"TRAFFIC ALERT SYSTEM USING VANET"

Submitted in partial fulfillment of the requirements
For the degree of

Bachelor of Engineering
in
Information Technology

by

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Dr. D. Y. Patil Vidyanagar, Sector 7, Nerul, Navi Mumbai, 400706

CERTIFICATE

This is to certify that, the dissertation titled

"Traffic Alert System using VANET"

is a bonafide work done by

Aniket Giriyalkar Roll No. 12IT1092
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Supervisor
Prof. Nilima Dongre

Project Co-ordinator	Head of Department	Principal
(Prof. Reshma Gulwani)	**(Prof. Dipti Jadhav)**	**(Dr. Ramesh Vasappanavara)**

Declaration

I declare that this written submission represents my ideas in my own words and where others ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Date : .. / .. / ....

Project Report Approval for B.E.

This is to certify that the project entitled Traffic Alert System using VANET is a bonafide work done by *Aniket Giriyalkar, Naved Pathan, Khushboo Goyal and Vinayak Papnoi* under the supervision of *Prof. Nilima Dongre*. This project has been approved for the award of *Bachelors Degree in Information Technology, University of Mumbai.*

Examiners :

1. .....
2. .....

Supervisors :

1. .....
2. .....

Principal :

.....

Date :
Place :

Abstract

The existing system has a communication gap with respect to the events occurring in the nearby regions. To reduce this inconsistency in the system, we use a dedicated device for a car which is similar to VANET as a platform to describe a wireless communication between vehicles. This new system will notify the vehicle well ahead of an incident happening in the nearby location, so that the vehicle can choose an alternate route. Notifications can include road traffic information, road blockage, WIP alerts, natural calamity alerts and weather report. For these notifications an application can be developed with an added trust model which will give the trust factor rating for the event. An application can be created to access the features such as entry into the website on-the-go, in-app emergency calling features, getting current location, alternative routes and directions. Through the website, a user can post an alert which is visible on the notice board to all the users who are logged in. Using these features the ambiguity among the road traffic system can be reduced.

Keywords: VANET , application , website

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Chapter 1

Introduction

VANETS are upcoming and promising applications of Mobile Ad-Hoc Networks. They promise vehicle to vehicle interactions for safer transportation, emergency update services during unexpected calamities, efficient traffic routing in urban areas and on freeways for faster transport, routing of packets for infotainment services and much more. A lot of study has been undertaken in this area for last few years. Also the years of research gone into Mobile Ad-Hoc Network will also come to fruition in the form commercial and large scale applications of MANETs when they will be deployed in vehicular systems. VANETs are unique subset of Mobile Ad-Hoc Networks in the sense that the nodes in VANETs strictly follow fixed and regular patterns. The speed and direction of nodes involved is bound by the traffic laws, geometrical and geographical constraints. VANETs also are unique in that the nodes are significantly larger compared to their cellular counterparts. They do not have harsh limitations of the battery size and battery life as vehicular nodes need and consume significant amount of energy for their locomotive operation itself. Hence the energy required for the nodal communication aspect is comparatively very negligible. This presents developers of the VANET systems a unique opportunity to develop an entirely new system that could rival or supplement the already existing cellular system by offering unique and competitive services. However, VANET research poses peculiar challenges as well, which are totally different from some other existing systems. The vehicular application require impeccable amount of guarantee of service for wide spread use. There is a reason why road-ways vehicle are not allowed to run at speeds of their dedicated-path counterparts. When reliable wireless communication becomes available across machine interfaces in vehicular nodes, the speed of nodes can be increased without loss of safety. The whole set of applications that will be needed to be built around the new eco-system that VANETs will provide. Despite the huge potential of VANET systems, the reach of the field outside enthusiastic research community needs expanding. One major reason for this could be cited as the non-standard multiple tools and resources for development and study. Most of the tools required for VANET study are custom, application specific and have quantized limited reach and awareness. This project aims at demonstrating the utility of popular academic tool-MATLAB and explores the use of MATLAB in few of the interesting modules of VANET study. A Trust model which evaluates the trust factor of the source from which information is received.

1.1 Problem Definition

The current system of Traffic Alert using VANET is build on VANET technology which is simulated using MATLAB. In this system the network at different locations will communicate with each other providing a platform for the VANET enabled system to communicate with each other. A Trust model is used to authenticate the informer of the communication. Based on this model a user can trust the provided information by the provider.

1.2 Scope

In the next years, vehicles will be equipped with multi interface cards, as well as sensors, both on board and externally. With an increasing number of vehicles equipped with on-board. Smart Vehicles, Technologies and Main Applications in Vehicular Ad hoc Networks wireless devices (e.g.,UMTS, IEEE 802.11p, Bluetooth, etc.) and sensors (e.g., radar, ladar, etc.),efficient transport and management applications are focusing on optimizing flows of vehicles by reducing the travel time ad avoiding any traffic congestions. As an instance, the on-board vehicle radar could be used to sense traffic congestions and automatically slow the vehicle. In other accident warning systems, sensors are used to determine that a crash occurred if air bags were deployed; this information is then relayed via V2V or V2I within the vehicular network.

Forgetting traditional vehicles, in the next few years we will drive smart intelligentvehicles, with a set of novel functionalities (e.g., data communications and sharing, positioning information, sensor equipment, etc.). It is then necessary that for specific applications (i.e., safety messages and alerts, gossip-based applications, etc.) the majority of mobile vehicles within a vehicular network be equipped with on-board wireless device, namely On-Board equipment (OBU)

1.3 Relevance and Motivation of the project

The basic motivation for the project is that the current system for Traffic alert is out dated and needs to have an upgrade. By bringing in this project we can assure the improvement of the ongoing traffic caused by various hazards or any type of calamity.

How does Traffic Alert System help people with the existing traffic issues?
As a regular driver/passenger, you may encounter traffic on a rather daily basis. To minimize this issue the Android Application along with the website provides with a very responsive and user friendly environment to show the user the existing traffic issues according to their desired location.

Notifications On-The-Go
It can be really tough for a person to identify the traffic according to his/her need of location. The website displays a real-time update of traffic along with it's location which is very easy to access.

Breakthrough and Achievement
Traffic Alert System is an affordable, leading edge software application that helps people to locate the traffic and accordingly find an alternative using a Google Maps integration.

1.4 Organization of the report

The report is organized in to chapters as mentioned below:

- Chapter 2 provides with the literature survey which summarizes the problems faced by the traditional system. It gives an overview of the perspectives of the tts system and the progress that has occurred in this domain with the development of multimedia and technology.
- Chapter 3 focuses on the approach being followed for implementing the proposed system. It defines the planning and formulation techniques being used to develop the proposed system.
- Chapter 4 talks about the proposed system and its features. It also contains the various methodologies and specifications of system requirements which would be used in order to implement the proposed system.
- Chapter 5 enlists various diagrams to depict the flow of various modules and enhance the understanding of working of the overall system. It consists of various block diagrams and flowcharts depicting the flow of data in the system. These diagrams highlight various modules and the way those modules connect with each other.
- Chapter 6 includes various aspects of future scope of the system and it provides with the overall outcome of the system.

Chapter 2

Review of Literature

2.1 Existing traffic alert systems:

In Indian road-traffic the problems, like congestion, unpredictable travel-time delays and road-accidents, are taking a serious shape.

In India road conditions are more varied, the traffic is chaotic and unstructured, there is lack of lane discipline, and a wide variety of vehicles.

People don't have enough time to communicate with others and warn them about some huge road blockage, long lasting traffic jams, or some road that goes under construction. Hence it becomes a big concern if a vehicle like ambulance or fire trucks which usually goes in emergencies gets stuck in these traffics.

Hence it becomes very important to develop an effective traffic alert system that can help many people to avoid such traffics and drive conveniently.

Here are few examples of existing traffic alert systems used in India:

2.1.1 Real-time Traffic Information System (RTIS):

The Real-time Traffic Information System (RTIS) prototype is a technology demonstration project for providing dynamic traffic information on an Intelligent Transportation System (ITS).

The RTIS prototype uses advanced technologies (GPS, video cameras, wireless COMMUNICATION, traffic models and algorithms) to provide traffic information that is updated every minute.

This system is a part of the Advanced Traveller Information System (ATIS) for Indian Cities project sponsored by Department of Electronic and Information Technology (DeitY), Government of India.

The system has certain issues/drawbacks too:

- Through this webpage, traffic Information is provided on an experimental basis for research purposes with no explicit or implied guarantees.
- The travel times and traffic information provided on this website are only estimates based on sample data and current conditions.
- The actual traffic conditions experienced by users in the near future may be different.

2.1.2 Traffline:

Traffline provides real-time traffic updates in Delhi, Mumbai and Bangalore. As it plans to extend the service to more cities, it has to figure how to monetise the user base.

In May, Aaj Tak's Vikrant Gupta wrote on social networking site Twitter, "Have to say @TrafflineDEL is doing a wonderful job. I always make it a point to scan

it before deciding on routes." Ashish Bali tweeted he had saved an hour, thanks to @TrafflineMUM. "Link road was the best idea. Reached Goregaon east from Dahisar in 30 minutes," he wrote. Traffline, which allows commuters to check traffic conditions in their cities at any time, was launched in 2012 through its parent firm Bird's Eye Technology, founded by Brijraj Vaghani and Ravi Khemani in 2011. Vaghani, co-founder and chief executive, manages product and business development. Khemani takes care of finance, daily operations, PROJECT MANAGEMENT and recruitment. Initial drags for the company included no concrete help in sourcing data, lack of capital and talent and the fact that Traffline wasn't a consumer-centric company. Vaghani says, the primary concern is "to get people used to checking traffic news before travelling". He adds the company is shifting from a premium model to an all-free one.

Issues and conclusion on Traffline:

- The Traffline application (app) is the same as Google Maps; all Traffline features are present in Google Maps. The report section of the Traffline app is very useful, as it tells end-users about the root cause of the traffic. And, the data can be used by traffic police for rapid action. But the timeline needs a filter section for updates. Most of the time, people SHARE their thoughts about traffic on Twitter, and such information isn't relevant.
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- Traffline will be a scalable business if the data generated by end-users can be utilised in a more effective manner, rather than only by the auto and travel sectors, as 'Android Auto' will be launched soon. Integrating live traffic feed with industries in the auto and travel sectors is not a valid point. So, once Android Auto is available in cars, people can download the Traffline app directly and use it. The auto sector will not have to depend on Traffline.

2.1.3 FM Radio Updates:

The traffic updates by the base station in the particular city is given by FM Radio. The update provided by the radio is generally confined to the particular location or the street where the condition is intense. It doesnt provide a live update always. The information is broadcasted only when the situation is severe and only in the free allotted slots.

The drawback of this system is that the person is not always connected through the radio 24x7 and thus is not updated every time. Another issue is that only the most important and severe conditions are transmitted and the minor or heavy congestions are neglected. That too the broadcast is done in prime cities or metropolitan. The highways and minor cities are ignored. Thus this system is not completely reliable for the traffic updates.

Chapter 3

Project Planning

3.1 Schedule for Project

A website and android app which is user friendly would be the final implementation of the project. It consists of following phases:

- **Phase 1: Design and overall model:**
  The basic idea of project is to be discussed with assigned project guide. Application design and overall methodology is decided in this phase.
- **Phase 2: Study and submit report:**
  The ideas provided by project guide and the team members are studied and documented. And the report is submitted to guide for verification of overall idea.
- **Phase 3: Presentation of overall report:**
  After verification from the guide we will make the presentation which would clear final approach.
- **Phase 4: Analysis and design:**
  The actual implementation work will start in this phase. It includes:
  - Finalizing Technology
  - Designing Problem Definition
  - Formulation of Database
  - Linking of Keywords
- **Phase 5: Front End Design:**
  The exact look of desktop application and finalization of the same will proceeded in this phase. The project is then verified by guide and changes suggested by guide would be implemented.
- **Phase 6: Initial Testing:**
  Project will be tested on data of one group. If it works properly then only project will be approved to the next level.
- **Phase 7: System Integration and Module testing**
- **Phase 8: Documentation:**
  Whole project will be documented and submitted.

No		Aug-Sept	Oct-Nov	Dec-Jan	Feb-Mar
1.	Design and Overview				
2.	Evaluation and Report Submission				
3	Presentation				
4.	Analysis and design				
	4.1 Finalizing Technology				
	4.2 Designing Problem Definition				
	4.3 Formulation of Database				
	4.4 Linking of Keywords				
5.	Front End Design				
6.	Initial Testing				
7.	System Integration and Module testing				
8.	Documentation				

Figure 3.1: Schedule for Project

Chapter 4

Methodology

4.1 Proposed System

In this project, we use VANET as a platform to describe a wireless communication between vehicles. This new system will notify the vehicle well ahead of an incident happening in the nearby location, so that the vehicle can choose an alternate route. The Android application Trust Model is created for evaluating the trust factor which is calculated based on the ratings it is given by its users. Better the ratings the more legitimate is the news from the source thus preventing anyone from posting hoax updates. Goal of this project/ is to create a simulation of Vehicular Ad-Hoc network for an urban city scenario which can be used for testing purposes. This simulation is done using Matlab.

4.2 Proposed Methodology

The main goal of this project is to reduce the inconsistencies existing in the current system. For this we use a Vehicular Ad-Hoc Network, or VANET which is a technology that uses moving vehicles as nodes in a network to create a mobile network. VANET turns every participating vehicle into a wireless router or node, allowing vehicles approximately 100 to 300 meters of each other to connect and, in turn, create a network with a wide range. VANET can be used to build simulative models of various VANET system test-cases that are generally built using network simulators without proper GUI support. MATLAB offers rich set of functionalities which reduces the development time for the framework necessary for carrying out tests.

4.2.1 Common VANET entities

There are many entities involved in a VANET settlement and deployment. Although the vast majority of VANET nodes are vehicles, there are other entities that perform basic operations in these networks. Several different entities are usually assumed to exist in VANETs. To understand the internals and related security issues of these networks, it is necessary to analyze such entities and their relationships.

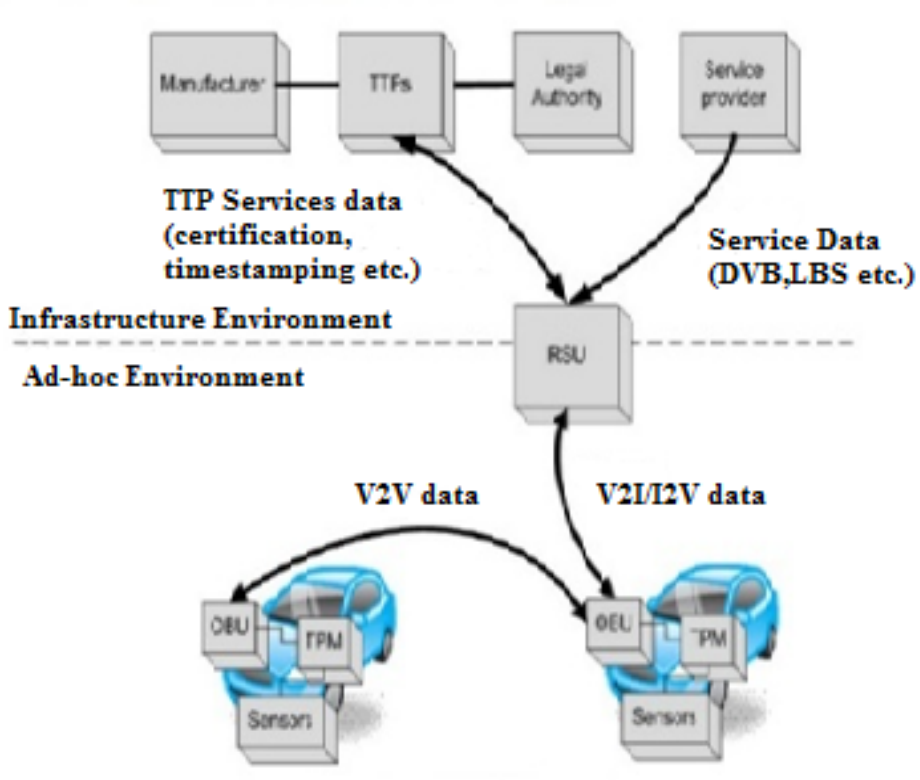

Figure 4.1: VANET model

As seen on Figure, two different environments are generally considered in VANETs: Infrastructure environment in which, entities can be permanently interconnected. It is mainly composed by those entities that manage the traffic or offer an external service. On one hand, manufacturers are sometimes considered within the VANET model. As part of the manufacturing process, they identify uniquely each vehicle. On the other hand, the legal authority is commonly present in VANET models. Despite the different regulations on each country, it is habitually related to two main tasks - vehicle registration and offence reporting. Every vehicle in an administrative region should get registered once manufactured. As a result of this process, the authority issues a license plate which is unique for everybody. Trusted Third Parties (TTP) are also present in this environment. They offer different services like credential management or time stamping. Both manufacturers and the authority are related to TTPs because they eventually need their services (for example, for issuing electronic credentials). Service providers are also considered in VANETs. They offer services that can be accessed through the VANET. Location-Based Services (LBS) or Digital Video Broadcasting (DVB) are two examples of such services.

4.2.2 Ad-Hoc Environment

In this part of the network, sporadic (ad-hoc) communications are established from vehicles. From the VANET point of view, they are equipped with three different devices. Firstly, they are equipped with a communication unit (OBU, On-Board Unit) that enables Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I, I2V) communications. They have a set of sensors to measure their own status (e.g. fuel consumption) and its environment (e.g. slippery road, safety distance). These sensorial data can be shared with other vehicles to increase their awareness and improve road safety. Finally, a Trusted Platform Module (TPM) is often mounted on vehicles. These devices are especially interesting for security purposes, as they offer reliable storage and computation. They usually have a reliable internal clock and are supposed to be tamper-resistant or at least tamper-evident. In this way, sensitive information e.g. user credentials or pre-crash information) can be reliably stored.

4.2.3 Alarm Model

The 3-bit color code is used to develop an alarm model where each color code is used to indicate a specific alert corresponding to the color. The different situation are allotted specific color and when the color is selected, the database is alerted about that specific problem in that area. There are 8 such colors that can be allotted as the maximum probable possibilities of colors can be 8 as a 3-bit color code will be used.
The 8 situations can be:

- Low intensity traffic.
- High intensity traffic.
- Medical emergency.
- Weather alert.
- WIP alert.
- Towing needed alert.
- Emergency at night alert.
- Future needs alerts.

4.3 System Requirements

4.3.1 Hardware Requirements

1. Processor:
   Pentium III-compatible processor or higher.
2. Processor Speed:
   Minimum: 600 MHz.
   Recommended: 1 GHz or higher.
3. Memory (RAM):
   Minimum: 512 MB
   Recommended: 1 GB or more
4. Hard Disk Space Requirements:
   Minimum: 2GB

4.3.2 Software Requirements

Minimum software requirements are:

1. Windows 7 or higher.
2. Android Software Development Kit(SDK).
3. Android Studio.
4. Eclipse.

Chapter 5

System Design

5.1 Use Case Diagram

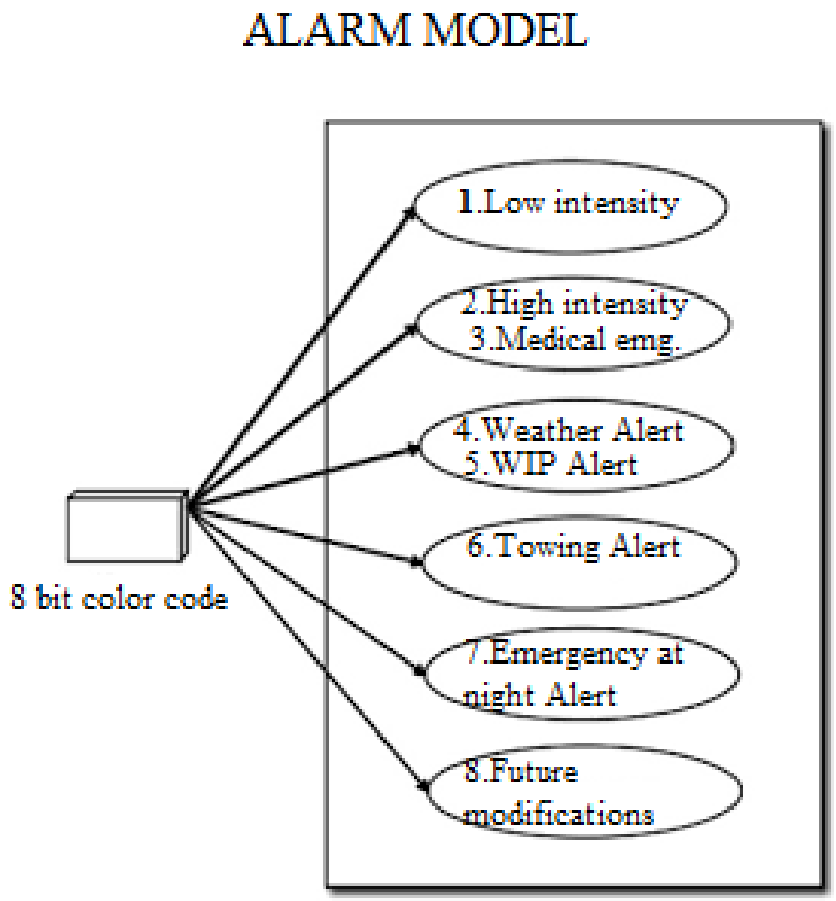

Figure 5.1: Use-Case Diagram

5.2 Activity Diagram

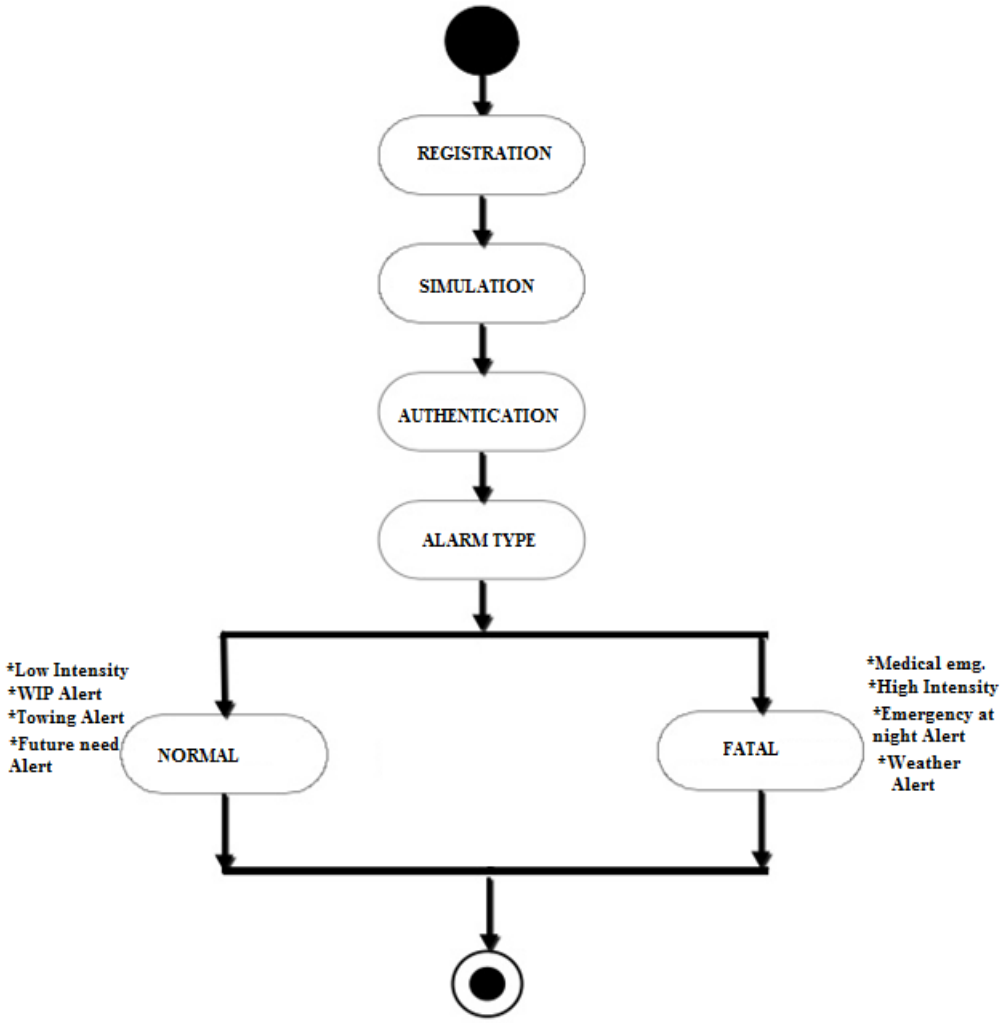

Figure 5.2: Activity Diagram

5.3 VANET Scenarios

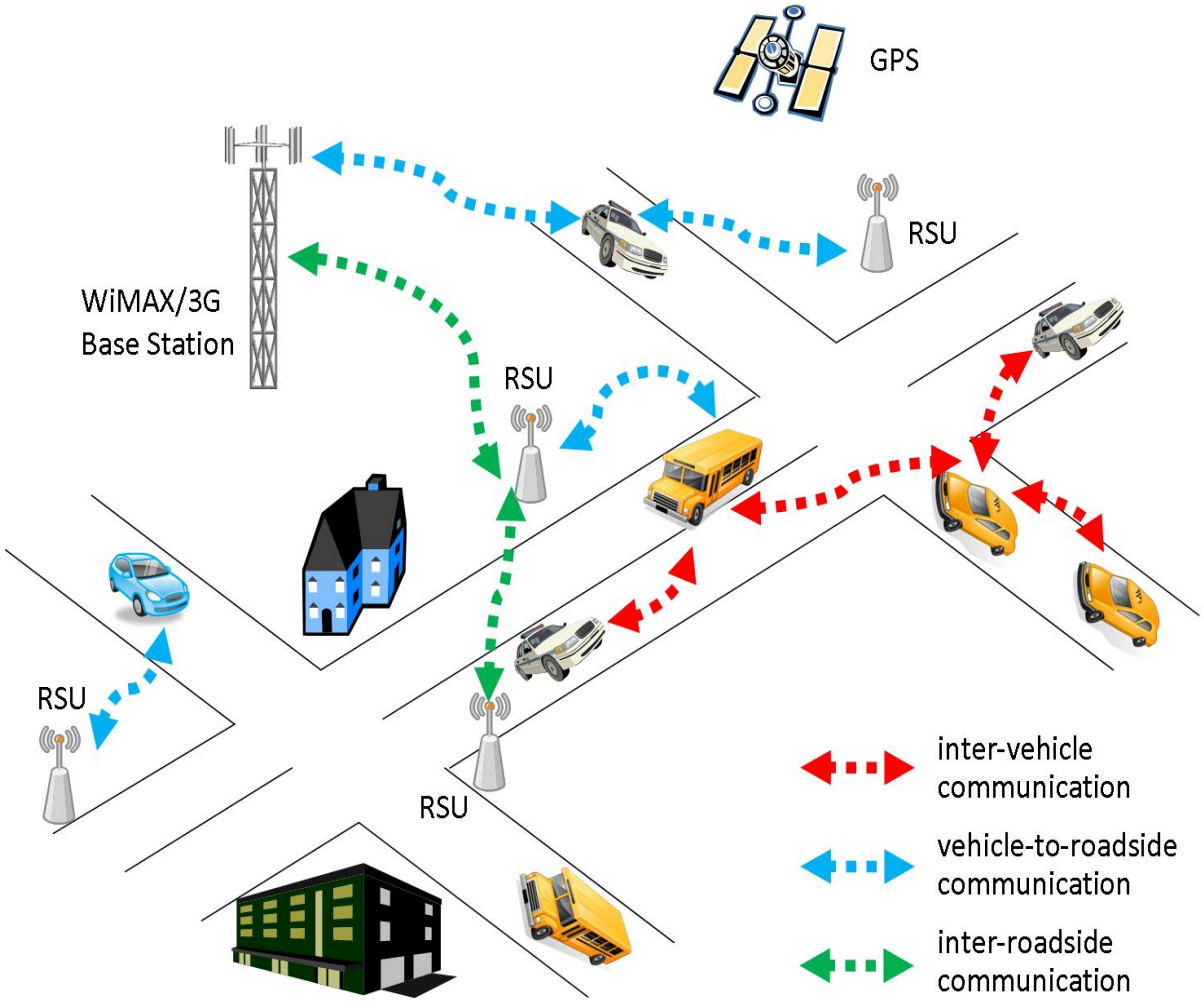

Figure 5.3: Various VANET scenarios

Chapter 6

Testing

6.1 Testing

Software testing is the process of evaluation a software item to detect differences between given input and expected output. Also to assess the feature of a software item. Testing assesses the quality of the product. Software testing is a process that should be done during the development process. In other words software testing is a verification and validation process.

- **Verification:**

  Verification is the process to make sure the product satisfies the conditions imposed at the start of the development phase. In other words, to make sure the product behaves the way we want it to.

- **Validation:**

  Validation is the process to make sure the product satisfies the specified requirements at the end of the development phase. In other words, to make sure the product is built as per customer requirements.

6.2 Test Cases

A test case is a document, which has a set of test data, preconditions, expected results and post conditions, developed for a particular test scenario in order to verify compliance against a specific requirement.Test Case acts as the starting point for the test execution, and after applying a set of input values, the application has a definitive outcome and leaves the system at some end point or also known as execution postcondition.
The test cases of the proposed system :

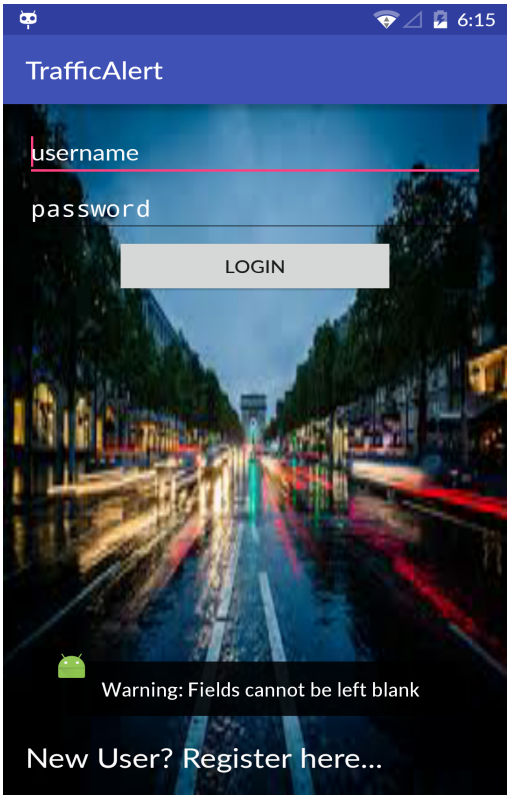

Figure 6.1: Testing if login can be successful with empty fields

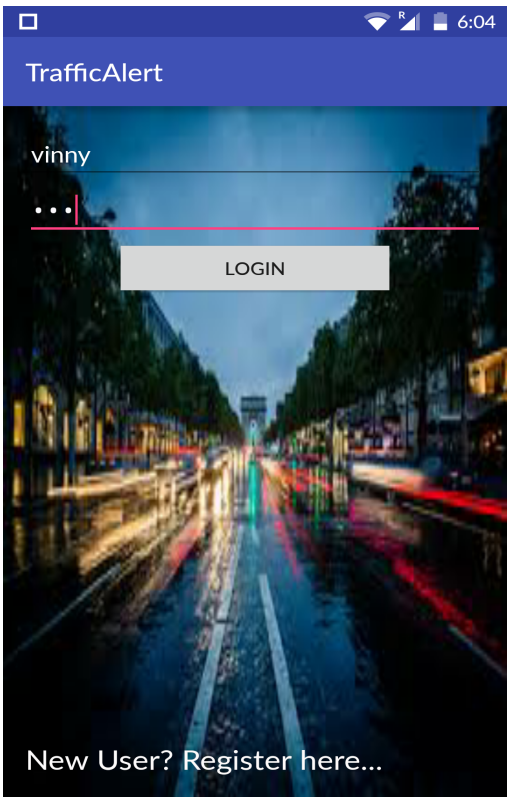

Figure 6.2: (Test)Login with wrong password

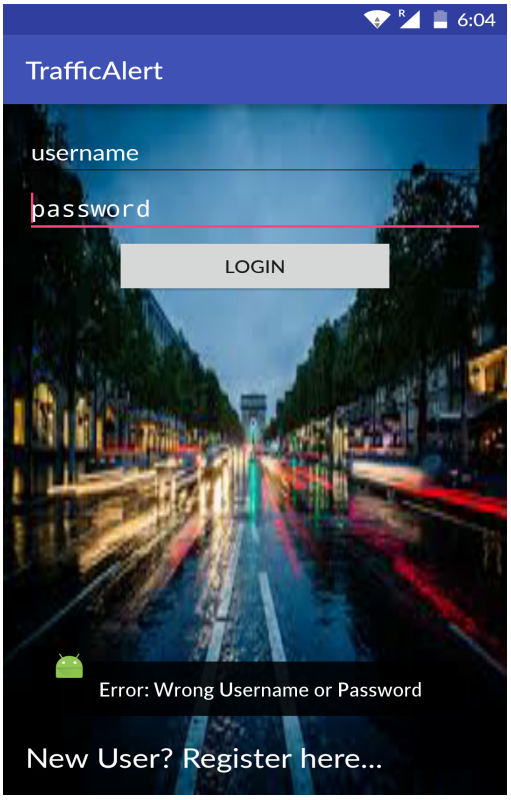

Figure 6.3: Login with wrong password failed

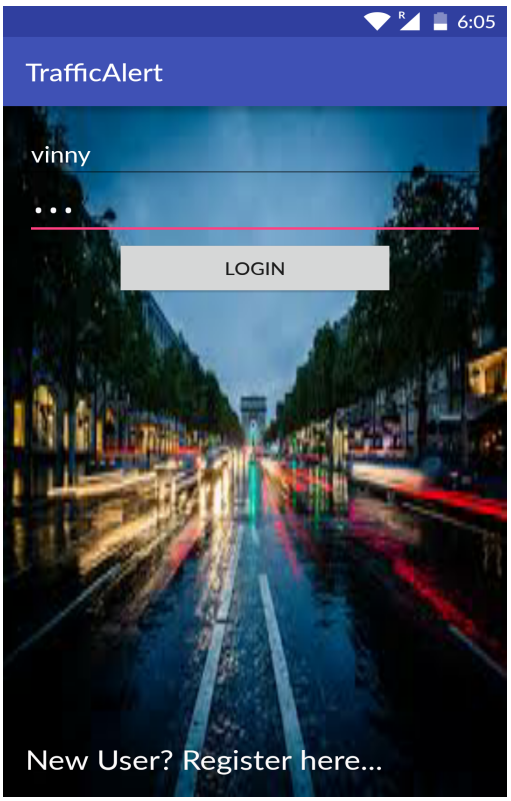

Figure 6.4: (Test) Login with correct password

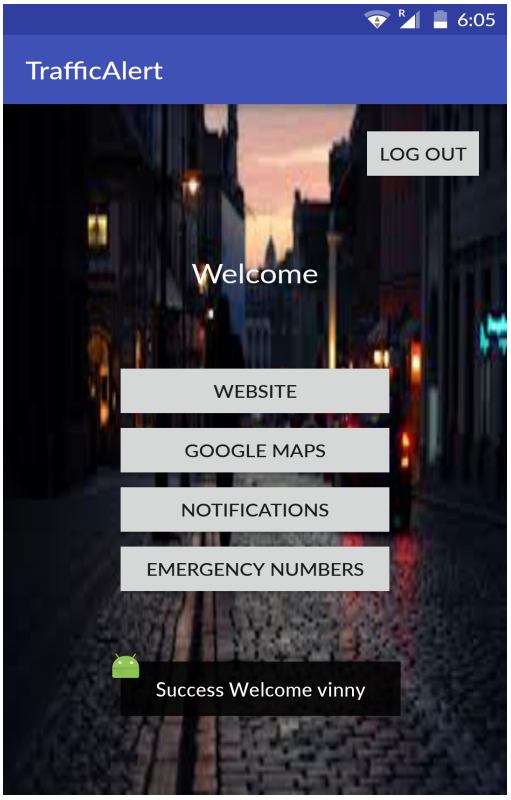

Figure 6.5: Login with correct password successful

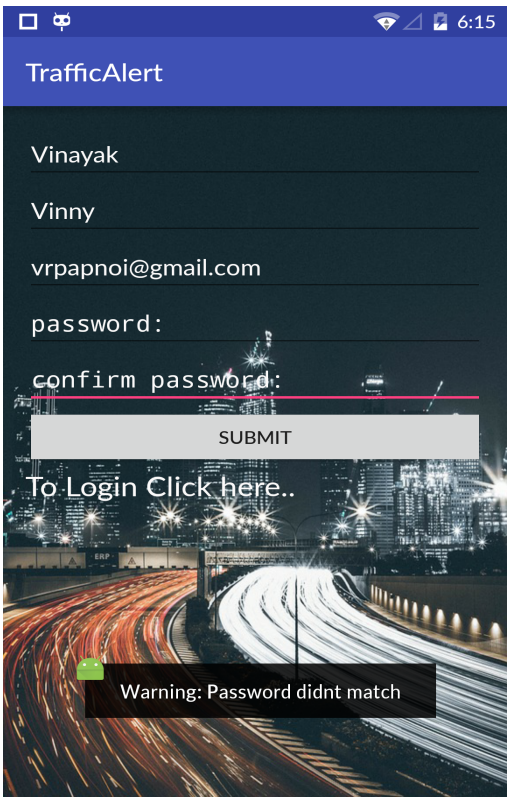

Figure 6.6: (Testing the registration page

Chapter 7

Implementation

7.1 Implementation of the Project

The main idea of this project is to minimize the existing complexity in the traffic system. Here, the admin can easily manage the traffic alerts in the website to help users to determine an alternative for their route. The database is maintained by using phpMyAdmin and MySQL Databases (webhost). The implementation can be seen in the following screen shots.

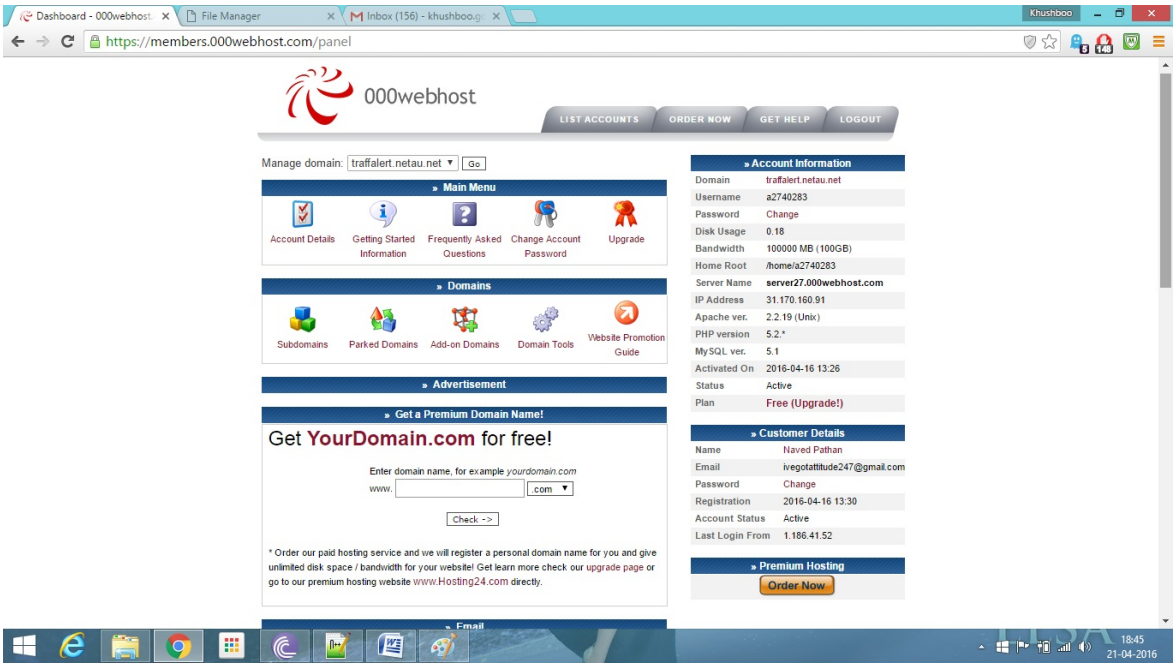

Figure 7.1: Webhost server

7.1.1 Alerts Database

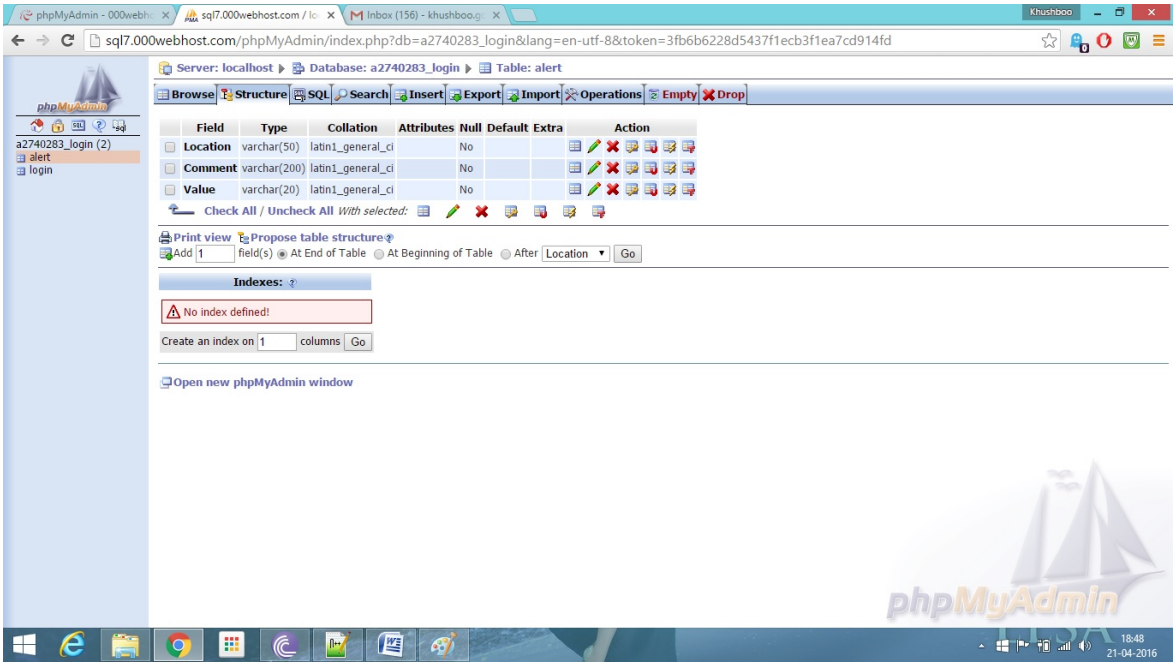

Figure 7.2: Structure of the alerts database

Figure 7.3: Management of the alerts database

7.1.2 Database of Users

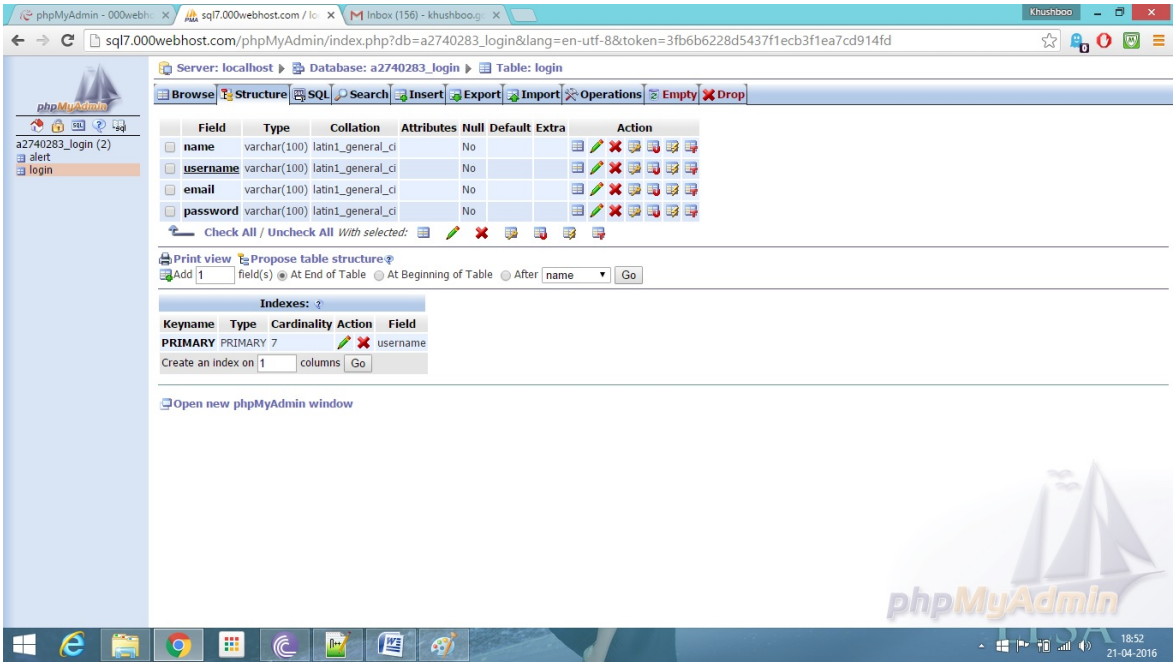

Figure 7.4: Structure of the login database

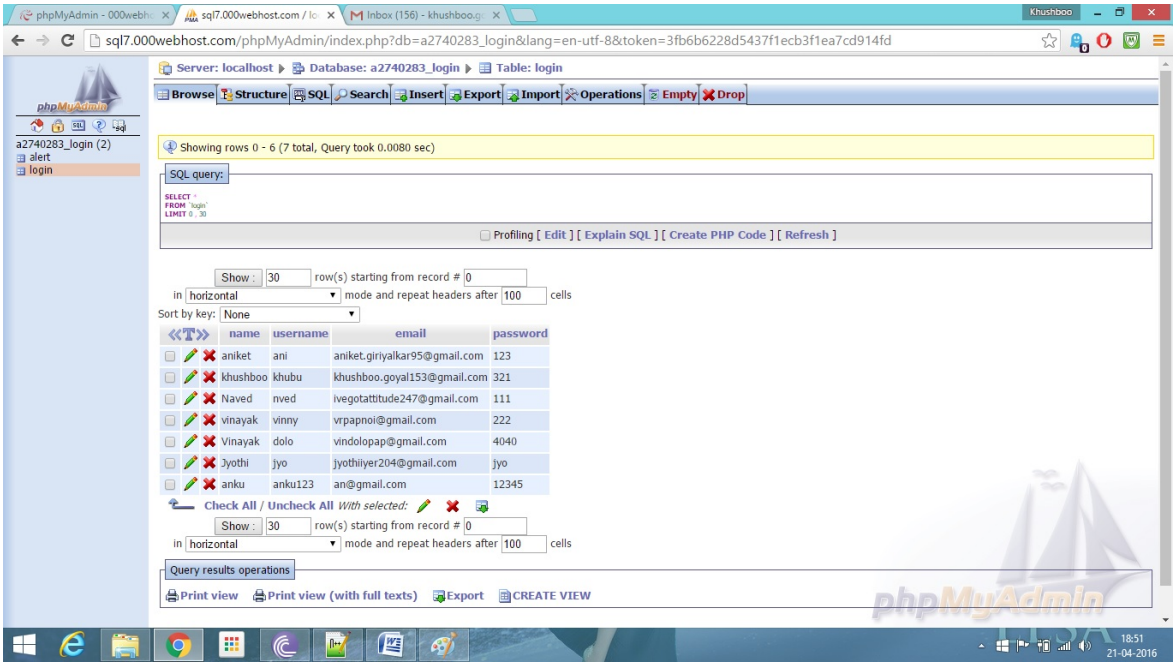

Figure 7.5: Management of the login database

7.1.3 Database of both Alerts and Users

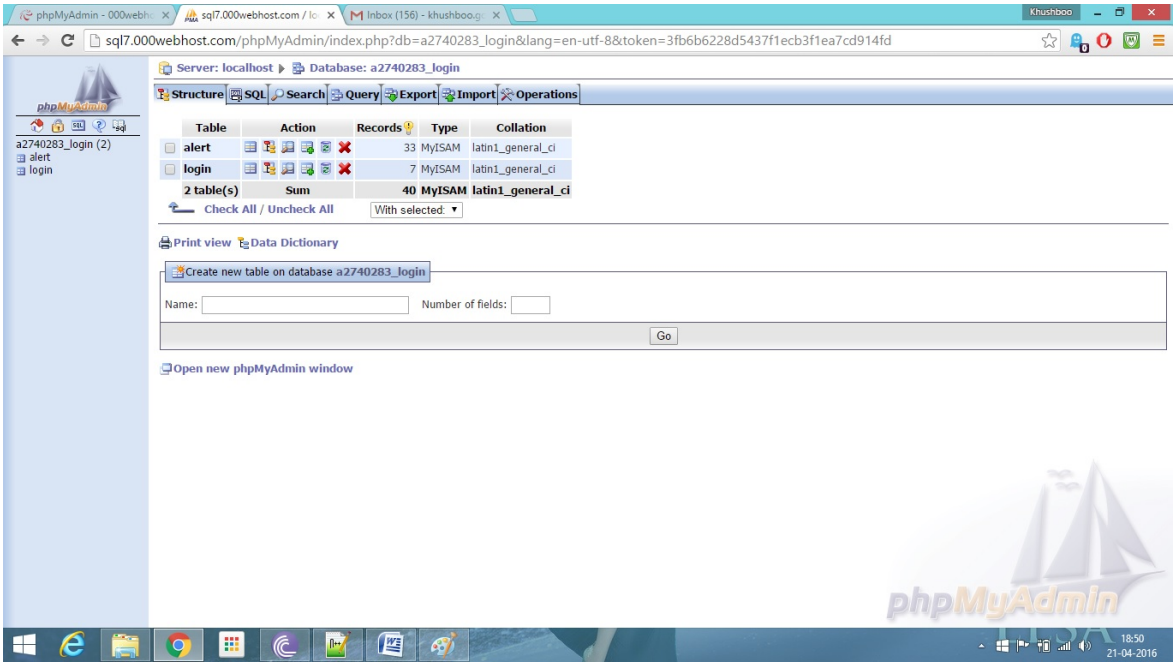

Figure 7.6: Entire database of the website

Chapter 8

Experimental Results and Performance Analysis

8.1 Screenshots of Project

8.1.1 Screenshots of Website

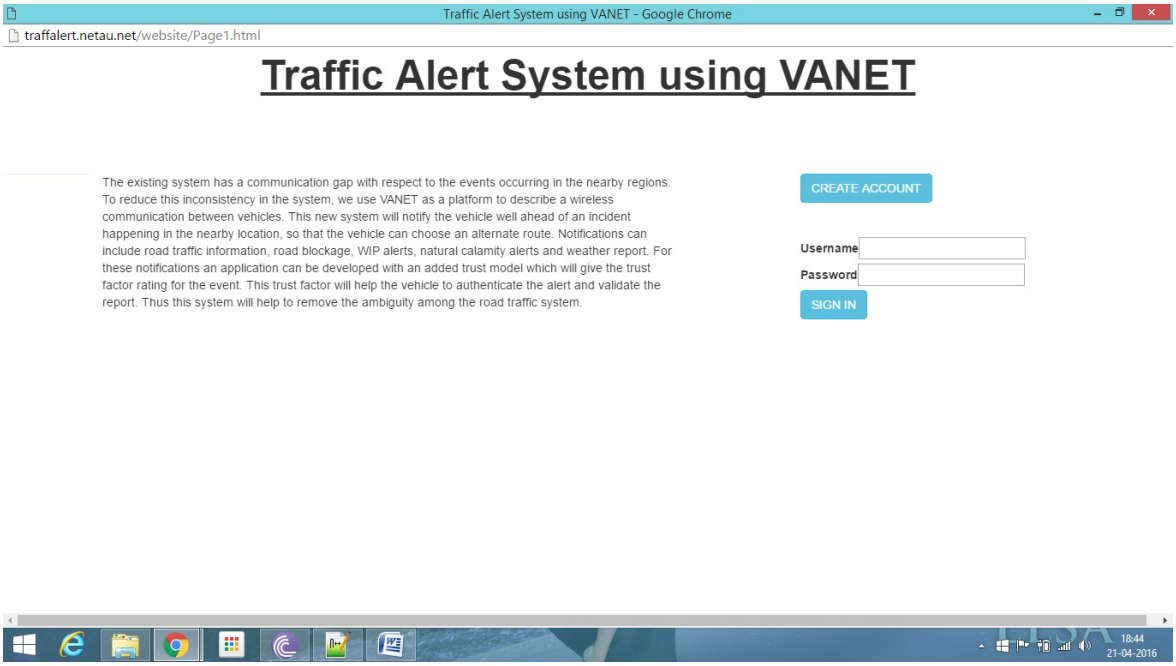

Figure 8.1: First page of the website

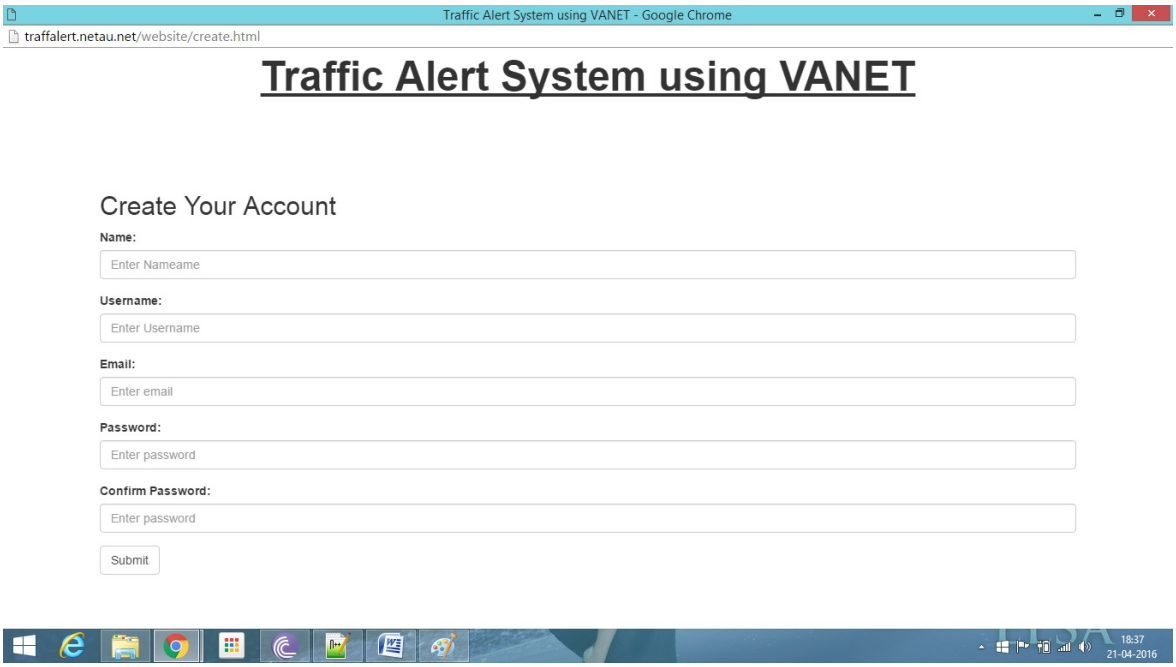

Figure 8.2: Registration page

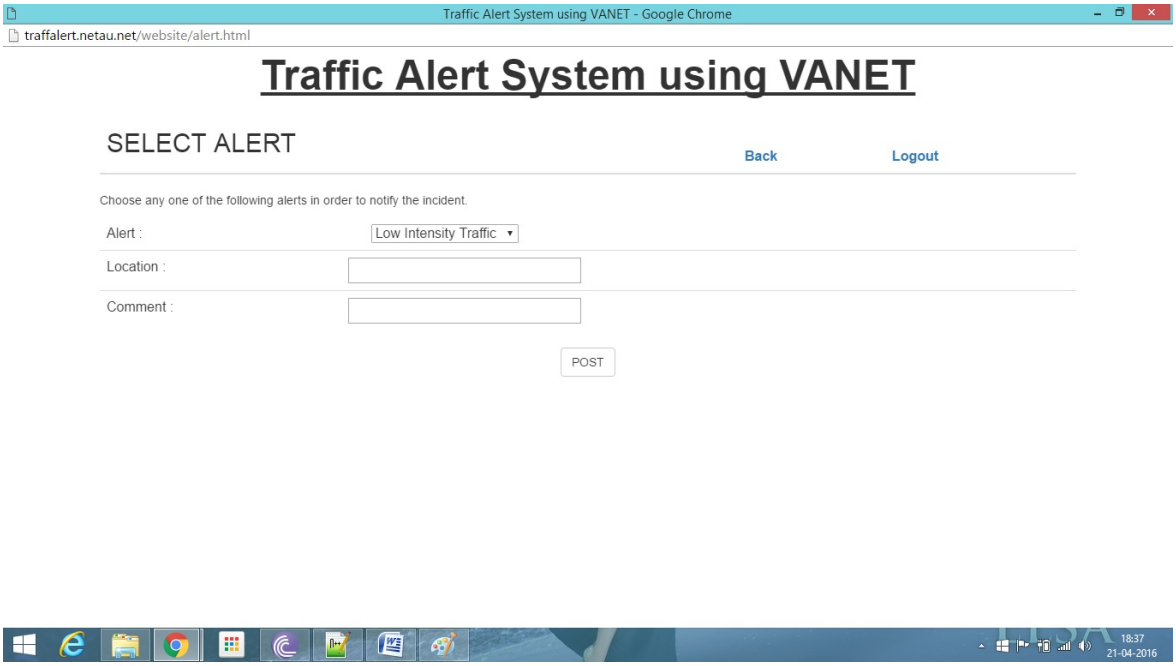

Figure 8.3: Selection of the alerts

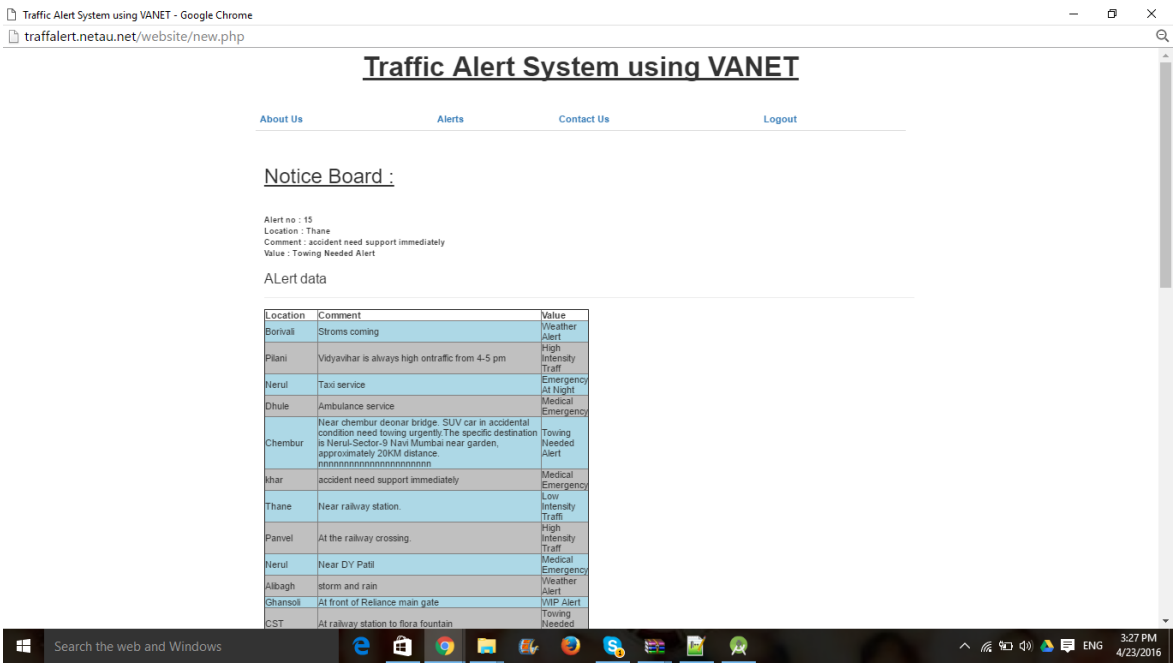

Figure 8.4: Display of alerts in Notice Board

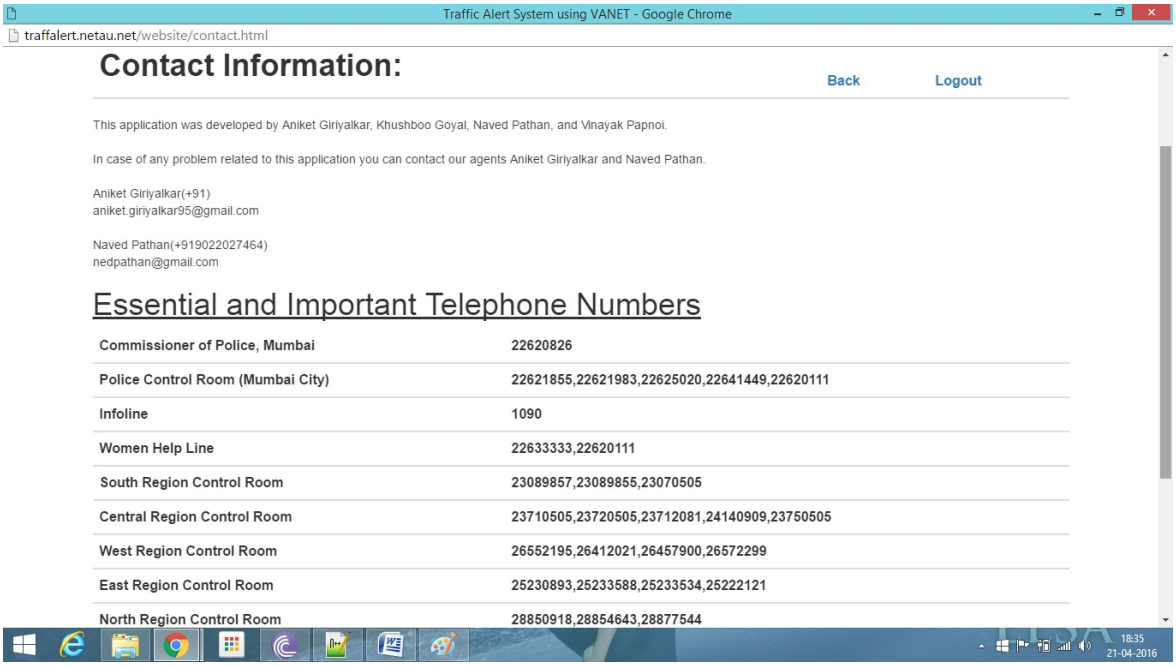

Figure 8.5: Contact information

8.1.2 Screenshots of Application

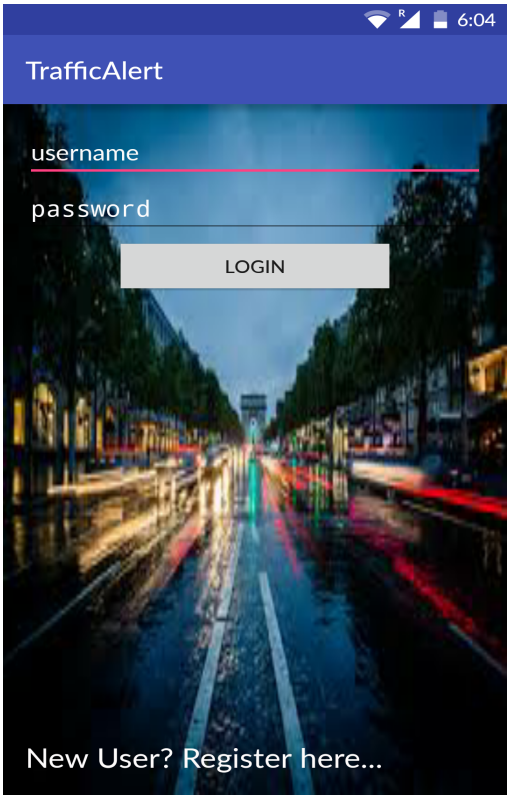

Figure 8.6: First page of the Android Application

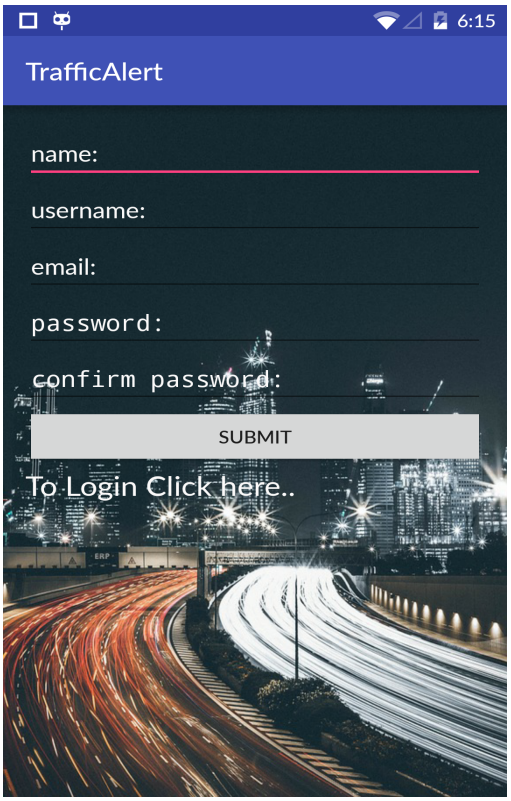

Figure 8.7: Registration page of the Android Application

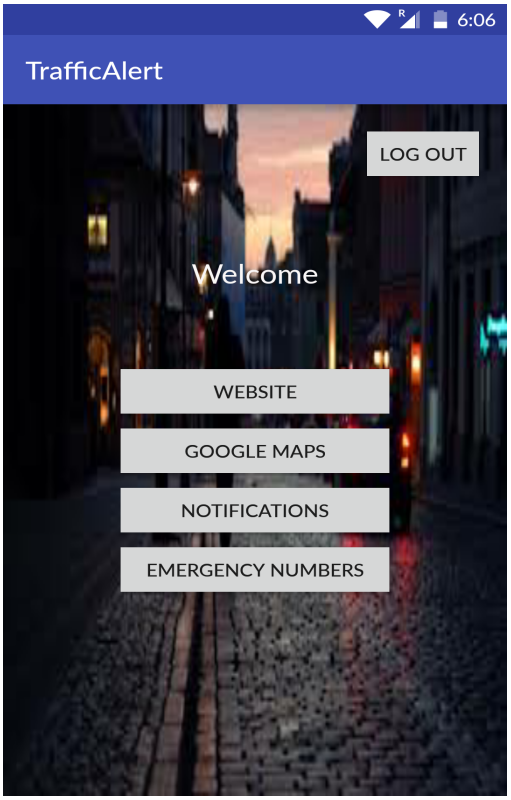

Figure 8.8: Welcome page of the Android Application

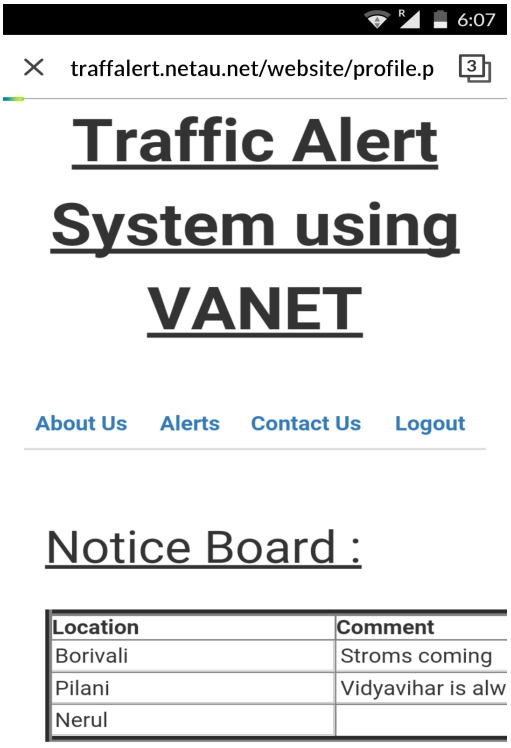

Figure 8.9: Website viewed from the Android Application

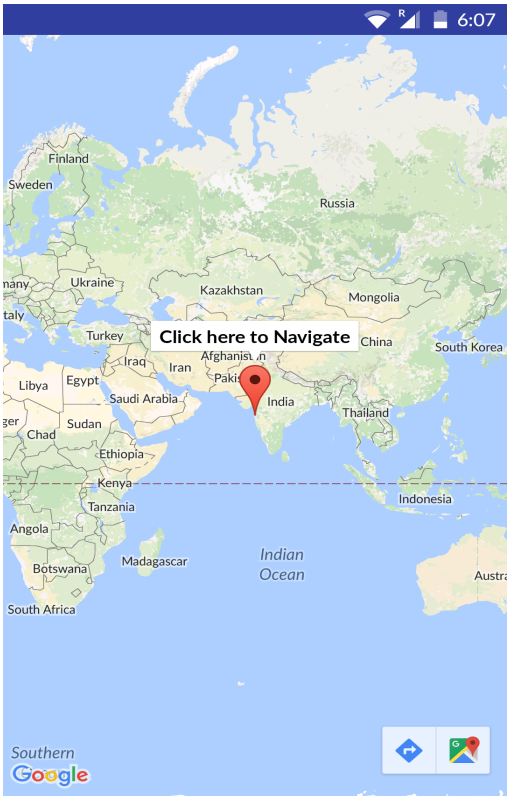

Figure 8.10: Current location

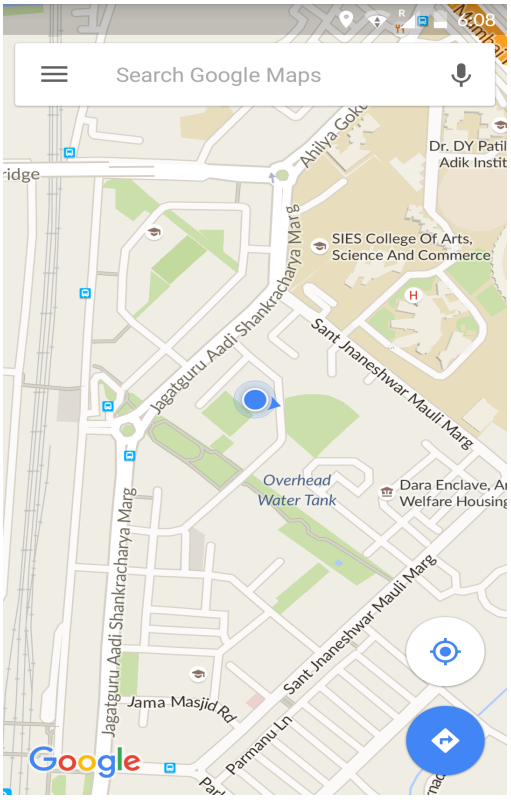

Figure 8.11: Directions provided by Google Maps

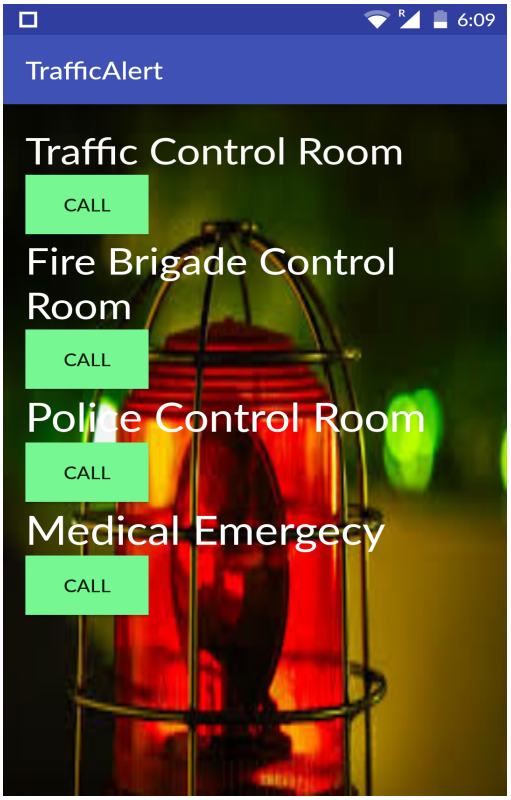

Figure 8.12: Emergency Contact Numbers

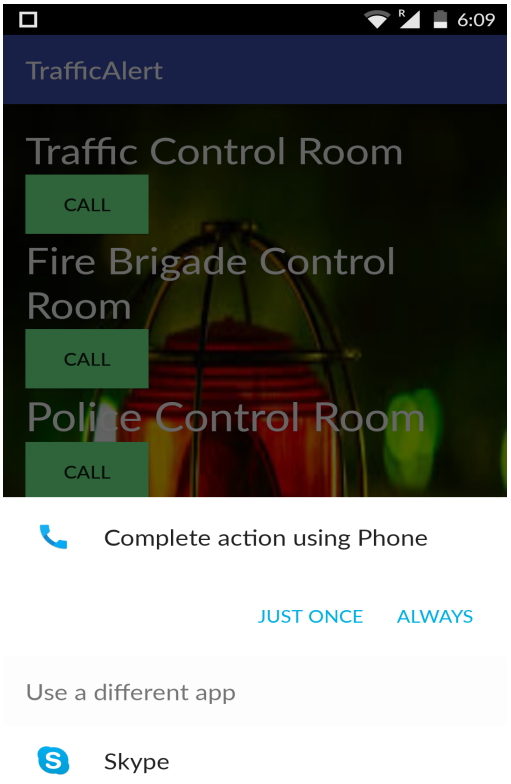

Figure 8.13: Demo of Emergency contact numbers

Chapter 9

Conclusion and Future Scope

9.1 Conclusion

The existing system has a communication gap with respect to the events occurring in the nearby regions. To reduce this inconsistency in the system, we use VANET as a platform to describe a wireless communication between vehicles. This new system will notify the vehicle well ahead of an incident happening in the nearby location, so that the vehicle can choose an alternate route.
Notifications can include road traffic information, road blockage, Work In Progress alerts, natural calamity alerts and weather report. For these notifications an application can be developed with an added trust model which will give the trust factor rating for the event. This trust factor will help the vehicle to authenticate the alert and validate the report. Thus this system will help to remove the ambiguity among the road traffic system.

9.2 Future Scope

In the next years, vehicles will be equipped with multi interface cards, as well as sensors, both on board and externally. With an increasing number of vehicles equipped with on-board Smart Vehicles, Technologies and Main Applications in Vehicular Ad-hoc Networks wireless devices (e.g.,UMTS, IEEE 802.11p, Bluetooth, etc.) and sensors (e.g., radar, ladar, etc.),efficient transport and management applications are focusing on optimizing flows of vehicles by reducing the travel time and avoiding any traffic congestion. As an instance, the on-board vehicle radar could be used to sense traffic congestion and automatically slow the vehicle. In other accident warning systems, sensors are used to determine that a crash occurred if air bags were deployed.
Every vehicle can be equipped by a hardware which will include the functionalities of both Website and Android Application. To describe the trust factor of the alert an added trust model will be added so that based on the existing information the user can confirm if the alert is legit or not.

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