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Road Quality & Ghat Complexity Analysis

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Abstract: Almost every today's smartphone is integrated with many useful sensors. The sensors are originally designed to make the smartphones user interface and applications more convenient and appealing. These sensors are potentially useful for many other applications in different fields. Improving the condition of road has become a necessity now days. Android Smartphone's are user-friendly way to solve the problem. Latest smart phone consist of useful sensors like accelerometer, Magnetometer and GPS (Global Positioning System). Any user can make use of these sensors to find bad road condition which are encountered every day while driving. The paper is describing a mobile sensing system for road irregularity detection using Android OS based smart-phones. This information can be helpful to user at the time if there are multiple routes for destination and he can choose one of the finest and shortest route.

Keywords: Road Maintenance, Smartphone Sensors, Road Surface, Roughness.

I. INTRODUCTION

Roads are key part of the people in their lives. Hence monitoring the road conditions has expected a significant amount of attention. Road smoothness is one of the most important road condition measure and primary indicator of the utility of roads. Road users can avoid or be cautious of the bad road ahead by using road surface condition information. Due to this demand initiates the development of the road surface inspection system.

Road smoothness condition can be defined by the irregularity, which may be in the form of surface bumpiness, potholes, cracks, corrosion or damages and so forth, in the pavement surface that adversely affects the ride quality of vehicles. Bad road condition can cause damages to vehicles, increase fuel consumption, increase road user costs for vehicle maintenance, unpleasant driving comfort, and sometimes cause traffic accidents. For many decades, roughness is an internationally accepted indicator to which it is usually used to measure the ride quality of the pavement. International Roughness Index (IRI) is a measurement indicator that has been used internationally for road surface condition.

Smartphones nowadays usually come with many useful sensors. A 3D or 3-Axis accelerometer is one of the most common sensors that can be found inside a smartphone. Accelerometer sensor gives us the acceleration measurements in m/s along each of x, y, z axes. It can be used to recognize the motion activities.

In smartphones, accelerometers are originally used for detecting the orientation of the screen as well as in some user interfaces and applications. One of the major problem in developing countries is to collect the road's condition for maintenance purpose. This application can help in monitoring the roads condition and complexity of ghats.

II. RELATED WORK

This system consists of two components one is mobile node and other is the access point. Access points responsible for storing the information about potholes in its vicinity, taking the feedback from vehicles, updating the information in repository and broadcasting the information to other vehicles. Whereas Mobile node which is the small device placed in vehicle is responsible for sensing those potholes which it did not have previous information about, locating and warning the driver about the potholes which it has information about, and giving the data about newly sensed pothole to access point.

While deploying the access point we feed in some initial data about potholes to it. Then it keeps on broadcasting the data. Vehicle equipped with the client device catches that data. Now the device has the information about the locations of potholes. The device is responsible for warning the driver about occurrences of pothole. But new potholes may always be formed because of environment or fatigue. So client device also acts as a sensor and finds out the occurrence of newly formed potholes on the road. If it finds out any new potholes it gives data of new pothole to Access point in terms of the feedback. Access points updates this information to its data store and then adds it to the information broadcast.

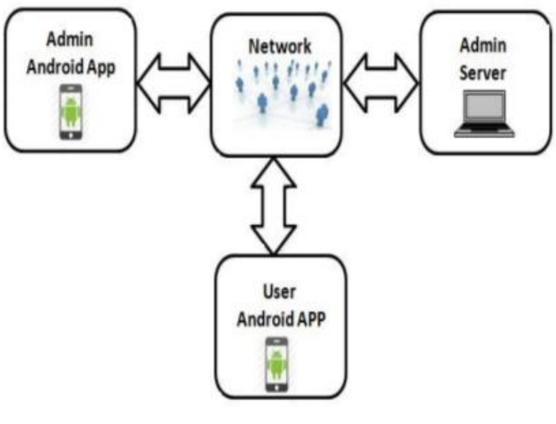

Fig: System Architecture

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III.RESEARCH METHODOLOGY

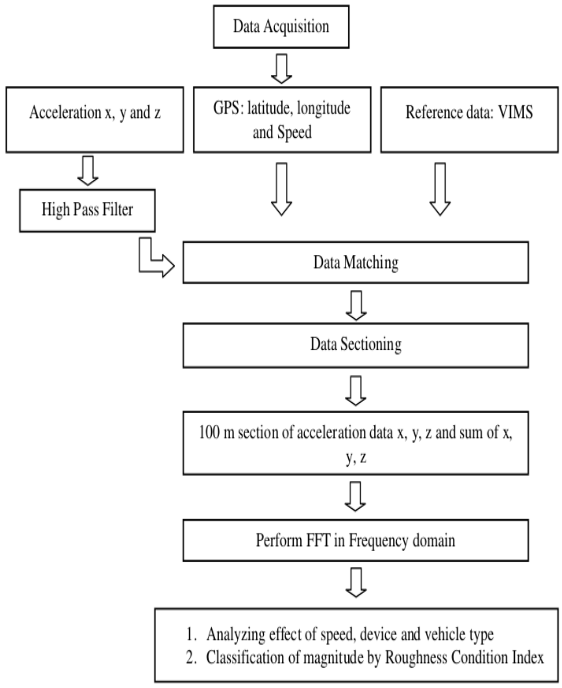

Fig: Data Processing

A. Bump Detection

The lowest layer of the system is on the application running on the Smartphone. The application collects data from the accelerometer and GPS and then processes this to detect braking and bump events. It then attaches a time and Location tag to this data, and sends it across to the internet web server for further processing. Bump is detected using sensor data gathered from admin phone, details of location of bump is stored on the server side for other users.

B. Ghat Complexity

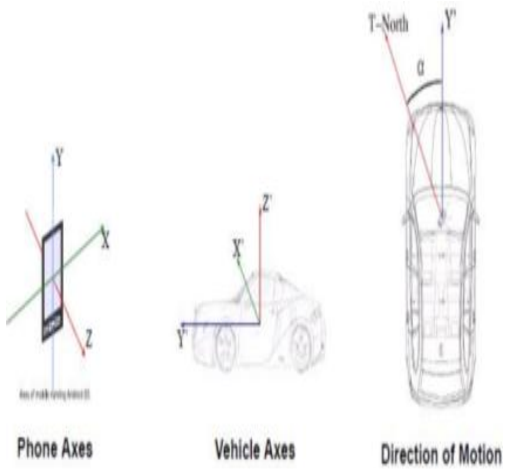

Fig: Axes Synchronization

As we have seen the data which we get from accelerometer and magnetometer, in that we consider y axis for Ghats detection, here we calculate the angle of "Y" axis with the north direction by which we can get how much car is turned at right or left side.

For this we also consider the previous angle of "Y" axis with north direction. This helps to count the number of turns in specific alarm, and also we can conclude how much they are tough.

C. Evaluation Of Road At Server Side

The REST web service on the server receives the event traces of several Smartphone‟s along with the time and location tags. Using this information, the web service infers higher level of evaluation such as road is smooth or it is with too much speed bump, Ghats are too complex or they are easy to drive, etc.

D.Make Data Available To Other Users

The web service needs to send over the inferred events to the Smartphone running the application. The Smartphone sends its location, and the internet service responds with events of interests in the vicinity of this location. These events are displayed on a map on the android phone, so that the user of the android application can choose to take alternate routes based on this.

IV. DISCUSSIONS

To create a successful road surface monitoring system accepted by wide user community, it is important to make it attractive for the users - to provide added value without a significant process overhead.

Therefore we envision our system as a service, which is added as a layer to existing navigation systems, such as Google Maps, which use real-time traffic information, collected by participatory sensing approach.

Although contemporary smart-phones have high processing power and considerable memory, the detection system is recommended to avoid resource-intensive detection methods and to preserve initial user interface responsiveness.

V. CONCLUSION

We all use Google maps and its application for navigation during travelling, but these applications couldn't able to tell you any road's condition or its complexity. We can use the accelerometer , magnetometer and GPS system and use this information to estimate road roughness/quality and Ghat complexity.

The use of smatphones because of its low cost and easy to use feature in addition to its potentially wide population coverage as survey devices. The data about road condition is necessary for proper maintenance and programming of road. Road surface condition information is very useful for road users because with the availability of such information, road users can avoid or be careful of the bad road ahead. This information is useful to user during travelling. This information can be helpful to user at the time if there are multiple routes and for destination and he can choose one of the finest and shortest route. It is useful for user whether road is safe to journey or not.

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