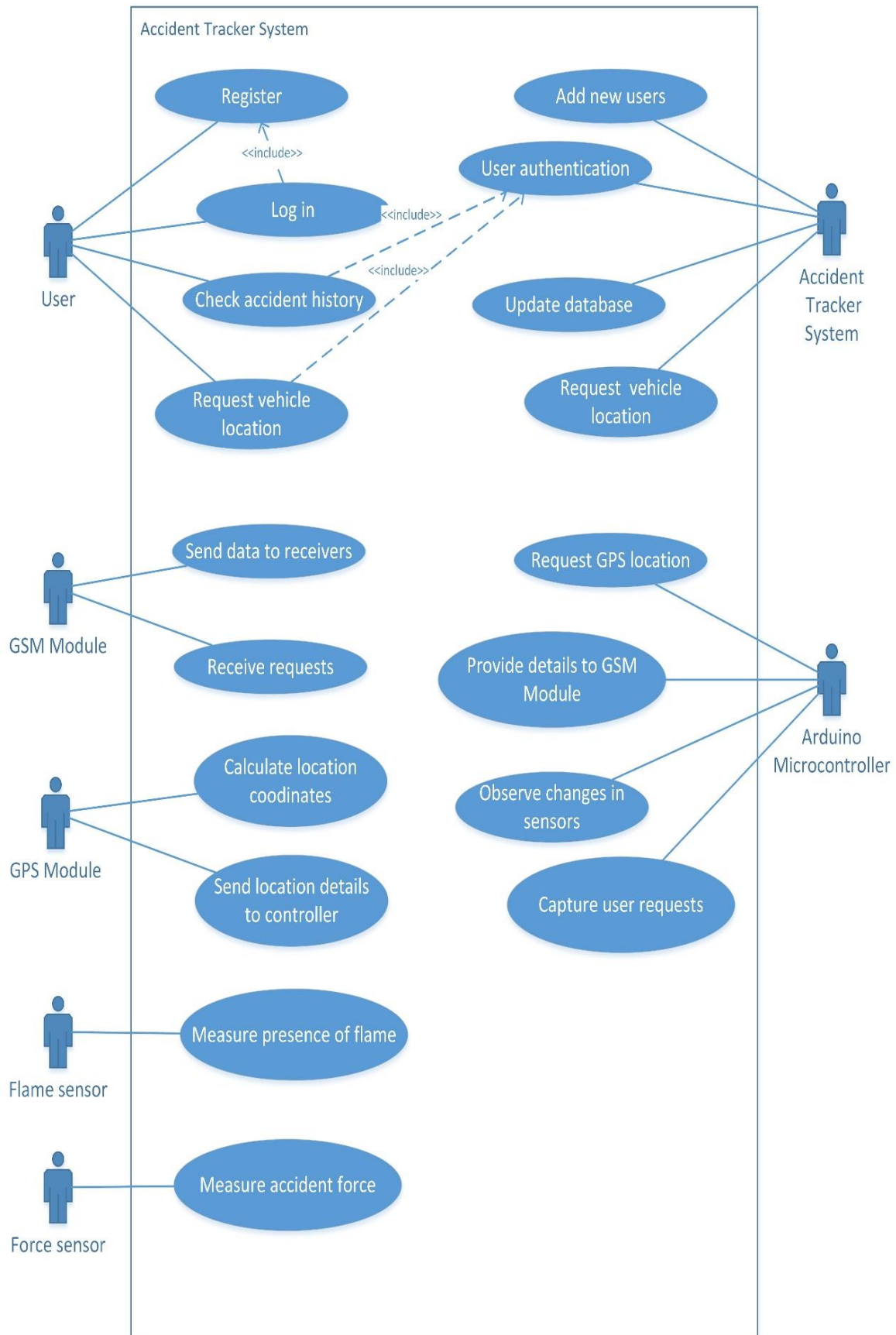
- For Accident



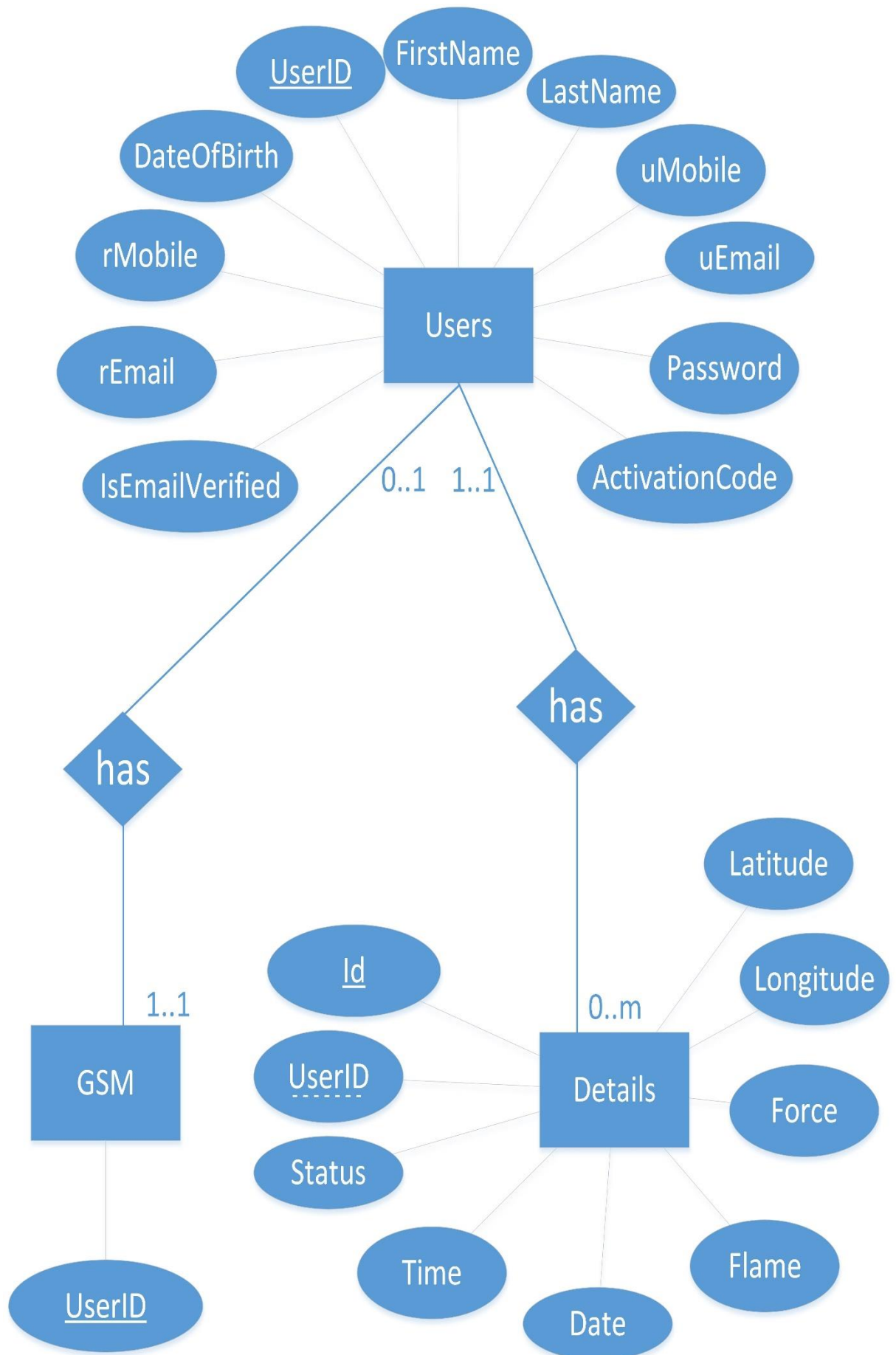
- **For track the vehicle**



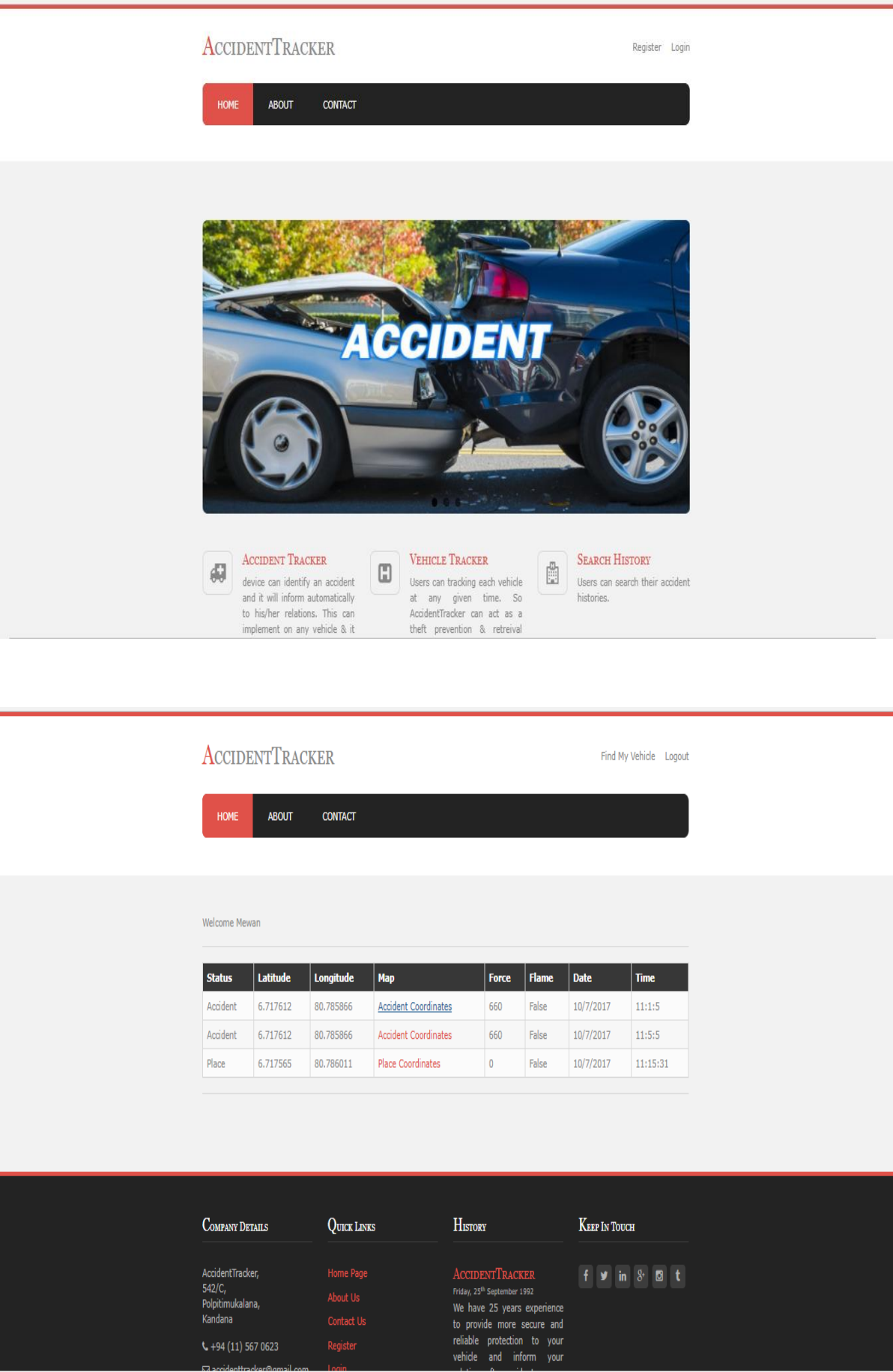
3.1.2. Use case diagram



3.1.3. ER Diagram



3.2. GUI design



Chapter 4

4. System development

4.1. Programming language and development tools

When selecting the tools and technologies for the development of Accident Tracker system the main factors that have considered is the matching of the requirement with the hardware, software and human technological capabilities which are available in the context. Since the application is related to detection algorithms, Choosing related tools and Platforms are very critical. Visual Studio and Arduino IDE were my development environments.

What is Visual Studio?



Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs for Microsoft Windows, as well as web sites, web apps, web services and mobile apps. Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silverlight. It can produce both native code and managed code.

Visual Studio includes a code editor supporting IntelliSense as well as code refactoring. The integrated debugger works both as a source-level debugger and a machine-level debugger. Other built-in tools include a code profiler, forms designer for building GUI applications, web designer, class designer, and database schema designer. It accepts plug-ins that enhance the functionality at almost every level including adding support for source control systems and adding new toolsets like editors and visual designers for domain-specific languages or toolsets for other aspects of the software development lifecycle.

Visual Studio supports 36 different programming languages and allows the code editor and debugger to support nearly any programming language, provided a language-specific service exists. Built-in languages include C, C++ and C++/CLI, VB.NET, F# and TypeScript. Support for other languages such as Python, Ruby, Node.js, and M among others is available via language services installed separately. It also supports XML/XSLT, HTML/XHTML, JavaScript and CSS.

What is Arduino IDE?



The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text.

The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

The Arduino compiler/IDE accepts C and C++ as-is. In fact many of the libraries are written in C++. Much of the underlying system is not object oriented, but it could be. Thus, "The arduino language" is C++ or C.

C# Programming Language?

C# syntax is highly expressive, yet it is also simple and easy to learn. The curly-brace syntax of C# will be instantly recognizable to anyone familiar with C, C++ or Java. Developers who know any of these languages are typically able to begin to work productively in C# within a very short time. C# syntax simplifies many of the complexities of C++ and provides powerful features such as nullable value types, enumerations, delegates, lambda expressions and direct memory access, which are not found in Java. C# supports generic methods and types, which provide increased type safety and performance, and iterators, which enable implementers of collection classes to define custom iteration behaviors that are simple to use by client code. Language-Integrated Query (LINQ) expressions make the strongly-typed query a first-class language construct.²

As an object-oriented language, C# supports the concepts of encapsulation, inheritance, and polymorphism. All variables and methods, including the Main method, the application's entry point, are encapsulated within class definitions. A class may inherit directly from one parent class, but it may implement any number of interfaces. Methods that override virtual methods in a parent class require the override keyword as a way to avoid accidental redefinition. In C#, a struct is like a lightweight class; it is a stack-allocated type that can implement interfaces but does not support inheritance.

C Programming Language?

C is a general purpose, imperative computer programming language, supporting structured programming, lexical variable scope and recursion, while a static type system prevents many unintended operations. By design, C provides constructs that map efficiently to typical machine instructions, and therefore it has found lasting use in applications that had formerly been coded in assembly language, including operating systems, as well as various application software for computers ranging from supercomputers to embedded systems.

C is an imperative procedural language. It was designed to be compiled using a relatively straightforward compiler, to provide low-level access to memory, to provide language constructs that

map efficiently to machine instructions, and to require minimal run-time support. Despite its low-level capabilities, the language was designed to encourage cross-platform programming. A standards-compliant and portably written C program can be compiled for a very wide variety of computer platforms and operating systems with few changes to its source code. The language has become available on a very wide range of platforms, from embedded microcontrollers to supercomputers.

Chapter 5

5. System testing

5.1. Test cases and results

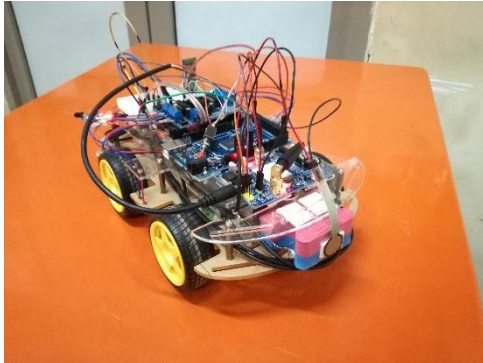
- Test case 01:
Description: Login with valid credentials in the web application
Result: Locations page is displayed
- Test case 02:
Description: Login with invalid credentials in the web application
Result: error message is displayed & redirect to login again
- Test case 03:
Description: Login with valid user name and invalid password
Result: error message is displayed & redirect to login again
- Test case 04:
Description: Login with invalid user name and invalid password
Result: error message is displayed & redirect to login again
- Test case 05:
Description: Send valid data stream to web application
Result: Data insert into database
- Test case 06:
Description: Send invalid data stream to web application
Result: Don't insert data into database
- Test case 07:
Description: Give valid sensor data
Result: Send Location and sensor data to web application
- Test case 08:
Description: Give invalid sensor data
Result: Don't send location and sensor data to web application

Chapter 6

6. Results and Discussion

6.1. Results

- **Accident Tracker device implemented on arduino robot car**



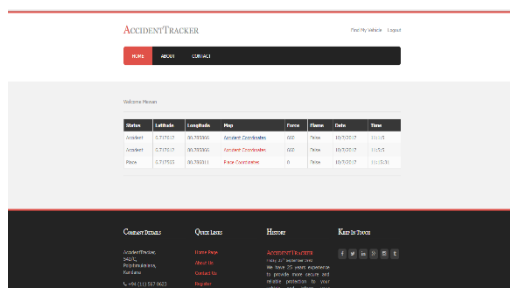
Accident tracker device consist of FSR to identify force of impact and flame sensor to identify the presence of a fire. And also SIM808 EVB V-3.2.2 module implemented on arduino robot car. SIM808 EVB V-3.2.2 module consist with both GPS and GSM systems. GPS used to get the coordinates of the location of vehicle and GSM used to send accident information to web application. In addition, this device can act as a theft prevention and retrieval device.

- **Inform accident to relation**



Web application send the information about accident to user's predefined relation through SMS. That SMS consist of accident location, how much force, fire is presence or not, date and grin itch time. Relation can locate the accident location from google map through location URL.

- **Search history**



All information of accidents are record by web application and database will be automatically update. It gives user to search his/her accident history and request for track the vehicle.

Chapter 7

7. Conclusion

7.1. Conclusion

Accident Tracker is web based application which is designed to improve the efficiency, reliability and entrustment of recovery from the vehicle accident. This Accident Tracker gives more benefits to the community which cannot obtain from another web based application. Accident Tracker send the location and status of accident to user's relations automatically through web application. Accident can be determine by using FSR and flame sensor. FSR use for determine the force of impact and flame sensor use for identify whether there have fire or not. And also user can search his/her accident history using web application. And also Accident Tracker can help user to locate the vehicle after being stolen and also when user forget where they park their vehicle. Any vehicle can use Accident Tracker because it is a standalone device. It does not need to connect with other system inside the vehicle. In conclusion, the objective of this project, which is to design and develop a device and web application that can identify an accident, inform it to user's relations and track current position of the vehicle using longitude and latitude and display the position graphically, by using GPS and GSM.

What I achieved

- Configure the four wheel robot car using Bluetooth sensor
- Identifying an accident using FSR and flame sensor
- Send accident information to user's relations through web application
- Keep all records of accidents inside the web application database
- User can search accident history
- Can add new users to web application
- User can track vehicle at any given time

7.2. Further modification, enhancement and extensions

In the further development of this Accident Tracker application I plan to make the application more advance by adding more support and additional functions to the system.

- 1) I will be able to add admin panel to web application
- 2) Providing facility to perform required changes in the user profile
- 3) The system is able to connect the Police, Hospital, Fire brigade and Ambulance service simultaneously which is not in the normal situation
- 4) Find the shortest path to nearest hospital
- 5) Inform that path to ambulance service

- 6) Send the location of nearest hospital to accident place to relations
- 7) Attaches strain gauge to Accident Tracker device to identify impact accurately
- 8) Write API to capture data from GSM module or insert data using GPRS instead of GSM

Chapter 8

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