



Traffic Prediction through Live GPS Data

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Abstract: Traffic clogging has become a nuisance in almost every city these days. In these situations, it would be a boon for the drivers if there is a facility or an application that predicts the traffic in a particular location or a city. This paper proposes an active traffic prediction system that uses live GPS data collected from mobile phones. The co-ordinates are stored in a database and the collected data is sent to a server which uses Great Circle Algorithm to compute the distance between two GPS co-ordinates. The distance covered by a user in three minutes is found and the traffic can thereby be predicted.

Keywords: GPS, Great Circle Algorithm

I. Introduction

The Industrial Revolution during the Second World War created a boom in the automobile market and ever since, there has been no downfall in this sector. However, this has caused quite a bit of an inconvenience in the general society due to traffic snarls in various cities. There have been efforts made to intimate drivers about traffic clogs in different cities. The most famous has been the introduction of the recent "Traffic View" by Google Maps. This traffic view works based on the GPS data collected from different mobile service providers. The major disadvantage of the Traffic view is that it is confined only to the metropolitan cities in India. Through this paper, we propose an application for Android phones which would help us predict traffic clogs in almost every city. Every five seconds, the application will record the GPS coordinates of users in a server. These coordinates are inputted to the Great Circle Algorithm to calculate the distance covered by a single user in three minutes. Based on the average distance covered by all the users in the vicinity, the traffic condition in that location can be predicted.

II. Architecture

Given below is the proposed architecture diagram. The main components and their working are also described.

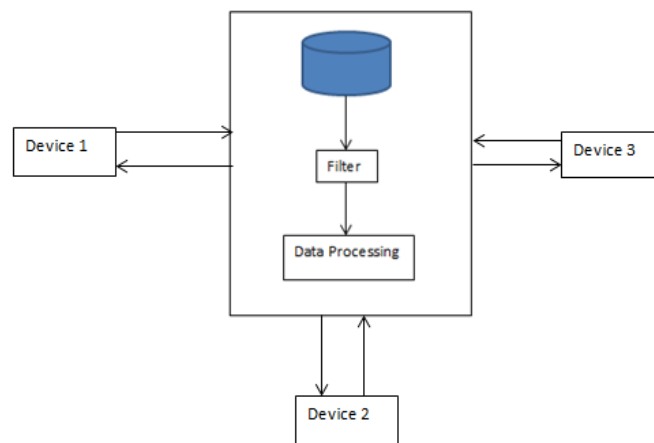


Fig. 1 – Architecture Diagram

Each device shown in the diagram is a mobile phone that runs on the Android platform and is connected to a server. Every five seconds, the server receives GPS coordinates from every device. Using these coordinates the distance covered by each device is computed with the help of the Great Circle Algorithm periodically in an interval of three minutes. This process is repeated for every device and the locations with traffic clogs are shown with the help of location markers on the map in the device.

Filter

If the GPS of the device is not switched on, the server would still be receiving garbage coordinates from these devices. The filter identifies such unwanted GPS coordinates received and removes it before sending the data for processing.

Data Processing

Every five seconds, the co-ordinates collected are stored in a database in the server. The distance between the co-ordinates is calculated using the Great Circle Algorithm periodically in an interval of three minutes as follows.

$$a = \sin\left(\frac{lat2 - lat1}{2}\right) \times \sin\left(\frac{lat2 - lat1}{2}\right) + \sin\left(\frac{lon2 - lon1}{2}\right) \times \sin\left(\frac{lon2 - lon1}{2}\right) \times \cos(lat1) \times \cos(lat2)$$

$$c = 2 \times \text{atan2}(\sqrt{a}, \sqrt{1-a})$$

$$\text{distance} = R \times c$$

where R is the radius of the Earth (6378100 meters)

lat1 is the latitude of the first co-ordinate

lat2 is the latitude of the second co-ordinate

lon1 is the longitude of the first co-ordinate

lon2 is the longitude of the second co-ordinate

The value computed above is the actual distance traveled by a user in an interval of three minutes. If this value is going to be less than one hundred meters, we conclude that the user is in a potential traffic clog. The location with this traffic clog is indicated using a location marker in the map and would be visible to all the other users.

III. Future Works

The application can be further developed by fixing certain locations that are prone to traffic clogs in a city as reference points. The potential traffic clogs are found using the above method and the location markers can be displayed only to those users within a perimeter of two kilometers from the traffic clog. This would enable the user to receive only those traffic updates that are required for him/her. Another improvement would be to predict the destination of the user as he travels and provide traffic updates which he will require on the go. Implementing an application of this scale would require a very strong database which will be able to store a lot of values from many users. The accuracy of the GPS co-ordinates in a particular location also plays a major role. For the application to be accurate, the GPS co-ordinates in the user's location must also be accurate. The users must also have good internet access as they travel. To receive better results on traffic conditions, the application would require a decent number of users who are using the application. Catering to very few users may not prove to be accurate.

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