Achieving real time and location aware system and vehicle responses using Vehicular Fog Computing

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Abstract –Fog computing extends cloud computing from edge networks. Fog computing has many advantages like location awareness ,low latency, traffic management, management of roadside accidents in cities. Road safety has become a main issue for government and vehicle manufacturers in the last fifteen years. Development of different vehicular technologies has helped companies, scientists and organizations to focus their efforts on road safety. Several products are offered by companies for monitoring behavior of driver using costly cameras and equipments, but we can create a system that is inexpensive, simple, and intelligently uses the sensors available on a mobile phone. By using mobile inbuilt sensors, the system is both cheap and usable.The system will use inbuilt mobile sensors like accelerometer, gyroscope. The goals of the system are reduce accidents, road safety.

1. INTRODUCTION

Vehicles are the main componenets of these system.Every day large amount of data is generated with the help of inbuilt sensors in the mobile phone. This large amount of data is stored on cloud servers. So large amount of data is there on cloud . If we store the data as it is on cloud then it is a wastage of space. So for this we use fog nodes so that we can filter out the data and store the useful data on the cloud.The system is mainly designed to prevent road accidents by notifying user about the speed, location, distance between the two vehicles, alerting about the rash-driving, notifying about the accidents on the way. This uses cameras, an accelerometer, gyrometer, GPS sensor. It reduces the human resources.

1.1 Project Motivation

Vehicles can create bit annoying problems when they are not managed in certain way for example they can lead to traffic or accidents due to improper human communications. To reduce the human resources which are required to manage traffic and accidents.

1.2 Problem Statement

Building such a mobile application which will minimise accidents and control accidents by maintaining minimum distance between two vehicles. It also alerts the user about rash-driving. Notifying user about roadside accidents, speed and current location.

2. SYSTEM ARCHITECTURE: OVERVIEW

The higher level view of the system is provided in the following fig: 1.The system is mainly made up of the three layers first is the data generating mobile phones second layer is the fog node for the processing and third layer is the cloud server for data storage purpose.

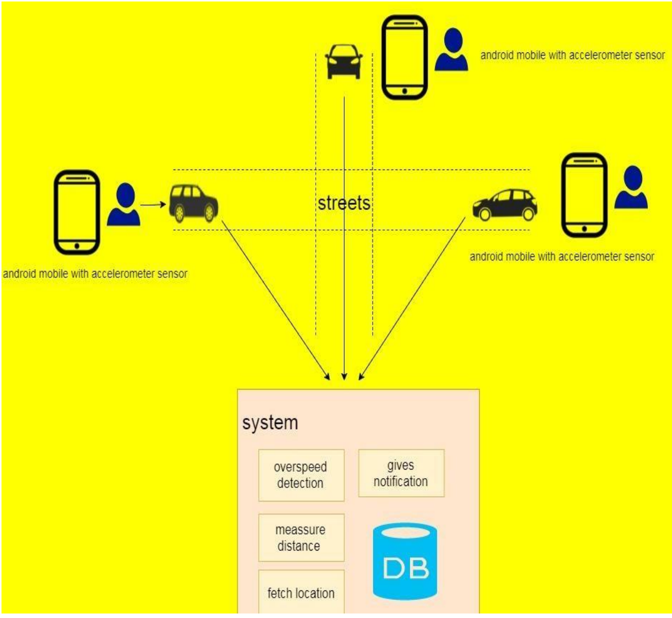

Fig: 1.Architecture Overview.

2.1 Android mobile:

This is the first layer of the architecture. Mobiles play an important role in this system. Mobiles generate the data. Data is generated with the help of android application which is installed in the mobile phone of the driver. Here we are using the data generated by the accelerometer, gyroscope and GPS. Accelerometer is used to collect data about the acceleration forces. That forces may produce due to accidents, reckless driving or some sudden jerks. Gyroscope is also used to collect the data. It senses change in orientation, direction. We can access the data of orientation with the help of gyroscope.

2.2 Fog nodes:

This acts as a middle layer of the architecture. These layer consists of vehicles in the wireless communication range of roadside units. This layer is main for VFC due to the increasing sensors, computation and storage abilities of vehicular equipments.For decision making data generatred by vehicles can be used and other is sent to the fog layer.

2.3 Cloud Server

This acts as a last layer of the architecture. It takes the data generated by fog nodes. It performs different operations on this data. From this we can take city level decisions. It also helps us to send notifications to the driver regarding various things like decrease the distance, about rash-driving , the road accidents, etc. It is use for optimal level decision making.

3. SOLUTION

3.1 Mathematical Model

Let Sys be the Whole system consisting of:
Sys= {IPt, Proc, OPt}.
Where,
IPt is the input to the system.
Proc is the procedure applied to the system to process the given input.
OPt is the output.

A. Input:

IPt = {UI, LOC, XA, YA, ZA}.
Where,
UI is user information.
LOC is user current location.
XA is value of x in accelerometer .
YA is value of y in accelerometer.
ZA is value of z in accelerometer.

B. Process:

PRO= {FL, SD, DM}
FL is fetch LOC
SD is Speed detection
DM is measure distance between user and other vehicles

C. Output:
OP= {NU}
NU user about Over speeding and DM

3.2 Working

3.2.1 First Phase:

In first phase we need to log in to the respective application. For that user need to enter data like full name of user, vehicle number, mobile number, etc. The first phase includes collection of data from sensors of the mobile phone like accelerometer, gyroscope. Accelerometer provides information about vibration and gyroscope provides information about orientation of the phone. The GPS which is there in the phone will provide information about location of the user.

3.2.2 Second Phase:

In second phase data-processing will be done on the data which we hot from first phase. In these Haversine algorithm is used for finding the distance between two vehicles. System uses different Decision based algorithms for making predictions like which area is more prone to accidents ,harsh-driving, etc. Here C4.5 algorithm is used so that system is abel to make decisions on its own. Haversine and C4.5 algorithm are explained below:

1. Haversine Algorithm:

Distance between two points can be calculated using the haversine formula.

Haversine waveform is sine wave, and contains a part of a sine .

Electronics and other applications use the haversine algorithm. For ex. Finding the distance between the points.

1. The R =earth radius.

2. LatO = latitude of point origin, LongO = longitude of point origin

3. LatT= latitude of target point, LongT= longitude of target point

4. Difference between latitude = LatO-LatT

5. Difference between longitude = LongO -LongT

6.Φ =Difference between latitude in radians

7.Λ =Difference between longitude in radians

8. O= LatO in radians.

9. T= LatT in radians.

10. B= min(1,sqrt(A))

11. Distance = 2*R*B

2. C4.5 Algorithm:

This algorithm is applied in Data Mining for making decisions. In these system parameters are distance between two vehicles, location of user, speed of the vehicle. The algorithm will decide that which will be the best decision depending upon the current scenario of the vehicle. This algorithm works on information gain and entropy of the attributes.. For each node of the tree, C4.5 choose one attribute of the data which will separate its set of samples into sets.

3.2.3 Third Phase:

In the third phase data from second phase is stored on cloud system. This data is more useful. This data is used for decision making. This data is process to get the optimal solutions. This phase is more useful in city-level monitoring system.

4. FUNCTIONALITIES OF SYSTEM

4.1 Registering and authenticating the user:

For using this system user need to register to the system by providing the details then if the details are correct then user successfully get registered and after that user needs to log in to the system.

4.2 Notify user about over speed and current location

Here user will be notified with his location and the over speed alert if speed reach above threshold.

4.3 Notify user about accidents on his way:

User will get notified about the accidents on his way for his safety and time consumption.

4.4 Notify user about Rash-driving :

If vibrations of accelerometer goes beyond the threshold then user and nearby drivers will get notified about the rash-driving so that accidents will get minimize.

4.5 Notify user about Minimum distance :

If two vehicles are not maintaining the minimum distance then both the vehicles will get minimum distance alert. So that minimum distance will be maintained between two vehicles and accidents will not happen.

5. SYSTEM BENEFITS

5.1 Minimizing space complexity

The traditional cloud server system will provide the large storage capacity and it also stores unuseful data. But in new system space needed for storage is reduce.

5.2 Instant decision making

The system gives us instance response based on real time data coming from android phones which is generated by accelerometer and gyroscope.

6. CONCLUSION

The proposed system will always help to manage the activities which creates problems during driving like accidents, traffic related problems. Here fog nodes are used so that space will not get waste. By using fog nodes we can use the resources very efficiently without wasting space and using complete bandwidth. The proposed system provides solution on problems like accidents, rash-driving, traffic by providing alerts to the drivers regarding minimum distance, nearby accidents, rash-driving. So that user can drive safely. By using this system we can make crowded cities more safe for people. We can also use VANET for creating bigger networks so that city level road safety is maintain.

7. REFERENCES

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