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Road Navigation Improvement Using Route Data Analysis

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ABSTRACT: The road condition is the one of the most important aspect of the transportation. Roads are used to transport more than sixty percent of all transportation in India and 85% of the traveling made through the roads. India has a second largest road network in the world (4.87 million kilometers). The Road transportation is increased over the year with this type of improvement in the road network between cities and villages. The roughness of the road are becoming a key part of the road. Road transportation has gradually increased over the years with the improvement in connectivity between cities, towns and villages in the country. The Indian roads are almost 90 percent of the country's day to day passenger traffic. In India buying of automobile and movement of goods transported in bulk by roads is becoming more and more at a rapid rate. Awareness about the road need to be created to cater the increased traffic and movement of the goods transporting. Indian government has designate twenty percent of the contributions of 1 us\$ trillion funded from the infrastructure during the 12th five year plan (2012-2017) to improve the country road. As roads are main part of the general transportation methods in their lives, thus taking care of the road conditions has expected a lot of consideration. So checking the road condition had become a major issue, so the transportation can maintain a strategic distance from or be careful about the bad road ahead or we can say they can be care full about the potholes present in the roads in some distance before of that pothole and terrible road ahead by using road's condition data. To checking the roads conditions we can use our smartphones, because smartphones contains many sensors which are helpful in getting the road surface condition data.

KEYWORDS:-Smartphone (android), Gyroscope, Accelerometer, algorithms, road condition.

I. INTRODUCTION

Damaged/bad roads (sudden humps/dips) are one of the major causes of road accidents. Vehicle maintenance is high due to erratic driving on bad roads. Traffic management is a tough task on bad roads in the city. Most recent advanced smart phone consist of helpful sensor which includes receiver, gyroscope, accelerometer, electronic compass, G-sensors, Magnetometer, cameras and GPS (Global Positioning Framework) are prepared in smart phone. A few application utilize these sensors in smart phones and combine mobile sensing techniques to solve problems such as interpersonal organization, movement data, environment observing and human services

II. RELATED WORK

Pothole patrol is an application, Which is used to detect the road roughness. This application works with a number of accelerometer sensor that is attached inside the taxi. Through this system they can detect 90% of the potholes, but this requires a hardware component of specific integration. For every taxi we need to use Wi-Fi card and Linux runs computer embedded system and also an extended GPS also needed, which should be fixed at the top of the taxi. Bus Net is a system developed at university of Columbus. It is built using hardware platform crossbow MICA's mot0r and several sensors like accelerometer and GPS. This system does not include real time data it should be like collect once the data on the road and upload it to their storage and also storage is limited. They use only accelerometer algorithm which senses and upload the data. University of Jyväskylä proposed a road condition or pothole detection method in the mind set of offline data. By using band-pass filter the accelerometer data is pre-



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processed with 0.5-6.0 Hz of frequency. A sliding activities with different methods such as normalized in the range [0,1], Chebyshev, Taylor and hamming. The next is to extraction, such as standard deviation, variance and wavelet packet decomposition. Reduction of methods or features is done using forward or backward selection, support vector machine and generic algorithm using component analysis principal. This approach shows good performance, but it is not suitable for devices with limited hardware and software resources. Undoubtedly we can use this process in Android smart phones, but we can use of the more better algorithm with the easiest method of detecting potholes by using some better algorithm.

With my algorithm, it will be distinct from this work

1. I am using timestamp which helps in detecting time availability of potholes and not detecting the time of availability of potholes and not detecting of potholes and update to the server
2. It will detect humps, dips, road roughness and potholes and also show the recent data of the routes.

III. LITERATURE SURVEY

Boston's mayor office project of new urban mechanics is built to help the resident by detection, street bumps and also to improve the streets. Volunteer use the application to detect the road roughness or street bumps and collect the data while they are driving. So they can improve road conditions and fix the problems that are occurring during driving as like too many humps in the road can be eradicated and plan long-term investments. Today's smartphones is a mobile personal computer with advance mobile operating system with features useful for mobile or handled use. Main Technology used in this is accelerometer sensor so we should know about this sensor

Sensors

Sensor is a device which detects events and generates data related to that event. Example: A thermal sensor will generate data based on the changes in temperature level in its environment. Change of temperature can be considered as event and the new temperature is the data generated by sensor. Mobile phones come with a variety of sensors that automated or easy many of our daily tasks. This field takes into account the presence of an accelerometer, a gyroscope, a compass and a barometer.

Android API for handling sensors

- Sensor
- Sensor Manager
- Sensor Event
- SensorEventListener

Handling Sensors

1. Get sensor service
2. Check sensor availability on the phone
3. Implement SensorEventListener
4. Register for listening sensor events
5. Receive data and manipulate it
6. Unregister listener

Accelerometer

- Accelerometer measures magnitude and direction of the acceleration.
- Can be combined with compass to calculate orientation of the device.
- Measures linear movement, but rotation measurement is unreliable
- Used for tilt detection and motion.
- Popular mobile phone feature based on an accelerometer is turn-to-mute. It allows user to mute an incoming call, silence an alarm or pause the mobile music player simply by turning the device face down.

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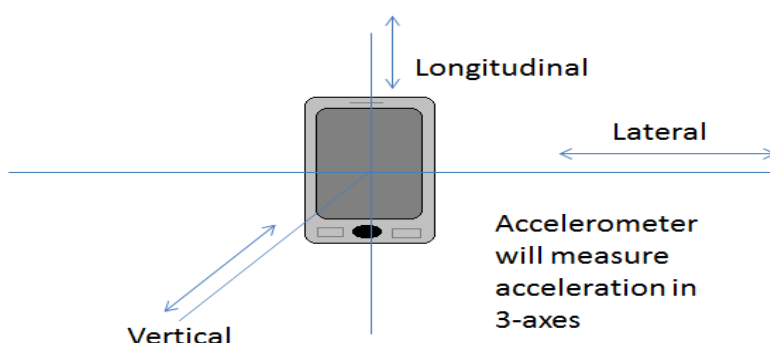
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IV. PROPOSED SYSTEM

The smartphones contains accelerometer, it is hardware component which is having seismic mass made up of silicon .Seismic mass changes position according to the orientation of the mobile. The accelerometer is nothing but a circuit that senses movement which it is attached and also measure the speed of acceleration. It also sense in which angle it is being held via mobile. An accelerometer response to the vibrations associated with movement.As the seismic mass present in between the circuit as the movement happens it starts changing its position from that it can get the data of potholes and humps. The accelerometer take the data as x, y, z co-ordinates and axes can be viewed as along with vehicle axes and phone axes.Measures the acceleration force in m/s² that is applied to a device on all three physical axes (x, y, and z), including the force of gravity.

Accelerometer in action

- 3-axis accelerometers can measure acceleration in vertical, longitudinal & lateral plane



- An Android application to be developed, which can run along with Google Maps turn-by-turn navigation
- User to place mobile in a holder inside the car, for navigation running Google Maps
- Variation in Accelerometer data when a hump/dip is tracked and uploaded to server
- Variation in Accelerometer data when a hump/dip is tracked and uploaded to server. When someone else uses the application for navigation, data is downloaded from server, and the driver is warned for arriving hump/dip in his route, and the driver can then slowdown the vehicle and pass the hump/dip carefully.

The application gathers information from the accelerometer and GPS and afterward forms this to identify braking and bump occasions. It then connects a time stamp and Location tag to this information, and sends it crosswise over to the web server for further preparing. Bump is distinguished utilizing sensor information gathered from administrator telephone, details of location of bump is stored on the server side different clients.

ALGORITHM USED

$$Phumps = \frac{\sum hump_i * 0.5}{\sum hump_i} + \frac{\sum hump_j * 0.5}{\sum hump_j} + \frac{\sum hump_k * 0.5}{\sum hump_k}$$

Where,

Phumps =probability of a hump

$\sum hump_i$ =number of humps encountered at given location last week.

$\sum hump_j$ =no of humps encountered at the given location during last month.

$\sum hump_k$ =number of humps reported at given location in whole app lifecycle.

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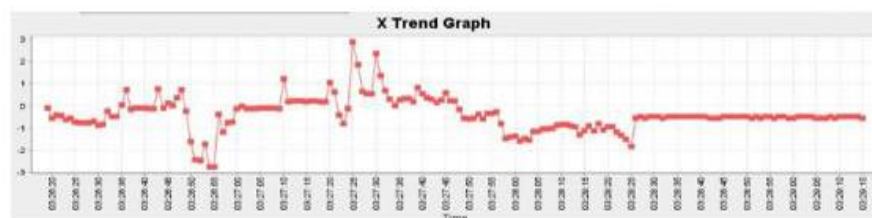
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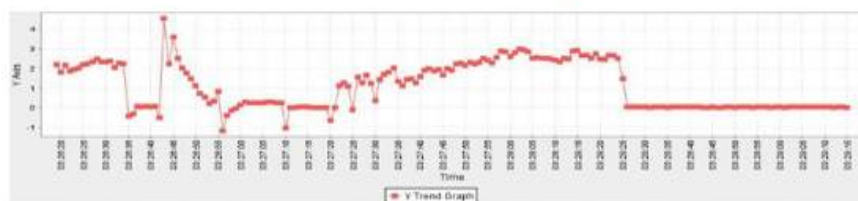
Final probability can be used to warn user about hump.

Data of locations potholes with their timestamp

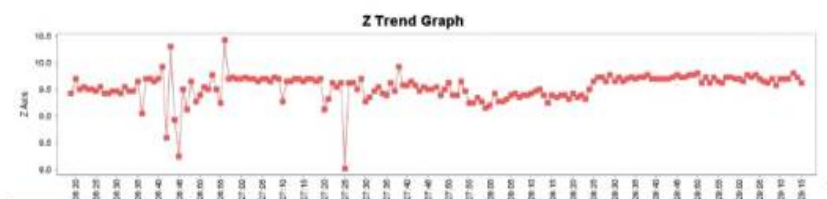
Latitude	Longitude	Timestamp
31.61920083655007	57.22747207909725	2017-04-26
22.8472067870209	28.70210688581983	2017-04-13
52.846934030089606	55.559617951289304	2017-04-04
35.47956100226836	33.64632925495764	2017-04-20
13.058098005807175	66.24292247443529	2017-04-05
63.935024642165985	41.85475843235547	2017-04-31
56.470302527522385	37.396350363092786	2017-04-15
49.482231264104506	67.49664925677028	2017-05-16
22.00063765215815	19.689690654463327	2017-05-28
23.99823150280843	68.08675503656953	2017-05-08
30.21610583899536	29.648390791547598	2017-05-03



Standard deviation for i



Standard deviation for j



Standard deviation for k

We use timestamp for improving our work that will take the data from user from different times so that we can give a more accurate result for the user about the potholes. As for sometimes the potholes could be eradicated from the roads



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so for that we can use timestamp to get the details of the potholes present before a week ago or present now or not so that we can delete the data of that pool from the server.

V. CONCLUSION

Road conditions are becoming the major issues in the country where 85% of the transportation is made through roads. If the road condition is not good, then its problem for vehicle maintenance and also it is stress full for a driver to drive on that road. So I am using such a method that will reduce the stress of the drivers as we know the our application are within a smart phone so just driver on the application and put in their vehicle in a mobile holder so it will not take any huge requirements after that where ever the potholes are present it will be notified to driver before the 200 or 300 meter away from that pothole that is pothole are there in 200 meters please slow down your vehicle. So it reduces many road accidents and vehicle maintenance will be easy.

FUTURE SCOPE

Connected cars can also use the data logged for warning drivers. Autonomous cars can use this data for better driving on our roads. We can also shows the total potholes present in different roads for same route.

NAVIGATION EXTENSIONS

With Air Quality Index (AQI) becoming more popular across the world, map re-routing can further be enhanced with AQI data. Users allergic to asthma and related diseases can change their route based on AQI. In India, AQI mapping is still a work in progress, but countries like US/China are way ahead in logging this data, and we are on track to get benefitted from AQI.

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