"GPS Based Sentiment Analysis for Traffic Monitoring

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ABSTRACT

In this "GPS BASED SENTIMENT ANALYSIS FOR TRAFFIC MONITORING" paper, we are interested to used android application to determine the traffic in 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. Once traffic jam is detected, the mobile phone will automatically alert the driver. The location of the vehicle (latitude and longitude) where traffic jams are formed is sent massage to the user automatically. The user receives the massage using a android application to avoid the traffic. The users receiving the messages will thereby avoid taking the congested route and hence the level of traffic on the congested road will decrease, and the user will reach the destination in comparatively less time.

Keywords *-GPS, Android operating system, SDK, LBS, traffic monitoring, Global system for mobile communication.*

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1. INTRODUCTION:-

GPS based sentiment analysis for traffic monitoring 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.

A. Global Positioning System

GPS (Global Positioning System) which is a spaced based on satellite navigation system(SNS) that provides information of location in all weather condition. The GPS technology has been implemented on smart phones.GPS requires clear sky to work and data connection, hence we have an alternative solution to locate the current user position is network provider. This gives the components of Location Based Service(LBS) the working of Android using GPS. The GPS system comprises of three parts: Space segment, User segment and Control segment. The diagram of the structure of GPS is given below.

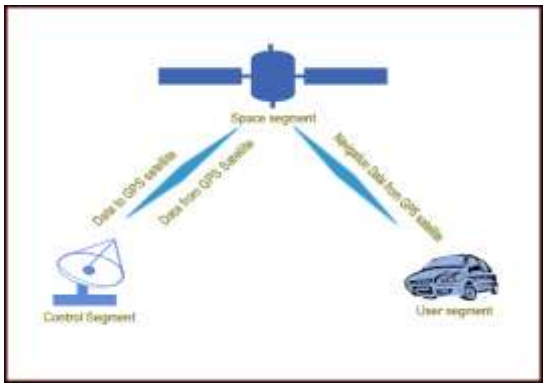

Fig 1:-Global Positioning System

Space segment – The satellites are the heart of the Global positioning system which helps to locate the position by broadcasting the signal used by the receiver. The signals are blocked when they travel through buildings, mountains, and people. To calculate the position, the signals of four satellites should be locked. You need to keep moving around to get clear reception.

User segment – This segment includes military and civilian users. It comprises of a sensitive receiver which can detect signals (power of the signal to be less than a quadrillionth power of a light bulb) and a computer to convert the data into useful information. GPS receiver helps to locate your own position but disallows you being tracked by someone else.

Control segment – This helps the entire system to work efficiently. It is essential that the transmission signals have to be updated and the satellites should be kept in their appropriate orbits.

B. Android Operating System

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 [2].

C. Location Based Services

Location-based services (LBS) use real-time geo-data from a mobile device or Smartphone to provide information, entertainment or security. Location-based services use a Smartphone's GPS technology to track a person's location, if that person has opted-in to allow the service to do that. After a Smartphone user opts-in, the service can identify his or her location down to a street address without the need for manual data entry.

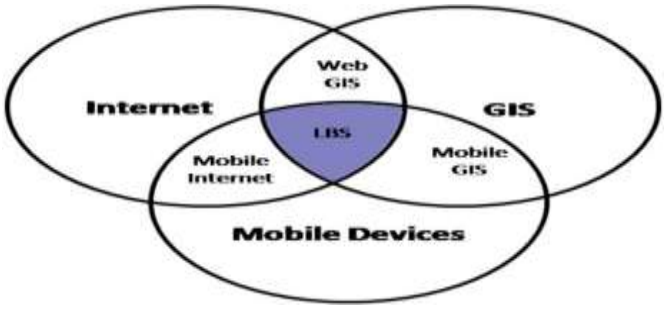

Fig 2:- Location Based Services

2. LITERATURE REVIEW

After studying various methods adopted by various authors it is observed that numerous methods are used for vehicle tracking, monitoring and alerting system..According to [3], due to the complicated traffic networks, traffic speed and the huge number of the traffic participants, the safety cameras and other existing traffic management methods are not good enough for controlling and managing traffic in any situation and in any location. Kardashyan [3] describes a new traffic management solution based on the automatically individual control to any traffic user anywhere and anytime. Akande Noah Oluwatobi represent automatic vehicle location is advanced method to track and monitor any vehicle equipped with software unit that receives and transfers signal through GPS satellite. Automatic vehicle location system used web based, mobile communication and SMS based platform for communication. This system enables to collect and analyze the information about location of vehicle in real time [4].Tripathi [5] presents an algorithm for detection of hot spots of traffic through analysis of GPS data by analyzing data clustering algorithms: the K-Means Clustering.

Akande Noah Oluwatobi represent automatic vehicle location is advanced method to track and monitor any vehicle equipped with software unit that receives and transfers signal through GPS satellite. Automatic vehicle location system used web based, mobile communication and SMS based platform for communication. This system enables to collect and analyze the information about location of vehicle in real time [7]. The system uses tracking on the basis of Google map. It is effective but system has complexity for Google map [8], Hoang Dat Pham, M. Drieberg, Chi Cuong Nquyen, "Development of vehicle tracking system using GPS and GSM modem," IEEE Conference on Open System, pp: 89-94, 2013. [9]. Hoang Dat Pham, M. Drieberg, et al. proposed vehicle tracking system demonstrates the feasibility of real time tracking of vehicle and improved customizability and global operability. The system will provide users with the capability to track vehicle remotely through the mobile network [10].

3. MOTIVATION

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. Smart phones and the Internet or cyberspace have revolutionized the communication and the lifestyle of people this made us think that we should develop such a system which help people of notifying their tasks and places of their interest .and other useful services. The manual work of remembering the events with respect to their location will get reduced as much as possible.

4. 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. 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. Installing additional devices on vehicles to increase sensing density can very quickly become prohibitively expensive [6].

B. Methodology

Several methods have been proposed that use sensors in Smart phones for activity detection in various environments.

- Application Start
- While (speed !=0)

- Update location in server (Latitude & Longitude)
- Thread sleep or Thread wait (Ex. 30 sec)
- If (speed=0 & counter==5)
- While loop closed.
- Get latest updated records for particular root from server.
- Apply sentiment analysis & calculate mean speed at each location.
- Compare mean speed value to standard value & Show alert message to user.

Fig 3:- 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. Proposed Architecture

The primary working principle of our app is Global Positioning System (GPS). GPS traffic management are effective, reliable and efficient, with a flexible scale of implementation at relatively small investment, which should be considered as a priority traffic management.

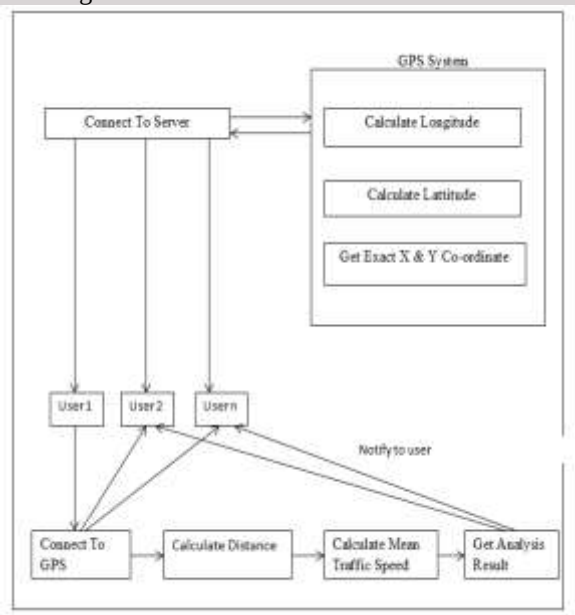

Fig 4:- Working of the Android application on roads

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. If the mobile phone is inside a moving vehicle then we can effectively calculate the lowest speed of the vehicle. 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 alert message will be displayed automatically to users.

D. System Modules

The Traffic detection system is made up of following components. They are (1)Real time monitoring daemon module, (2) Global Positioning System module, (3) data processing module and (4) alert module. The daemon monitors the driving behaviors in real-time and collects acceleration information. The collected information includes lateral and longitudinal acceleration and latitude. This information is helpful in the following round pattern matching process. If the pattern condition is satisfied, which means traffic detection is detected; one signal is transmitted to trigger an alert. If there is traffic than Smartphone may get automatically alert message to the users.

I. 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. If accelerometer is reading keeps above 2.65 m/s^2 for several seconds, it is concluded that the device is present in a moving vehicle.

Fig 5:- 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].

II. Global Positioning System Module

If the mobile phone is inside a moving vehicle then we can effectively calculate the lowest speed of the vehicle. 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, which means that if we take two positions a second apart take the distance between them and calculates the speed you could be off by up to 10 meters per second.

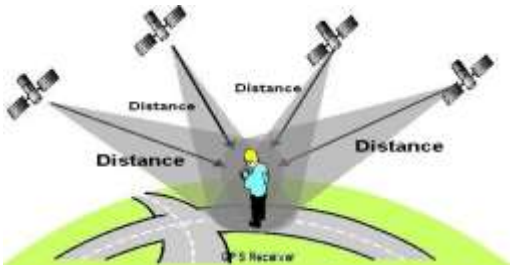

Fig 6:- Global Positioning System

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.

III. 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) While (true)
(2) Update location
(3) Thread sleep or Thread wait
(4) Counter = set value according to user.
(5) If (speed = =0)
(6) Counter ++;
(7) If (counter = = 10)
(8) Break;
(9) While loop closed.
(10) Alert module activated.

IV. 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 message. The automatically traffic alert message send to users through GPS. If there is traffic then they will take the alternate route and then reduce the new incoming traffic on the routes.

Fig 7:- Alert Messaging

This is the flow chart of proposed system of GPS based sentiment analysis for Traffic Monitoring

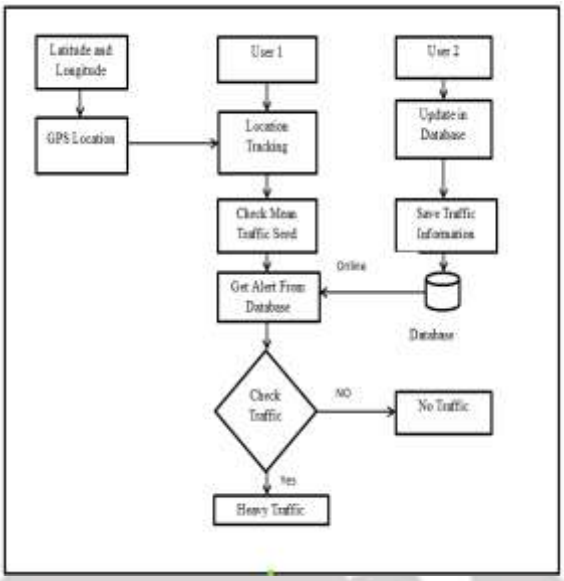

Fig 8:- Proposed flow chart of traffic monitoring

5. RESULTS AND DISCUSSIONS

The first page of our application is Login Page. In this activity, where on clicking on start service button then service is run in the background. Second Screen shot of the app, In this, we entered a source-destination name. Then click on view traffic report then it's show route map report.

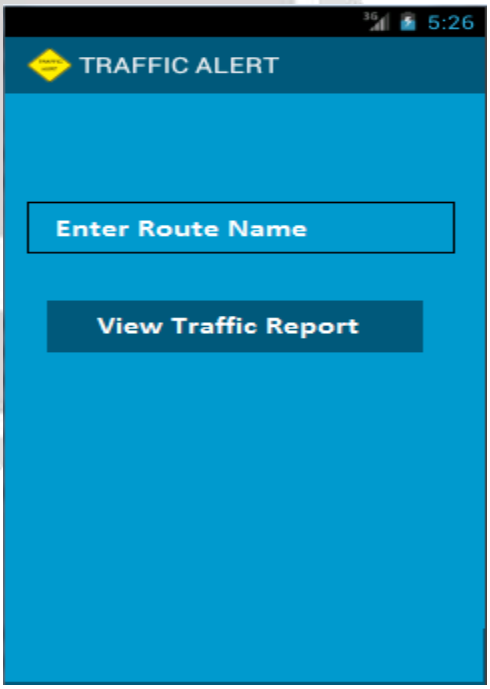

Fig 9 :- Start Module

Fig 10:- Location Tracking

In below Alert Module, alert message is display like this on user's mobile. There is two option view map, which show route by map. In this Screenshot, the route is show by map. In this module traffic is updated by sentiment analysis.

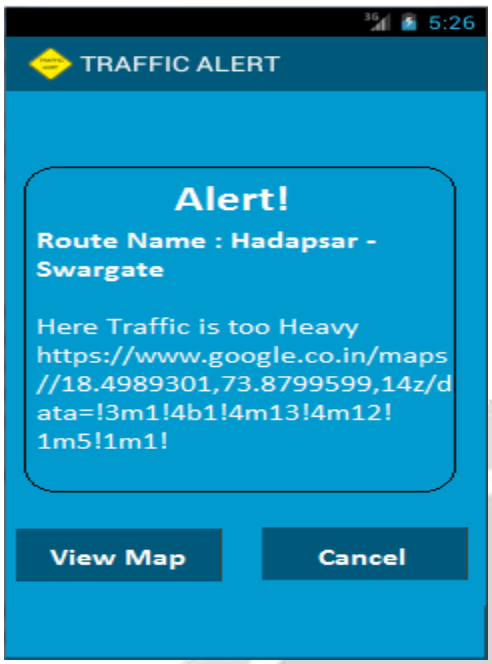

Fig 11:- Alert Module

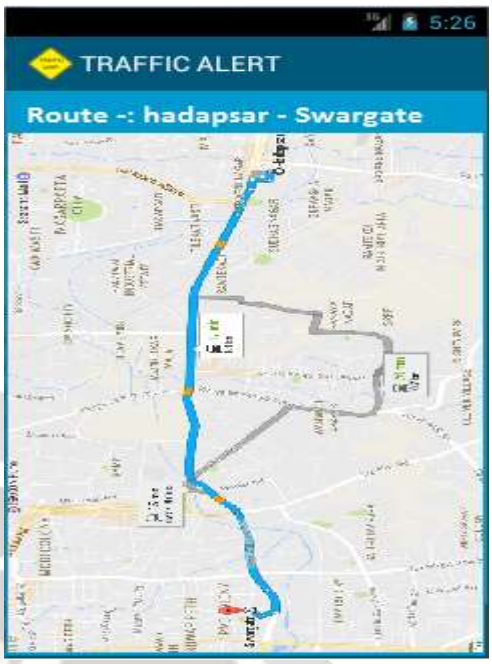

Fig 12:- Route Map

Here is four modules as output screenshot,

1) Global Positioning System Module: - It basically acts as user interface. This Module also provides the facility of sharing Traffic Update via messages.

2) Location Tracking Module: - In this module GPS provides latitude, longitude information to system and also check location accessibility.

3) Traffic Analysis Module: - In this module traffic is updated by sentiment analysis.

4) Alert Module: - In this module traffic alert message is display on users mobile using this app.

6. 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 All this can be done in an energy efficient manner by using low energy consuming components of the mobile and the GPS (Global Positioning System). The application of the GPS technology in traffic data collection gives a detailed study of traffic condition with an additional provision of better historical repository for road traffic data for other future analysis. The research resulted in the development of a model for GPS system with traffic monitoring. this is a major contribution towards automation of traffic management and analysis for any given country. We adopted traffic status estimation algorithms, the link-based algorithm. The testing result shows that the traffic status can be fairly well estimated and demonstrates the feasibility of such application in most of cities. The future research should focus on enhancing the system towards driver behavior analysis and reporting ,with specific real-time warning and advanced mapping, for instance the ability to send a real-time arning alert to the reckless and speeding drivers.

7. ACKNOWLEDGMENT

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