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Estimation of road condition using Smartphone sensors via C4.5 and AES 256 algorithm.

Amrut Patil[1], Dhanashree Lad[2], Harsha Mehta[3], Dhanashri Borkar[4], Mehboob Shaikh[5]

[1,2,3,4,5] *Department Of Computer Engineering, Padmabhooshan Vasantdada Patil Institute Of Technology, Bavdhan, Pune*

Abstract — *Nowadays every smart phone is integrated with many helpful sensors. Sensors are originally design to make the computer program and application convenient. The smart phone sensors like Gyroscope and Accelerometer are used to estimate road roughness conditions. The collected data is from sensor and easy to manage value in the frequency domain to calculate magnitudes of vibrations. Well maintained roads contribute to a significant portion of countries economy. Roadsense application provides information about rules and regulations (Vehicle Papers, Parking Rule, Distraction While Driving) to be followed while driving the vehicle. Throughout this paper, we discuss the previous hole detections ways in which has been developed and process a worth effective answers to identify the potholes and bumps on the roads. In our application mobile sensors are accustomed establish potholes and the bumps. The proposed system captures the geographical locations of potholes and bumps using GPS sensor among the mobile. These sense data sent for classification and uses algorithm C4.5, AES256 then this data sends for further processing. Finally the data is send to the vehicle driver. An android can be used to display the road condition in the map.*

Keywords — *Accelerometer, Gyroscope, Road Monitoring, Pothole, Android.*

I. INTRODUCTION

To properly monitor, plan for maintenance and manage road infrastructure, substantial amount of data is always needed, particularly time series and up to date road condition data. Road condition data changes over time; since it also usually requires considerably significant investment and time to collect the data on a regular basis, obtaining such data is often a challenge that many governments are facing, especially in countries where budget is limited and advance technology is still unaffordable. Road surface roughness is regarded as one of the most important road conditions, because it affects vehicle maintenance costs, fuel consumption, comfort, and safety. Road measurement is normally done either by one or a combination of two main approaches, which include a subjective rating or a visual inspection, an approach that is labor intensive and very time consuming; and the use of sophisticated profilers, which are highly accurate but costly to obtain, operate and maintain, requires skillful operators as well as cumbersome calibration before deployment.

In the smartphone era, where the number of smartphone users is increasing steadily, using smartphones to collect road condition data and estimate road roughness condition could change the way the government monitor, plan for maintenance and manage the road infrastructure forever, because the chance of having plenty of up to date data with inexpensive investment is huge. On the other hand, today's smartphones usually come with sensors that are capable of recording useful signal for road surface condition estimation similarly to those used in many high-tech equipment. There are some studies that are relevant to this work, such as the use standalone, mobile and smartphone sensors to assess and monitor road and traffic conditions, detect road bumps/anomalies and their locations, and analyses events/features of different road defects; in simulation and real-life traffic conditions Further development includes the introduction of smartphone apps that claim to work in detecting road bumps and roughness condition. The final goal of this project is to develop a significantly simpler app that identifies road condition and inform other application user about traffic update.

II. LITERATURE REVIEW

1] Road Condition Monitoring Using On-board Threeaxis Accelerometer and GPS Sensor[6]
AUTHORS: Kongyang Chen, Mingming Lu, Xiaopeng Fan, Mingming Wei, and Jinwu Wu

A study by United States Federal main road Administration has shown that road condition is an important issue of main road quality and sleek roads can cause easier driving expertise and fewer municipal investment. International Roughness Index (IRI) has been wide used to measure pavement smoothness as a result of it will offer a standardized rating for various measure tools. However, existing activity tools supported IRI square measure sometimes terribly expensive. During this paper, we have a tendency to gift a inexpensive vehicle-based answer, Road Condition observation with

Three-axis Accelerometers and GPS Sensors (RCM-TAGPS), by employing a low cost three-axis measuring system and a GPS detector embedded in a very vehicle to observe the road condition. we tend to analyze the facility Spectral Density (PSD) of pavement roughness, estimate IRI, and classify the pavement roughness level into four levels per a Chinese trade normal. The past result shows RCM-TAGS give the roughness level properly, even below some interference like potholes, manholes and decelerating belts and hence the total value of RCM-TAGPS in every vehicle is not any quite fifty greenbacks, that is regarding 1/4400 to 1/160 of the prevailing system employed in engineering and municipal engineering.

2] An Estimation of Road Surface Conditions Using Participatory Sensing[1]
AUTHORS: Yukie Ikeda, Masahiro Inoue

When natural disasters occur, some roads can be blocked and can't be used. paved surface conditions conjointly deteriorate. Thus, assembling and providing the knowledge on usable roads and paved surface conditions will permit individuals to be exhausted safely. During this study, we tend to planned associate estimation system of the paved surface conditions by assembling measuring instrument information from pedestrians' smartphones. the strategy estimates whether or not the paved surface condition may be a flat pavement road, a rough road, a slope or a support by victimization supervised machine learning technique. From the results of experiment, we have a tendency to found that the system will estimate six varieties of paved surface conditions with a high accuracy once coaching the model with the data from the users.

3] Road Test Experiments and Statistical Analysis for Real-Time Monitoring of Road Surface Conditions[8]
AUTHORS: Amr S. El-Wakeel, Abdalla Osman, Aboelmagd Noureldin and Hossam S. Hassanein

The Internet of Things (IoT) infrastructure, systems, and applications demonstrate potential in serving modern city development. Crowd sensing approaches for paved surface conditions observance will profit good town road data services. Deteriorated roads induce vehicle harm, tie up, and driver discomfort that influence traffic management. During this paper, we tend to propose a framework for observance paved surface anomalies. We tend to analyze the common paved surface varieties and irregularities additionally as their impact on vehicle motion. Additionally to the standard use of sensors obtainable in sensible devices, we tend to utilize the vehicle motion sensors (accelerometers and gyroscopes) presently obtainable in most land vehicles. Varied land vehicles were utilized in this analysis, spanning totally different sizes, and year model for intensive road experiments. These trajectories were wont to collect and build multiple tagged information sets that were utilized in the system structure. So as to boost the performance of the sensing element measurements, ripple packet de-noising is employed during this study to modify economical classification of paved surface anomalies. We adopt applied mathematics, time domain and frequency domain qualities {to distinguish |to totally differentiate |to tell apart} different road anomalies. The descriptive information sets collected during this study are wont to build, train, and check a system classifier through machine learning techniques to sight and categorise multiple road anomalies with totally different severity levels. What is more, we analyze and assess the capabilities of the sensible devices and therefore the alternative vehicle motion sensors to accurately geo-reference the paved surface anomalies. Many trial experiments examine the advantages and assess the performance of the projected design.

4] Mahalanobis Distance-Based Road Condition Estimation Method using Network-Connected Manual Wheelchair[2]
AUTHORS: Kazuyuki Kojima, Hiroki Taniue and Jun'ichi Kaneko

This paper describes a way to estimate road condition using our developed network-connected manual chair. we've got been developing the chair on that torsion sensors, Associate in Nursing measuring system and a GPS receiver area unit enforced, for gathering the road condition knowledge onto our server laptop. Our final purpose is to develop a system that show traffic disturbances for manual wheelchairs on the digital map mechanically. For this purpose, this study aims to associate the device values with road conditions mistreatment Mahalanobis distance.

III. PROPOSED SYSTEM

Propose system analyze the road condition and road surface. It identify bad road patches and gives notification to navigation system. For that we used inbuilt accelerometer sensor and gyroscope sensor. To improve the system result we

use decision tree algorithm. Propose system has self-managing database which collect data from vehicle drivers android smart phones. This data update in real time periodically. Application utilizes this data to inform other application users about road condition.

IV. SYSTEM ARCHITECTURE

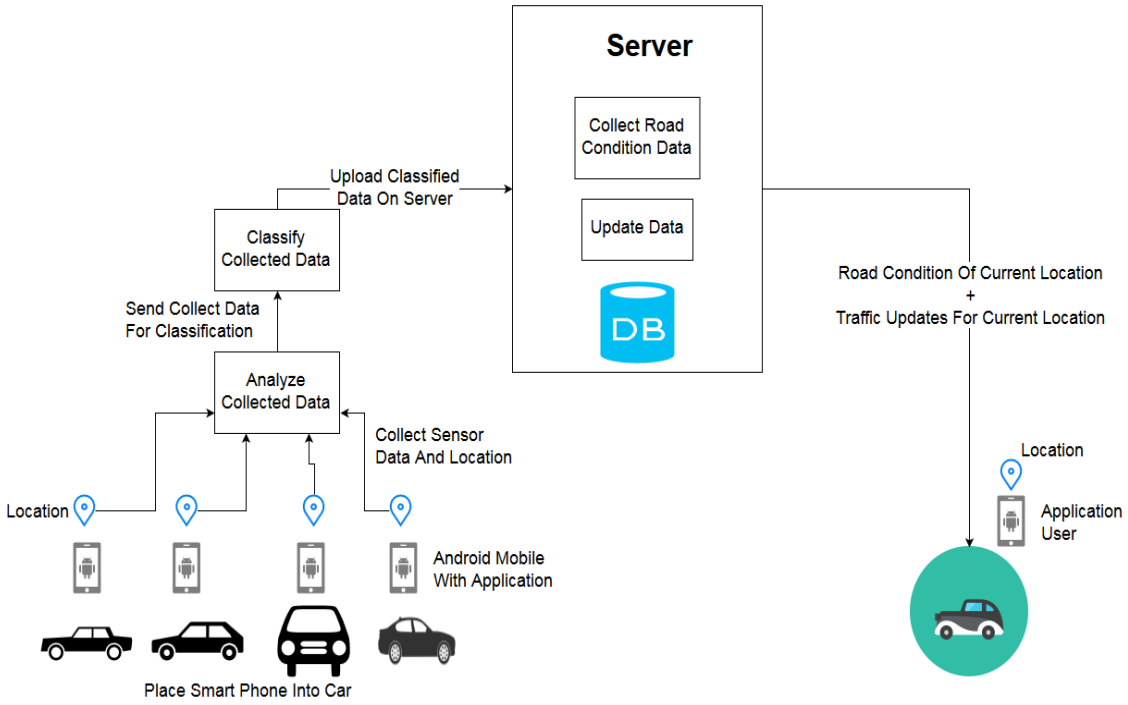

Fig.: System Architecture

Road condition data changes over time, since it usually requires considerably significant investment and time to collect the data on a regular basis. In the architecture of road detection the user who is travelling will have android application in their mobile from which they will collect the sensor data and location, sensing of data is done using accelerometer and gyroscope. This collected data is then analyze and send collected data for classification. Classify collected data.

In this C4.5 and AES 256 algorithm is used.C4.5 is used in data mining as decision tree classifier.C4.5 is collection of algorithms for performing classifications in data mining. AES 256 is a cryptographic algorithm used to protect electronic data. It is a symmetric block cipher that can encrypt and decrypt information encryption converts data into an unintelligible form called as Ciphertext Decryption converts the data into back into plaintext.

Upload the classified data on database. On server there is collection of data and will be updated day by day as new data is generating .Though server, road condition of current location and traffic updates for current location is retrieve and will be given to user. User will get the appropriate information about road condition.

V. CONCLUSION

Propose system uses an accelerometer and gyroscope sensor for collection of data and GPS for plotting the road location trace in Google map. We are going to implement decision tree algorithm. Our best results are obtained thanks to a grouping of sensors, accelerometer and gyroscope. We also going to inform nearest user about road condition.The smartphone-based on sensor is very useful because it removes the need to deploying special sensors in vehicle. It has the advantage of high scalability as smartphone users increases day by day. Thus, we have developed a smartphone application RoadSense. The RoadSense application is an attempt to provide its users with better knowledge about the routes of there transportation.

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