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Pothole Detection System for Road Maintenance

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***Abstract*: Monitoring road and traffic conditions in a city is a problem widely studied. Several methods have been proposed towards addressing this problem. Several proposed techniques require dedicated hardware such as GPS devices and accelerometers in vehicles or cameras on roadside and near traffic signals. All such methods are expensive in terms of monetary cost and human effort required. We propose a non- intrusive method that uses sensors present on smartphones. In this fast-moving world that we live in, safe commute is not only everyone's priority but also to provide a hassle-free shuttle between places is the government's duty. In this paper, we propose a system which detects potholes on the road. As we all know prevention is better than cure, we design and implement a system which not only recognizes potholes but also stores this data on a cloud platform which can act as a database for further reference and enable us to analyze the data. The proposed system contains two important functions, first is to detect the pothole which is done through a multi-sensor subsystem consisting of accelerometer and gyroscope and secondly warn the driver and store this information on a cloud based which can be accessed by other users which will help them apprehend the potholes on their way. Once the location of the potholes is known, Government authorities can be informed about the same.**

***Keywords*: pothole detection**

1. Introduction

With the increase in world's population, there has been increasing load on the infrastructure. Roads have been flooded with the vehicular traffic. It has become increasingly difficult to manage this traffic. This is the prime motivation behind making a vehicle intelligent enough to aid driver in various aspects. One of the increasing problems the roads are facing is worsened road conditions. Because of many reasons like rains, oil spills, road accidents or inevitable wear and tear make the road difficult to drive upon. Unexpected hurdles on road may cause more accidents. Also because of the bad road conditions, fuel consumption of the vehicle increases; causing wastage of precious fuel. Because of these reasons it is very important to get the information of such bad road conditions, collect this information and distribute it to other vehicles, which in turn can warn the driver. Lastly the information must be conveyed in the manner which can be understood and used by driver. We in this project try to design and build such a system. In this system the access point collects the information about the potholes in the vicinity of a wireless access point and distributes to other vehicles using a wireless broadcast. Here 'vicinity' is a user defined term. Ideally the vicinity is every rout till the next access point.

2. Problem statement

Pothole detection system is a system that aims at warning the driver about the uneven roads and potholes in its path. Pothole detection system is a system that aims at warning the driver about the uneven roads and potholes in its path. We study the different ways in which goal of the system can be achieved. We justify the methods we have chosen in these projects. And then we give details about the working of the different subsystems.

3. Literature survey

Automatic Detection and Notification of Potholes and Humps on Roads to Aid Drivers, Rajeshwari Madli, Santosh Hebbar, Praveenraj Pattar, G.V.Prasad

One of the major problems in developing countries is maintenance of roads. Well maintained roads contribute a major portion to the country's economy. Identification of pavement distress such as potholes and humps not only helps drivers to avoid accidents or vehicle damages but also helps authorities to maintain roads.

This paper discusses previous pothole detection methods that have been developed and proposes a cost effective solution to identify potholes and humps on roads and provide timely alerts to drivers to avoid accidents or vehicle damages. Ultrasonic sensors are used to identify potholes and humps and also to measure their depth and height respectively. The proposed system captures the geographical location coordinates of potholes and humps using GPS receiver. The sensed-data includes pothole depth, height of hump and geographic location, which is stored in the database (cloud). This serves as a valuable source of information to the Government authorities and to vehicle drivers. An android application is used to alert drivers so that precautionary measures can be taken to evade accidents. Alerts are given in the form of a flash messages with an audio beep.

An Empirical Comparison of Supervised Learning Algorithms, Rich Caruana, Alexandru Niculescu-Mizil

A number of supervised learning methods have been introduced in the last decade. Unfortunately, the last comprehensive empirical evaluation of supervised learning was the Stat log Project in the early 90's. We present a large-scale empirical comparison between ten supervised learning methods: SVMs, neural nets, logistic regression, naive bayes, memory-based learning, random forests, decision trees, bagged trees, boosted trees, and boosted stumps. We also examine the effect that calibrating the models via Platt Scaling and Isotonic Regression has on their performance. An important aspect of our study is the use of a variety of performance criteria to evaluate the learning methods.

4. Proposed system

Proposed 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.

The whole scenario works as follows. 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.

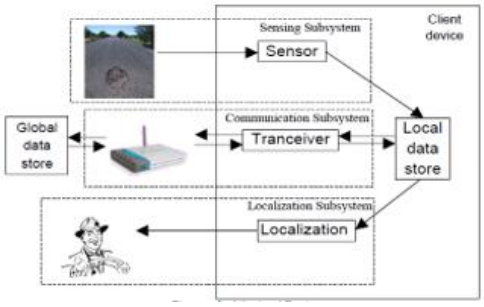

Fig. 1. Architectural design

5. Conclusion

We have studied different machine learning algorithm for prediction of road quality. It uses accelometer and gyroscope sensor for collection of data and GPS for plotting the road locations on google maps. We have tested three classification algorithm. Our experimentation shows superiority of c4.5 in terms of detection accuracy (98.6%). Our best results, thanks to grouping of two sensors: accelometer and gyroscope. The smartphone based method is very useful because it removes need of deploying special sensor in vehicle. Our system can be used to create the personal road type warning system that maintains historical record of road conditions.

6. Future work

We aim to improve the road type detection algorithm through detecting other road anomalies and trying other machine learning classifiers.

- Applications
- Finding Potholes

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