Smart Application for the Detection of Road Conditions While Driving

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----------ABSTRACT----------

Many drivers do texting while driving (T&D) and it is very dangerous. Several mobile phone applications are created and designed to detect T&D. It should be able to distinguish the mobile phones of the drivers from the passengers. Existing solutions find the driver's location only with the help of devices and manual input. This paper provides a method to detect the Texting while Driving (T&D) in an automatic way without the use of any kind of devices. The idea is that when a user is creating messages, the embedded sensors of a smartphone gathers the associated information like touch strokes, holding the speed of the vehicle and orientation. This information is evaluated and analyzed to see the availability or existence of some kind of specific patterns. The obtained results from many experiments reveal that our method can have a better detection accuracy and low false positive rate. The method preserves privacy and does not access any of the contents of messages.

I. INTRODUCTION

According to statistics provided by World Health Organization (WHO), road accidents have become one of the top 10 leading causes of death in the world. Specifically, road accidents claimed nearly 1.25 million lives per year (2015). Studies in [1] show that most road accidents are caused by poor condition of roads. Bad roads are a big problem for vehicles and drivers; this is because the deterioration of roads leads to more expensive maintenance, not only for the road itself but also for vehicles. Accordingly, road surface condition monitoring systems are very important solutions to improve traffic safety, reduce accidents and protect vehicles from damage due to bad roads. Both road managers and drivers are interested in having sufficient information concerning road infrastructure quality (safe or dangerous road). Our proposed system, unlike existing solutions that require external hardware, is an inexpensive simple yet efficient solution that is able to monitor road quality. It is realized on Android smartphones and is highly portable and easy to maintain. Our applications provide constructive feedback to drivers and local authorities by plotting the evaluated road location on a Map and saving all recorded workout entries. Creating an Android application that allows real-time and automatic collection and analysis of accelerometer and gyroscope data in order to get reliable road surface labels in contrast to previous works that mostly use offline methods (videos, images for data labeling).

While most of previous works employ unimodal accelerometer data, we are using gyroscope sensor in conjunction with accelerometer sensor to derive more accurate road quality prediction. Section II presents a background on the three machine learning algorithms used in the paper. Section III introduces some recent research works related to the monitoring of road surface conditions. Section IV describes the general idea and the proposed architecture. Experimental results of the proposed work are presented in Section V. In Section VI, we conclude the paper and we give some perspectives.

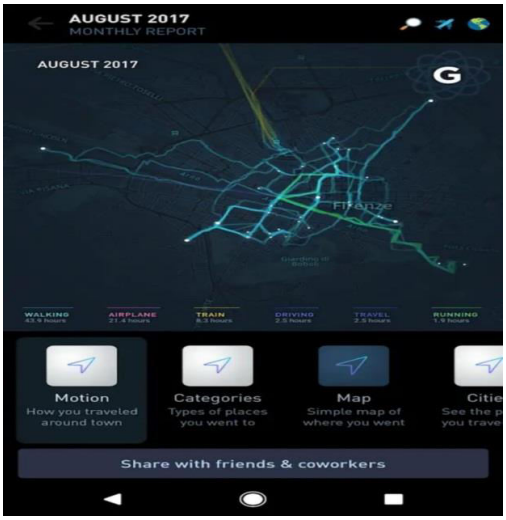
II. LITERATURE SURVEY

Detecting driver phone use leveraging car speakers:

This work addresses the fundamental problem of distinguishing between a driver and passenger using a mobile phone, which is the critical input to enable numerous safety and interface enhancements. Our detection system leverages the existing car stereo infrastructure, in particular, the speakers and Bluetooth network. Our acoustic approach has the phone send a series of customized high frequency beeps via the car stereo. The beeps are spaced in time across the left, right, and if available, front and rear speakers. After sampling the beeps, we use a sequential change-point detection scheme to time their arrival, and then use a differential approach to estimate the phone's distance from the car's center. From these differences a passenger or driver classification can be made. To validate our approach, we experimented with two kinds of phones and in two different cars. We found that our customized beeps were imperceptible to most users, yet still playable and recordable in both cars. Our customized beeps were also robust to background sounds such as music and wind, and we found the signal processing did not require excessive computational resources. In spite of the cars' heavy multi-path environment, our approach had a classification accuracy of over 90%, and around 95% with some calibrations. We also found we have a low false positive rate, on the order of a few percent. Distinguishing driver and passenger phone use is a building block for a variety of applications but its greatest promise arguably lies in helping reduce driver distraction.

Combining probability from independent tests: the weighted Z-method is superior to Fisher's approach:
Author:M. Whitlock.

The most commonly used method in evolutionary biology for combining information across multiple tests of the same null hypothesis is Fisher's combined probability test. This note shows that an alternative method called the weighted Z-test has more power and more precision than does Fisher's test.



III. PROPOSED SYSTEM

It is realized on Android smartphones and is highly portable and easy to maintain. Our application provide constructive feedback to drivers and local authorities by Plotting the evaluated road location on a Map and saving all recorded workout entries. While most of previous works employ unimodal accelerometer data, we are using gyroscope sensor in conjunction with accelerometer sensor to derive more accurate road quality prediction.

IV. MODULE DESCRIPTION

4.1 User Authentication

This module used to accessing app only trusted users. We implemented two methods one is Registration and Login. In registration we collect user data like name, username, password, email, mobile no and save to server. After registration process complete user need to login to access the application. In that time we get username and password from user the validate the data if data is present they are only valid user else they are invalid users.

4.2 Drive Mode

In this module we implemented Drive options with start and stop. If user select start on that time location gathered every 15 seconds saved to local database. And we use Location manager for getting location of moving device.We use gyroscope sensor it will check the road condition with X Y Z axis likeit's a smooth road or rough road, have speed breaks. Then we store the gyroscope value in to database with from location to location as well as time also. User can stop the drive mode.

4.3 User Profile

In this module we implemented User Profile option. If user is authenticated user can see his profile and so he can update his old profile also

4.4 Send Report

In this module we implemented Send Report. If user once drives from location to location after stop drive mode it will calculate the road conditions using gyroscope with report like road is good or bad then we can provide constructive feedback to drivers and local authorities. Besides, Road Manager can benefit from this system to evaluate the state of their road network and make a checkup on road construction projects, whether they meet or not the required quality

4.5 View Routes

In this module we display the list of routes were we traveled with feature of particular date and particular place also we seen that place in map also and we can view all the places with route on particular date also in Google map.

4.6 Input design

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

What data should be given as input?

How the data should be arranged or coded?

The dialog to guide the operating personnel in providing input.

Methods for preparing input validations and steps to follow when error occur.

4.7 Output design

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.

Select methods for presenting information. Create document, report, or other formats that contain information produced by the system. The output form of an information system should accomplish one or more of the following objectives.Convey information about past activities, current status or projections of theFuture.Signal

important events, opportunities, problems, or warnings.Trigger an action.Confirm an action.

4.8 Advantages

Our goal is to derive a road quality recognition system that detects,analyses, identifies and predicts the state of road segments using smartphone sensors. Our system does not depend on any pre-deployed infrastructures.

In our system, road conditions could be detected and identified by smartphones according to readings from accelerometer and gyroscope sensors

Unlike existing solutions that require external hardware, is an inexpensive simple yet efficient solution that is able to monitor road quality.

V. CONCLUSION

In this paper, we studied a machine-learning algorithm for prediction of road quality. It uses an accelerometer and gyroscope sensor for collection of data and GPS for plotting the road location trace in Google map. We have tested three classification algorithms: decision tree C4.5, SVM and Naive Bayes. Our experimentation shows the superiority of C4.5 in term of detection accuracy (98.6%). Our best results are obtained thanks to a grouping of two sensors; accelerometer and gyroscope. The smartphone-based method 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 Road Sense. The Road Sense application is an attempt to provide its users with better knowledge about the routes of their transportation. With further work in this field, it is possible for this project to play a proactive part in improving road conditions in developing countries. To this end, our system can be used to create a personal road type warning system that maintains a historical record of road conditions. As a future work, we aim to improve the road type detection algorithm through detecting other road anomalies and trying other machine learning classifiers.

VI. FUTURE ENHANCEMENT

We have demonstrated that the system works as desired in that it may infer people's daily life faithfully and generate road data and route automatically and flexibly according to users' preferences. In the future, we hope that we can further expand the types of MCs by adding more inference rules, develop more possible ways to display people's daily activities, and make the sensing framework to be publicly available.

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