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TJamSpotter: Real Time Android App for Road Traffic Management

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Abstract— Traffic in India is increasing day by day and the Traffic Management System in India is fully dependent on managing it manually because very few roads in the country have Intelligent Road Traffic Infrastructure or Intelligent Sensor Network. So, managing traffic solely on the basis of road management is not very easy. Also, with increasing number of smart mobile phones in India, it is easy for people to use mobile applications which make their life easier. So, TJamSpotter is also an app which can help people in dealing with the road traffic jam problem to a great extent. No such application is designed till date to manage road traffic in India. TJamSpotter is an Android Application which can be easily downloaded from Google Play. The idea behind designing the app is to show the utility of reality mining to help reducing chances of people to hitch in road traffic congestion. The approach of the app TJamSpotter to solve the problem of the road traffic congestion is to first get user subscribed to a particular group/route. Based on that subscribed group, user can notify a message informing about the traffic congestion which will be flashed on the screens on the group of people using that route.

Keywords— Reality Mining, Road Traffic Management, Android Application, Google Play, Smartphone

I. INTRODUCTION

Traffic congestion is a severe problem in mostly the urban areas where the traffic is increasing more day by day. The infrastructure of roads in many developing and under developed country is not designed to bear such heavy traffics especially in peak hours. The result causes road traffic congestion and bottlenecks.

Currently, there are some traffic alert systems in Sri Lanka to aid road users by providing real time traffic alerts. Dialog Plc provides real time traffic alerts through SATNAV system. This system provides automated and voice supported navigation with the use of GPS data [2]. But we have no such mobile application in India. Another GPS system called T-Navi partners with Mobitel to provide live updates on traffic jams or road congestion [2]. All such kind of systems works for intelligent traffic systems. None of the system is based fully on the real time user data sharing based.

The fact that sensor data are typically weaved into mainstream social media platforms allows their combination with other online data such as text streams and updates, photos and videos. For instance, GPS, physiological, vibration, direction and health sensors applications (e.g. Garmin Connect1, EveryTrail2) collect user-contributed sensory information in real-time or a posteriori, and allow their users to share it together with other forms of social content. This unprecedented flood of data provides us with the opportunity to make decisions based on the data itself, rather than on guesswork, or on artificially constructed models of reality. Therefore, harnessing such data carries the potential to be the main enabler of Reality Mining by driving nearly every aspect of our modern society, including mobile services, retail, manufacturing, financial services, life and natural sciences [4].

Our approach is to design an Android app for managing the traffic in India which uses reality mining in such a way that the users of the app may post their information in real time. Such information can be shared with a group of people which can help them to avoid the congestion roads. It can also provide real time traffic alerts to road travelers, giving them information about the routes having traffic jam. The app wills the use Global Positioning System (GPS) based vehicle tracking; vehicle motion based traffic condition evaluation, mobile and web technologies. Android is a software stack for mobile devices that includes an operating system, middleware and key applications. Android is a software platform and operating system for mobile devices based on the Linux operating system and developed by Google and the Open Handset Alliance. It allows developers to write managed code in a Java-like language that utilizes Google-developed Java libraries, but does not support programs developed in native code.

II.EXISTING SYSTEMS

We propose four principal motives: a simulation, a sensor network, a real-time web site and a data mining approach. First, the simulation will consider all the vehicles, public roads, peoples, offices, and educational institutes. The simulation will study the nature, cause, and time of people's movement and will find an appropriate schedule for the vehicles and routes; it will also suggest new working hours for different institutions to reduce congestion. Second, an internet-connected sensor network will continuously monitor traffic density and congestion in different routes. Vehicle drivers will use this system to know the current traffic status of different routes and select the best route. Third, a real-time web site integrated with the sensor network will show the users current traffic and congestion status to plan their trips. The web system would provide a jam-less and efficient route from the source to the destination. Fourth, a data mining approach will use statistical data on congestion and traffic status provided by the sensor network so that historical trends about the traffic and congestion status of different routes can be used to reschedule vehicle routes[1].There are following systems existing in as found till date. All the systems though are based upon the intelligent traffic mechanisms and are established in other parts of the world [2]. No such

application is found till date which is mobile application is found till date meant for India.

Traffic control system is one of the various areas, where critical data about the well-being of the society is recorded and kept. Various aspects of a traffic system like vehicle accidents, traffic volumes and concentration are recorded at different levels. Intelligence traffic control system (ITCS) includes large numbers of RFID Reader that collect enormous quantities data in an attempt to provide information for the support and improvement of signal timing operations [5]. Using GPS, system can locate the position of the end user which will help to locate the vehicle in which he or she is present or the position of the person. The commuters in the same vicinity can be clubbed together on comparatively lesser number of vehicles if the source and destination lies on the same path. Since the open source system of Android gives authority to customize our device, an Android based application has been designed to reduce the traffic on roads[6].The proliferation of GPS-based technology used in devices such as smartphones and navigation systems is a strong enabler to enhance information dissemination for motorists. This allows motorists to better plan their journeys by deciding when, how and where they want to travel. It will help to spread traffic demand over different modes, time and space, and help relieve congestion on heavily used roads [7].

Different sensor technologies can be used for traffic detection. Most common is the use of induction loops for each lane and at each observation point. Highway entries and exits usually are equipped with induction loops separately. Cars and trucks are counted separately on each lane. In addition, the induction loops measure the speed of the detected vehicles. This sensory equipment produces huge amounts of data at each section station. This inhibits transmitting and analyzes the complete data online at the central traffic control computer. Thus either the huge amounts of data must be analyzed locally at the section stations, or - state of the art - the amount of data is reduced by data aggregation to allow for the implementation of higher level control strategies [8].

Today's smartphone not only serves as the key computing and communication mobile device of choice, but it also comes with a rich set of embedded sensors, such as an accelerometer, digital compass, gyroscope, GPS, microphone, and camera. Collectively, these sensors are enabling new applications across a wide variety of domains, such as healthcare, social networks, safety, environmental monitoring, and transportation and give rise to a new area of research called mobile phone sensing [9]. The introduction of smartphones and 'apps' (applications for mobile devices) has provided many old and new functionalities which have changed the way people communicate and search for information. Today, people follow the news, check train timetables and the weather, chat with friends and plan their routes whilst on the move. This study looked at ways in which this new mode of communication and use of information could be translated to the world of data collection. Surveys conducted face-to-face, by telephone, on paper or through the Internet often require a good deal of time and effort from respondents to complete. [10].

There are very few apps currently present which are in use or under testing phase and that too are not being used in India or are developed for Indian Traffic scenario. Following are the details and features of few apps being used abroad.

A. Satnav:

Dialog SATNAV uses GPS technology to efficiently bring automated and voice supported navigation to GPS Smartphones. Dialog SATNAV is powered with detailed maps of Sri Lanka to assist navigating to and from any destination in the country varying from places of business and hotels to over 200,000 places of interest and routes across 9 provinces.

a. Features:

(a). Live traffic updates
(b). Optimal and shortest route indication
(c). More than 200, 000 points of interest around the country
(d). Breakdown or Road Construction Alert
(e). 3D building views
(f). Voice guidance in English, Sinhala and Tamil
(g). Walkie Talkie
(h). Track your friends
(i). Comments on the map

B. Real Time Traffic Information:

It is a transport system which is safe and smooth flowing through a suite of advanced traffic systems called Intelligent Transport Systems (ITS).From Expressway Monitoring Advisory System (EMAS) to the Parking Guidance System (PGS) and TrafficScan—each is connected to our highly sophisticated and integrated backend i-Transport system.

a. Features:

(a). Traffic data is aggregated, integrated and disseminated at the ITS Centre for traffic monitoring and management.
(b). The data is also collected for traffic analysis and planning.
(c). Real time and localised traffic information is disseminated through websites, radio broadcasts and smartphones.
(d). To reach out to the wider public and leverage on the private sector's innovations as well as their broad distribution channels, traffic information is also disseminated through the private sector's products and services.

C. Metropia:

Metropia is more than just a mobile app, it is an advanced traffic demand management solution that optimizes the use of cities' existing transportation grids, using an incentive-based approach to metro mobility improvement. The Metropia mobile app makes commuting easy with real-time trip predictions, route mapping, voice navigation and pre-trip alerts. With the app, commuters earn rewards simply by making smarter transportation choices that get them to their destinations faster while reducing harmful CO2 emissions. Greater incentives are assigned to departure times and routes that help commuters avoid traffic while lessening their impact to the roadway system.

a. Features:

(a). Metropia, an intelligent traffic management system

(b). It incentivizes communities to work together to ease city roadway congestion
(c). It will launch the beta test of its innovative mobile app in the Austin area on September 19th, 2014.
(d). Joining Metropia in Driving a Better Austin is its supporting partner, the Central Texas Regional Mobility Authority (Mobility Authority), which is partnering in the Austin beta test.

III. ANDROID APPLICATION " TJAMSPOTTER" DEVELOPMENT

Android applications are written in the Java language, compiled into byte codes which will be converted to a .dex file (Dalvik executable file) using the dx converter. This will further be com-piled in to android package file (apk file), that can be installed on the android devices[3]. Android is a software Environment that includes a Linux based OS, different application frame-works; end user applications, libraries, integrated multimedia support and more. Tools and differ-ent APIS that are used for developing mobile apps are provided through the android SDK.

A. Software/Hardware Requirement:

a. Operating Systems:

(a). Windows XP (32-bit), Vista (32- or 64-bit), or Windows 7 (32- or 64-bit)
(b). Mac OS X 10.5.8 or later (x86 only)
(c). Linux (tested on Ubuntu Linux, Lucid Lynx)
(d). GNU C Library (glibc) 2.7 or later is required.
(e). On Ubuntu Linux, version 8.04 or later is required.
(f). 64-bit distributions must be capable of running 32-bit applications.

b. Development tools:

(a). JDK 6 (JRE alone is not sufficient)
(b). Apache Ant 1.8 or later
(c). Not compatible with Gnu Compiler for Java (gcj)

c. Platform for development:

(a). Eclipse (used for developing TJamSpotter)
(b). Android Studio (Can also be used which is still under Beta-testing and is unofficially launched for Android development)

d. Deployment:

(a). Play Store (Upload the App on it)
(b). Apk Distribution (Though mail or Bluetooth transfer)

e. Tools used for development:

(a). Android Development Tools

IV. PHASES OF DEVELOPMENT

A. Requirement Gathering:

There is no such application of mobile phone which could inform us about the traffic jam information, which led to idea of designing such an application. The requirements were gathered on the basis of personal and general problems faced by the people in traffic jams.
Motivation for project development

(a). Data from the use of cell phones can be a great use to generate interesting patterns which can further be used to make predictions in various areas.
(b). The location proximity of a person can help us to know about the whereabouts of his surroundings.
(c). Reality mining can also help city planners to avoid traffic problems .When we can predict traffic jams and let the people know about it and avoid them to stuck in road traffic congestion.

a. Use Case:

The user activities are depicted as follows using UML tool for the use case.

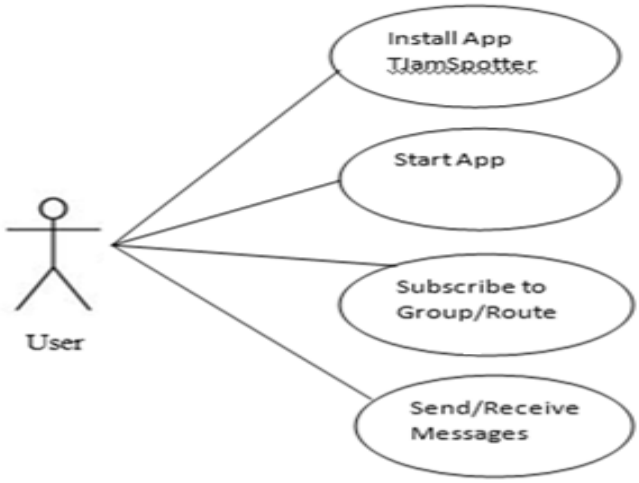

Figure. 1 Use Case Diagram of the Application TJamSpotter

b. Activity Diagram:

The activity diagram of the app is given below.

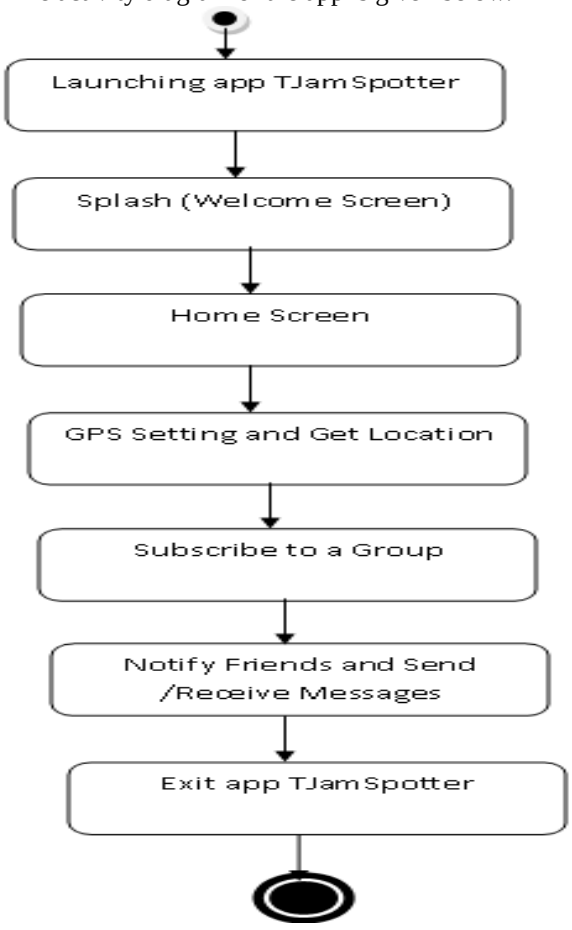

Figure. 2 Activity Diagram of the Application TJamSpotter

B. Scope of Work:

a. Present Scope of Work:

(a). Taking the Current Location of User:

Though the mobile application is designed keeping in view the proximities of Delhi/NCR in India but later it can work for any place in India or other places apart from India also, because the application is taking coordinates from starting point till end point. Also the application is connected with google map and it can take the current location of the user from anywhere.

(b). Sending Messages to Group of Users:

The application main task is to inform the group of people who are using the application about the traffic jam on the specific routes. This is done by sending the messages.

b. Future Scope of Work:

(a). Optimum /alternate route suggest:

The future work will aim at suggesting an alternate route to the user so that one can opt for another way to the destination.

(b). Trending : Intelligent Traffic Sensing:

There will be focus on sensing the traffic on the basis of prior information /data collected till date and a trending will be given after mining the data which will specify in advance about the traffic prone areas to the users.

C. Designing Data Base:

Parse data base is used to store the data related to the application. For the notifications also Parse database is used.(GCM database can also be used in case we have server for further versions of the applications)
Limitations of the parse database are that we can have only 25000 users at a time who are accessing the application.

D. Development:

The development of the application is done using Eclipse with java as the backend language for coding.

E. Testing:

The monkey testing is used to test the application which is done using Eclipse. The testing can also be performed on Emulator in case we do not have an Android Device/ Mobile.

V. WORKING OF TJAMSPOTTER

A) Splash screen:

It will show information about developer.

B) Home Screen:

a. Shows current location of user if GPS is on
b. Enter message or location or both to notify user help one's avoid traffic
c. Notify Friends
d. You can subscribe to a familiar group to avoid unwanted subscription and notification

C) Incoming Home Screen:

It will show the message or location (if GPS) of sender.

Table 1: Comparitive Study Of Various Apps And Tjamspotter

App Name **Point of Differences**	***SATNAV***	***LIVE TRAFFIC NSW***	***METROPIA***	***TJAMSPOTTER***
Country/ City	**Sri Lanka**	**Australia /Sydney**	**US/ Austin**	**India/ NCR**
Used Where Intelligent Traffic System is Implemented	Yes	Yes	Yes	No
Optimal and Shortest Route Indication	Yes	Yes	Yes	No
Based On Data Collected in Real Time by Users	No	No	No	Yes
Traffic Updates using Real Time Data of Users	No	No	No	Yes
Works on Mobile OS	All	All	All	Android

VI. SNAPSHOTS

The following snapshots are taken during installation and running the application.

Figure. 3 Splash Screen: Developer Info

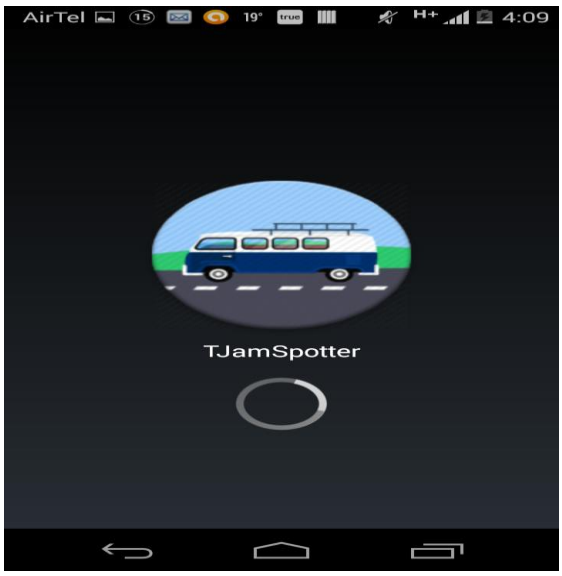

Figure. 4 Splash Screen: TJamSpotter

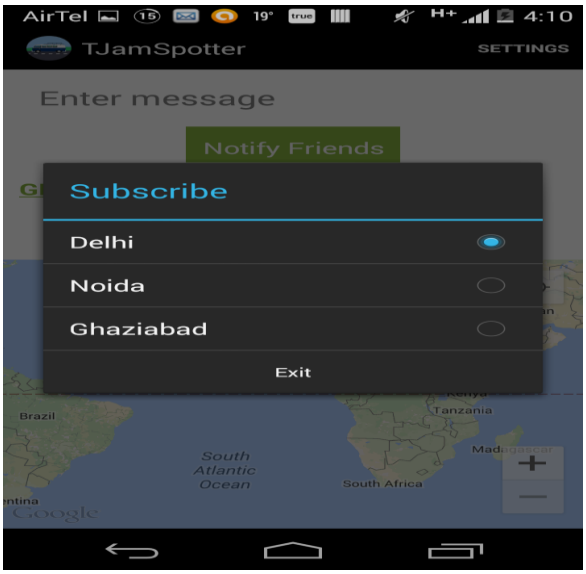

Figure.5 Group Subscription Popup

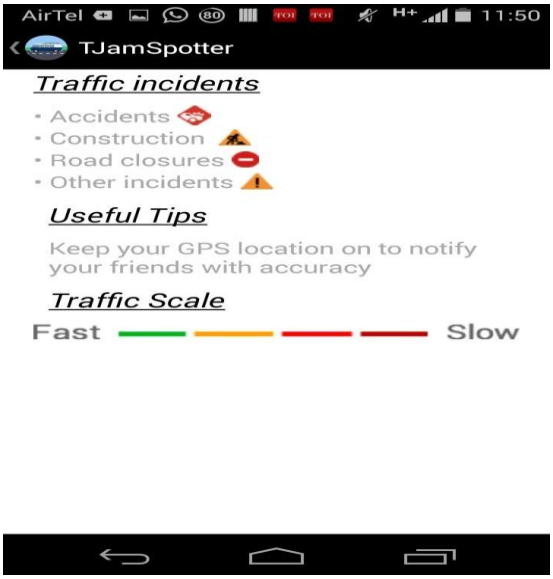

Figure. 6 Traffic Incidents Page

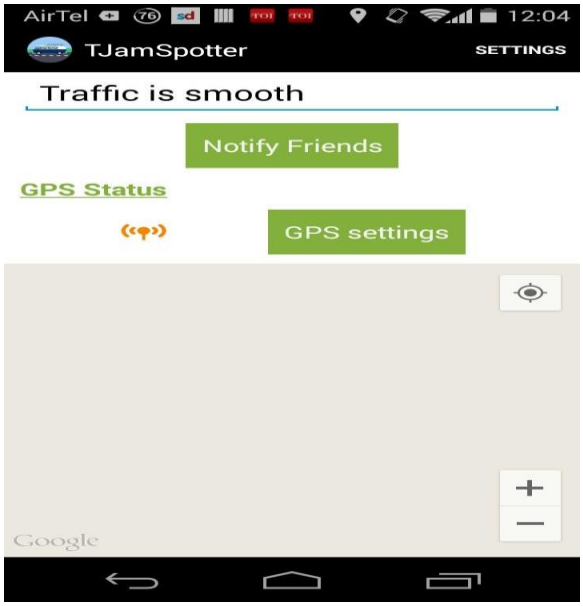

Figure. 7 Notification to friends

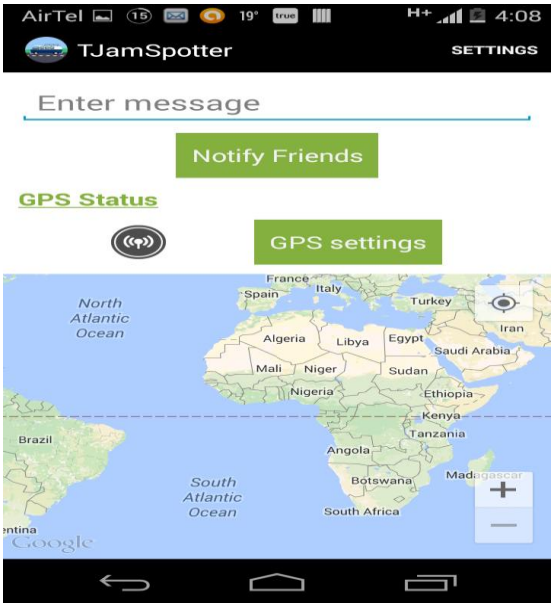

Figure. 8 GPS setting

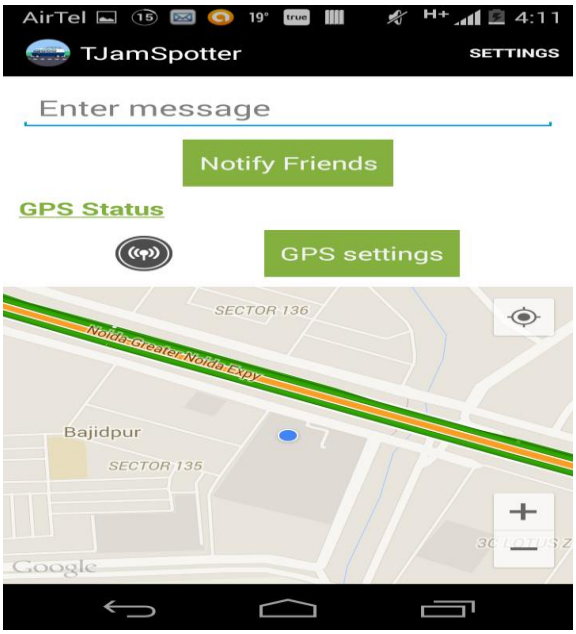

Figure. 9 Current GPS Location

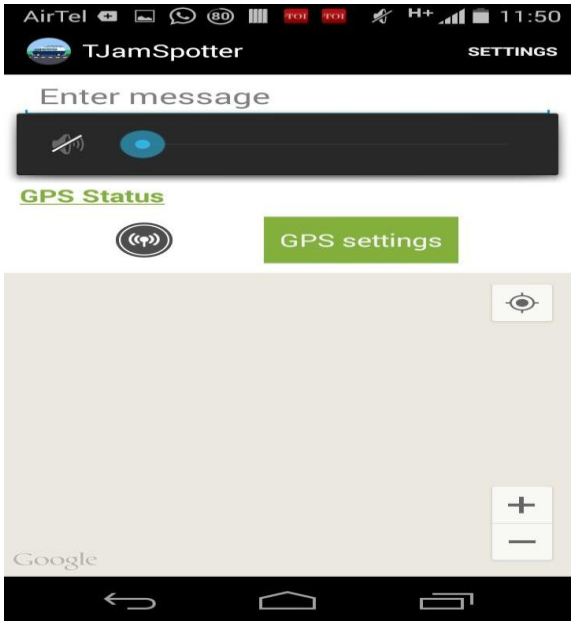

Figure. 10 Sending Voice Message

VII. TESTING PHASE

The Android testing framework, an integral part of the development environment, provides architecture and powerful tools that help you test every aspect of your application at every level from unit to framework. Android testing can be done inside the development tool using emulator and can be further tested on the smartphone (having Android OS installed) i.e. the hardware devices.

In this Project, the black box testing is used to perform testing on the mobile application. Black box testing is defined as a method of software testing technique whereby the internal structures (or working) of the item under the test are unknown to the tester. The tests are successfully carried out on MOTO X with Android Version KitKat(Android 4.4) and TJamspotter installed in it. Though the app is designed to run on latest versions of Android also that is Lolipop(Android 5.0,5.1), so can be easily run on them too.

VIII. CONCLUSION

The latest advancement in mobile phones , specially the smartphones has caused revolution in the development and usage of the mobile application. Android applications are also a part of diverse solutions that are offered to the busy people to live their life easily and perform their daily tasks using mobile phones.

The mobile application TJamSpotter is designed to provide a simple solution to the people who travel on traffic prone roads on daily basis. The App uses the real time data from the mobile phone, given by the uses subscribed to the particular groups and informs that particular group about traffic jam. This way the people in that group who are travelling through the same route can avoid using that traffic congested route.

IX. FURURE WORK

In future the proposed mobile application can be made commercial. The design can be modified so as to add more options which can suggest for alternative routes as well. The application may also include suggesting the most optimized route which is shortest and also costs the least. Since, the application only has groups for Delhi/NCR which can later be enhanced to some more groups which can be formed for other regions as well. Also the concept of Reality Mining will be taken to certain more levels where it can be used to design an application to study and improve human behavior.

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