

Traffic Detection System Using Android

By

Om Prakash¹, Mukul Aggarwal², Archit Vishvesha³, Bhoopendra Kumar⁴

^{1,2}Assistant Professor, KIET, Ghaziabad, Uttar Pradesh, India

^{3,4}Student, KIET, Ghaziabad, Uttar Pradesh, India

¹om.prakash@kiet.edu, ²mukul.digital@gmail.com,

³archit.1113029@kiet.edu, ⁴bhoopendra.1113037@kiet.edu,

ABSTRACT

Traffic Detection System is an Android application that aims at determining the behavior of traffic in a particular location. It calculates the speed of the vehicle and the level of congestion or the amount of traffic is determined on the basis of the values of sensors. If any such obstruct found, then the driver is provided an option to send messages regarding high traffic to his/her friends. After a distinct number of repeated low speed and breaks, the location of the vehicle (latitude and longitude) send to a pre-specified contact (selected in case of traffic congestion) through an SMS. This application uses the features of the Global positioning system. The Latitude, as well as the longitude of the location where traffic jams are formed, is sent to the friends of the user. The Goggle map of the location also sends to the friends. It uses the SMS Manager a functionality of Android. The friends receiving the messages will thereby avoid taking the congested route and hence the level of traffic on the congested road will decrease, and the friends will reach the destination in comparatively less time.

Keywords

GPS, Android, SDK, OHA, SMS.

1. INTRODUCTION

Traffic Detection System aims at the early detection of traffic congestion. The entire solution requires only a Smartphone having Global Positioning System and good network coverage. The program installed on the mobile computes speed based on sensor readings and compares them with pre-decided values of the counter and the speed limit in traffic congestion. Once traffic jam is detected, the mobile phone will automatically alert the driver and will ask for the contacts to which alert messages should be sending. The location of the vehicle is also sent to a pre-specified contact number via an SMS. The contacts on social networking sites can also be getting the alert messages.

Android is a software package and Linux-based operating system for mobile devices such as tablet computers and Smartphone. It is developed by Google and later on the Open Handset Alliance. Java language is mainly used to write the Android code even though other languages can be used. The goal of the Android project is to create a successful real-world product that improves the mobile experience for end users. Android technology is based on Java software applications. This technology requires the use of a special software development kit (SDK) to create applications for an Android device. The SDK is freely

available for download from the Internet. For this reason, and because it will work on multiple operating systems, many software developers prefer Android technology over that used in other Smartphone [4].

Google Play, formerly known as the **Android Market**, is a digital application distribution platform for Android and an online electronics store developed and maintained by Google. The service allows users to browse and download music, magazines, books, movies, television programs, and applications published through Google. Users can also purchase Chrome books and Google Nexus-branded mobile devices through Google Play. Applications are available either for free or at a cost. They can be downloaded directly to an Android or Google TV device through the Play Store mobile app, or by deploying the application to a device from the Google Play website [5].

2. RELATED AND PROPOSED WORK

A. PROBLEM STATEMENT

With growing number of vehicle users, traffic is growing day by day. It is desirable to have a mechanism by which people can know, in real time, about the traffic condition in the routes on which they wish to travel. As a result, working on traffic monitoring has gained significant attention in recent times. Much of the previous work concentrated on lane system and orderly traffic, which is rare outside the developed world. For example, in India, the traffic is highly chaotic and unpredictable. Further, many of the proposed solutions need installing dedicated sensors in the vehicles (like GPS-based tracking units) and/or on the road side (like inductive loop vehicle detectors, traffic cameras, Doppler radar, etc.) which are expensive. Also, installing sensors in a huge number of vehicles or installing traffic cameras at several junctions is impractical due to monetary cost and human effort required. The methods that use inductive loop vehicle detectors can only used in lane traffic systems, which is not the case in many countries. Traffic detection using traffic cameras is restricted to the location where they are deployed (generally at traffic signals). To detect the road conditions, accelerometers installed in a vehicle may be used. But, this is also not feasible, as the number of vehicles participating in the system will be limited to the vehicles where accelerometers are installed. Installing additional devices on vehicles to increase sensing density can very quickly become prohibitively expensive [1].

B. RESEARCH METHODOLOGY

Several methods have been proposed that use sensors in Smart phones for activity detection in various environments (Indoor localization, traffic detection and detecting activity of a person). The Smartphone based traffic estimation methods obviate the need for specialized hardware installed in vehicles or on the road side.. The Nericell system uses an accelerometer, microphone, GSM Radio and GPS sensors available in Smart phones that users carry with them.

- The primary working principle of our app is Global Positioning System (GPS).
- It checks the latitude and longitude of the place and pinpoints the location.
- Any change in the value of latitude and longitude will measure the distance covered in a certain time interval, and thus we will calculate speed.
- The calculated speed will be displayed and compared with the standard value.
- If the speed is consistently low, then message will be displayed, and SMS will be sent to particular contact



Fig 1: Working of the Android application on roads

This figure describes the working of the Android application on roads. The GPS calculates the speed and then detects the traffic jams or congestion.

C. SYSTEM MODULES

I. System Overview

The Traffic detection system is made up of following components. They are (1) monitoring daemon module, (2) Global Positioning System module, (3) data processing module (4) alert module and (5) message sending module. The third module implements the detection algorithm, as marked by a dashed box. The workflow of Traffic detection system is shown in fig below. After the system starts manually, a calibration procedure is conducted when the system detects that the phone is located in a moving vehicle. Then the main program launches, working as a background daemon. The daemon monitors the driving behaviors in real-time and collects acceleration information. The collected information includes lateral and longitudinal acceleration and altitude. They are processed separately and used as inputs to the multiple round pattern matching process. At the same

time, the historical information will be registered. This information is helpful in the following round pattern matching process. If the pattern condition is satisfied, which means a traffic detection is detected; one signal is transmitted to trigger an alert. The phone may alarm to remind the driver or automatically sends the location of the vehicle to a pre-specified contact number via SMS. If the condition is not satisfied, execution returns to the daemon immediately [3].

II. Real-Time Monitoring Daemon

Real-Time Monitoring Daemon Module is the foremost module of the application that aims at determining whether or not the Smartphone is placed in a moving vehicle. As soon as the application is launched, a service runs in the background that continuously fetches the acceleration values from the accelerometer. If this reading keeps above 2.65 m/s^2 for several seconds, it is concluded that the device is present in a moving vehicle. During the human movements even in the running, the average acceleration in a time window of 3 seconds is no more than 2 m/s^2 . The most of accelerations in human movements keep below 1 m/s^2 . So it is easy for the system to detect when the vehicle starts.



Fig 2: The real time daemon

The objective of this module is to determine that device is present in moving the vehicle or not. Once it concludes that the device is in moving the vehicle, modules following the real time daemon module start their functionality [2].

III. Global Positioning System Module

If the mobile phone is inside a moving vehicle then we can effectively calculate the lowest speed of the vehicle. The phone calculates the speed of the vehicle by calculating Doppler distance and dividing it by the time interval. For average speed over a long distance, it takes the distance travels and divided it by the time taken. For instantaneous speed each GPS position has an error of up to 5 meters, that means that if we take two positions a second apart take the distance between them and calculate the speed you could be off by up to 10 meters per second or about 22.5 mph. The way a GPS actually calculates the speed at any given moment is by measuring the Doppler shift in the signals from the satellites. Just as a car engine or police siren sounds higher pitch when it's heading towards us than when it's heading away, in the same way, the signals from the satellites change very slightly depending on how fast we are moving towards or away from them. If we know where we are (GPS position) and we know where and how fast the satellites are moving (they broadcast that information) then by measuring the Doppler on the signals you can calculate how fast the receiver is moving far more accurately than by taking the difference between two positions.

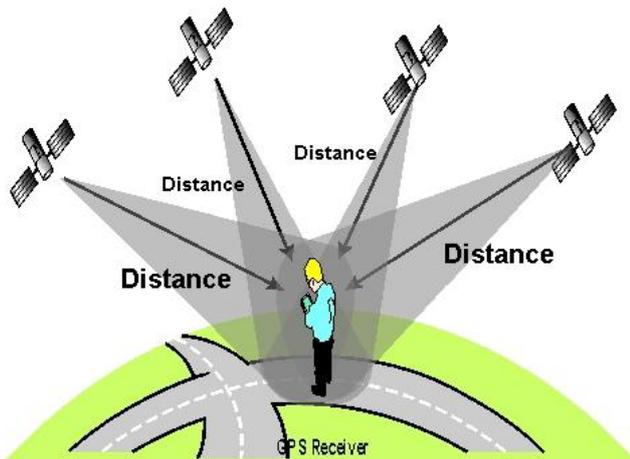


Fig 3: Global Positioning System

This module aims at calculating the readings from accelerometer and GPS, on the basis of which the speed of the vehicle is determined. These readings act as an input to the data processing module where the calculation of the actual level of traffic takes place on the basis of an algorithm, using the readings calculated in this module.

IV. Data Processing Module

In this module, the calculation of the actual acceleration of the vehicle takes place. The acceleration information of the mobile phone is transformed into the acceleration of the vehicle. This speed of the vehicle is compared with the counter value. If the speed of the vehicle is consistently low and the number of times when the speed of the vehicle is lower than the lowest speed limit, the value of the counter is incremented and if the incremented value of the counter is equal to the pre-decided value than alert module is activated.

Algorithm:-

- (1) Speed is calculated by GPS Module.
- (2) Counter = set value according to user.
- (3) While(speed !=0)
- (4) If (Speed of the vehicle < lowest speed limit (5kmph or any other pre-decided value))
- (5) Counter ++;
- (6) while loop closed.
- (7) If counter = pre-decided value
- (8) Alert module activated.



Fig 4: Data Processing

V. Alert Module

The Alert module is the module that is used to warn the driver about traffic congestion. It checks the value of the counter; if it is equal to pre-decided value than system generates an alert (a warning to the driver to send alert messages to friends). The driver is warned by alerts in a specific number of times and is requested to send messages to his friends. If the user sends messages to his/her friends, then they will take the alternate route and then reduce the new incoming traffic on the routes.



Fig 5: Alert Messaging

VI. Message Sending Module

When the application “Traffic Detection System” is installed on the device, it asks the user to enter ten contact numbers. These contact number comes into use in this module. When the number of maximum alerts has been provided to the driver, this module determines the location of the vehicle (using Global Positioning System) and generates a message which is sent to that entered contact number via an SMS. Location of the vehicle determined specifies the latitude and longitude of the place where the vehicle actually is. The location of the place in Google map also send to the specified contact. A system generated message consists of determined location in terms of latitude and longitude is sent to the pre-specified contact number.

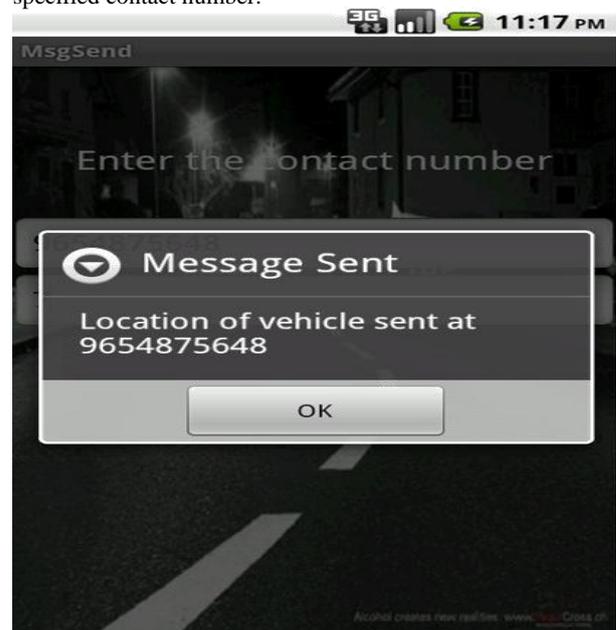


Fig 6: Message Sending

3. RESULTS AND DISCUSSIONS

Welcome Page (User Interface)

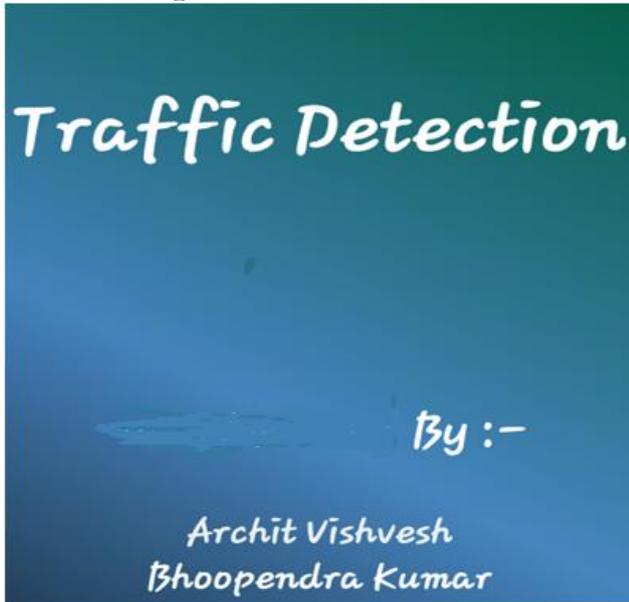


Fig 7: Welcome Page of App

It is the first page of our application. It describes the names of all the developers. In this activity, we have used alpha animation. The names of first and third developer have been left bright of Fade-in and the names of the second and fourth names are fade-out or disappear after 5 seconds.

Launch Activity Page

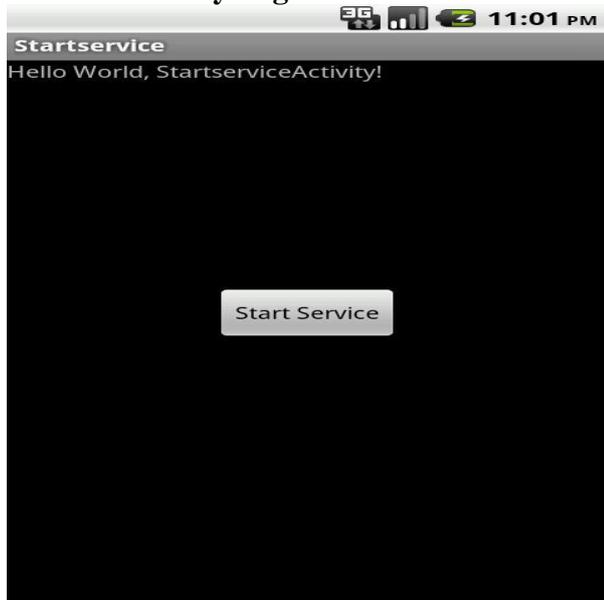


Fig 8: Launch Activity Page

Screen shot of the launch activity, where on clicking the start service button a service starts in the background. It is in association of the real-time monitoring daemon where the determination of the presence of a device on a moving vehicle is done.

Global Positioning Module

Fig 9: Global Positioning



The Global Positioning Module basically acts as an interface to the user. This Module is also the HOME PAGE of the application. The primary function of this Module is to display various Parameters such as Speed in MPH and KMPH, the current location of the user in Latitudes and Longitudes with the help of Global Positioning System (GPS). This Module also provides the facility of sharing Traffic Update via messages and also through social media like Facebook, Whatsapp, Messenger, etc.

SMS Manager



Fig 10: SMS Manager

The counter value in the settings signifies that when the moving speed of the user is consistently lesser than the threshold speed value (nearly 5 km/h) and is equal to the selected counter value, then a message is automatically sent to the contacts in the phone book that are already saved in a locally designed database.

Messages Via Shared Media

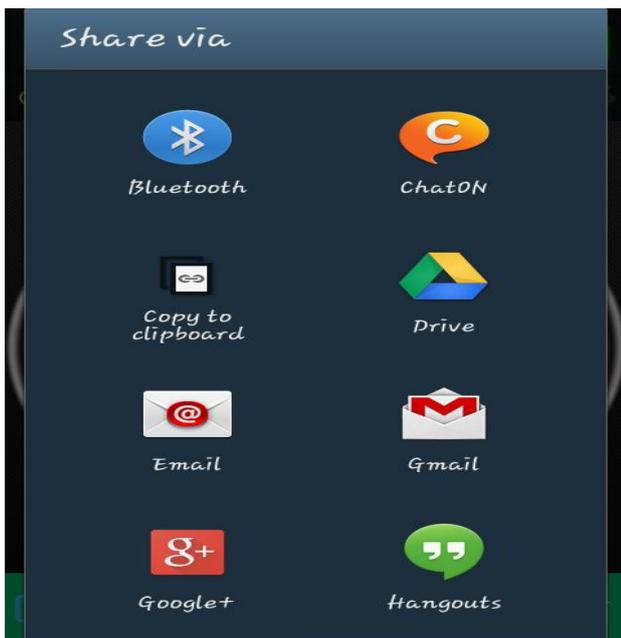


Fig 11: Messaging via shared media

This page shows various social networking sites that can be used by the user to send alert messages.

Setting Page (Counter Value)

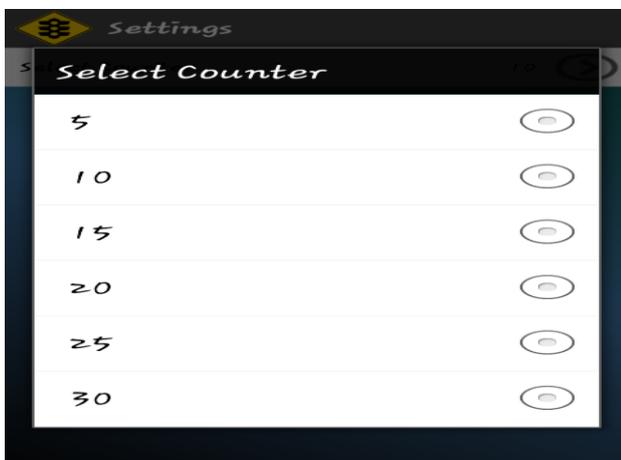


Fig 12: Counter Setting Page

This page shows the value of the counter. This value of the counter can be changed. It determines the number of times the vehicle reaches its lowest speed limit.

Multiple SMS Activity

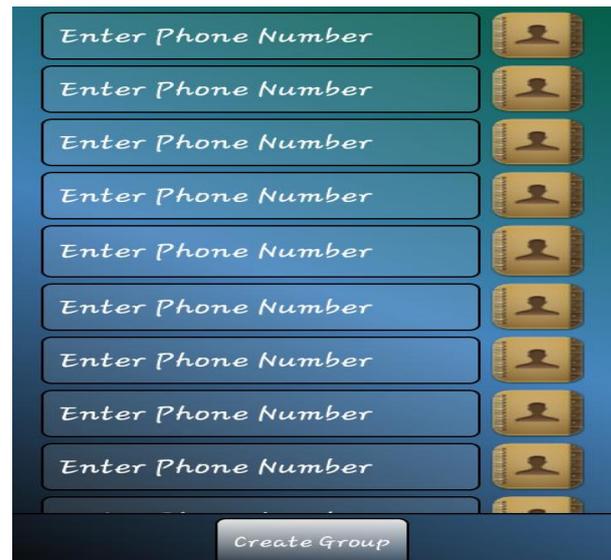


Fig 13: Multiple SMS Sending Activity

This activity deals with saving ten contacts in a local database called shared preference. The alert messages are sent to the following ten contacts.

4. CONCLUSION

As road traffic is increasing day by day, monitoring it in an effective way has been the challenge to researchers. Since Smart phones are penetrating into common people's lives very fast, utilizing the sensors available in them for traffic monitoring is a good idea. All this can be done in an energy efficient manner by using low energy consuming components of the mobile like accelerometer and magnetometer and occasionally using GPS for localization and finding the bearing of the road. Also, applying machine learning techniques in classifying data can help the system to adapt to changing factors like nature of the road and vehicle type the users use. The data processed by the mobile can be sent to a central server, which can use the information received to annotate maps accessed by the users through this application. This annotation can contain a lot of information like the intensity of traffic at a junction, the bumpy nature of the road, etc.

5. REFERENCES

- [1] J. Lee, J. Li, L. Liu and C. Chen, "A Novel Driving Pattern Recognition and Status Monitoring System", in First pacific rim symposium, PSIVT 2006, pp. 504-512, December 2006.
- [2] Jiangpeng Dai , Jin Teng , Xiaole Bai , Zhaohui Shen and Dong Xuan, "Mobile Phone Based Traffic Detection", September 2008
- [3] U.S. CDC, "Traffic Detection Application", [http://www.cdc.gov/Traffic Detection/impaird-drivjactsheet.html](http://www.cdc.gov/Traffic%20Detection/impaird-drivjactsheet.html)
- [4] <http://developer.android.com>
- [5] <http://androidhive.inf>