MOBILE APP'S FOR MAL DRIVING-BEHAVIOURS IDENTIFICATION

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ABSTRACT-In this today's digital world smartphone becomes inevitable. The applications of smart phone can be ranging from the home utility, health care**,**GPS**,** horoscope to stock exchange and other significant areas of day today life. Hence there is a need for developing an app for safe transporting in the roads.For this we detect different malicious behavior of a driver and through our app we prevent the accident and hence provide safe transportation. We need to consider a fine-grained monitoring approach, which not only detects abnormal driving behavior but also identifies specific types of abnormal driving behaviours, i.e. weaving ,swerving side slipping ,fast U-turn ,turning with a wide radius and sudden braking .we propose a fine-grained abnormal Driving behavior Detection and iDentification system ,D^3,to perform real-time high-accurate abnormal driving behaviours monitoring using smartphone sensors. We extract effective features to capture the patterns of abnormal driving behavior. After that , two machine learning methods , Support Vector Machine (SVM)and Neuron Networks(NN), are employed respectively to train the features and output a classifier model which conducts fine grained abnormal driving behaviours detection and identification. We show that D^3 achieves an average total accuracy where NN classifier is higher than SVM classifier.

1. INTRODUCTION

It is necessary to detect drivers' abnormal driving behaviors to alert the drivers or report TransportationBureau to record them. Although there has been works[3][4][5] on abnormal driving behaviors detection, the focus is on detecting driver's status based on pre-deployed infrastructure, such as alcohol sensor, infrared sensor and cameras, which incur high installation cost. Since smart phones have received increasing popularities over the recent years and blended into our daily lives, more and more smart phone based vehicular applications [6][7] `are developed in Intelligent Transportation System. Driving behavior analysis is also a popular direction of smart-phone-based vehicular applications.

However, existing works[9][10] on drivingbehaviors detection using smartphones can only providea coarse-grained result using thresholds, i.e. distinguishingabnormal driving behaviors from normal ones. Since thresholdsmay be affected by car type and sensors' sensitivity, they cannot accurately distinguish the differences in variousdriving behavioral patterns. Therefore, Those solutionscannot provide fine-grained identification, i.e. identifyingspecific types of driving behaviors.Moving along this direction, we need to consider a fine-grainedabnormal driving behaviors monitoring approach,which uses smartphone sensors to not only detect abnormaldriving behaviors but also identify specific types of the drivingbehaviors without requiring any additional hardwares.The fine-grained abnormal driving behaviors monitoring isable to improve drivers' awareness of their driving habitsas most of the drivers are over-confident and not aware oftheir reckless driving habits. Additionally, some abnormaldriving behaviors are unapparent and easy to be ignoredby drivers. If we can identify drivers' abnormal drivingbehaviors automatically, the drivers can be aware of theirbad driving habits, so that they can correct them, helping toprevent potential car accidents. Furthermore, if the resultsof the monitoring could be passed back to a central server,they could be used by the police to detect drunken-drivingautomatically or Vehicle Insurance Company to analyze the policyholders' driving habits.. According to [3], there are six types of abnormal drivingbehaviors defined, and they are illustrated in Fig.1. *Weaving*(Fig.1(a)) is driving alternately toward one side of the laneand then the other, i.e. serpentine driving or driving in Sshape;*Swerving* (Fig.1(b)) is making an abrupt redirectionwhen driving along a generally straight course; *Sideslipping*(Fig.1(c)) is when driving in a generally straight line, butdeviating from the normal driving direction; *Fast U-turn*(Fig.1(d)) is a fast turning in U-shape, i.e. turning round(180 degrees) quickly and then driving along the oppositedirection; *Turning with a wide radius* (Fig.3(e)) is turning cross an intersection at such an extremely high speed thatthe car would drive along a curve with a big radius, andthe vehicle sometimes appears to drift outside of the lane,or into another line; *Sudden braking* (Fig.3(f)) is when thedriver slams on the brake and the vehicle's speed falls downsharply in a very short period of time.

This work uses smartphone sensing and machine learningtechniques. By extracting unique features from the readings of smartphone sensors, we can detect and identify thesix types of abnormal driving behaviors above. To realizea fine-grained abnormal driving behaviors detection andidentification, we face the following great challenges. First,patterns of driving behaviors need to be identified fromreadings of smartphone sensors. Second, the noise of smartphonesensors' readings should be removed. Finally, thesolution should be lightweight and computational feasibleon smartphones.In this paper, we first set out to investigate effectivefeatures from smartphone sensors' readings that are able todepict each type of abnormal driving behavior. Through empiricalstudies of the 6-month driving traces collected fromsmartphone sensors of 20 drivers in a real driving environment,we find that each type of abnormal driving behaviorshas its unique patterns on readings from accelerometersand orientation sensors. By extracting unique features fromreadings of smartphones' accelerometer and orientationsensor, we first identify 16 representative basic features tocapture the patterns of driving behaviors, then generate 136polynomial features based on the 16 features, and obtain152 features in total. Then, we train those features throughtwo machine learning methods respectively, *Support VectorMachine* (SVM) and *Neuron Networks* (NN), to generatea classifier model which could clearly identify eac Of driving behaviors (i.e. the normal driving behaviors as well as the six types of abnormal ones).

Based on the classifier model, we propose an abnormal *D*riving behavior *D*etection and i*D*entification system, *D*3, which can realize a fine-grained abnormal driving behaviors detection and identification in real-time using smart phone sensors. Our prototype implementation of *D*3 on Android-based mobile devices verifies the feasibility of using *D*3 in real driving environments. We highlight our main contributions as follows
:

- We identify 16 representative basic features and 136polynomial features to capture the patterns of abnormal driving behaviors by empirically analyzing the6-month driving traces collected from real driving environments.
- We use two machine learning method respectively, SVM and NN, to train the features of riving behaviors and obtain a classifier model which can not only distinguish abnormal driving behaviors from normal ones but also identify specific types of abnormal driving behavior.

- We propose a fine-grained abnormal driving behaviors detection and identification system, *D*3, to perform real-time high-accurate abnormal driving behaviors monitoring with smart phones. he fine-grained system can inform drivers of their abnormal driving behaviors which otherwise may be ignored by them so as to improve their awareness of driving habits.
- We conduct extensive experiments in real driving environments. The result shows that in real driving environments, *D*3 can identify specific types of abnormal driving behaviors in real time with an average total accuracy of 95.36% with SVM classifier model, and 96.88% with NN classifier model.

The rest of the paper is organized as follows: The related work is reviewed in Section 2. In section 3, we analyze the acceleration and orientation patterns of the six specific types of abnormal driving behaviors from smart phone sensors' readings. We present the design details of our abnormal driving behaviors detection and identification system, *D*3, in Section 4. We evaluate the performance of *D*3 and present the results in Section 5. Finally, we give the conclusion remarks in Section 6.

2. LITERATURE SURVEY

In the paper "smart phone enabled dangerous driving report system [1]", an algorithm is proposed to detect anomaly in speed profile to detect whether a vehicle is speeding. It also alert passenger in case of speeding. This method of preventing the speeding by alerting the passenger as well as driver is incorporated in our paper .

Senspeed sensor measures the deviation between the estimated speed in the real one. If there is abrupt deviation then immediately an alert message is send to the driver. Also malicious driver behaviours with reference to the reference point is always compared and the deviation is continuously monitored. This method of continuous monitoring of driver's behaviours gives security in vehicular applications. This concept is derived from "senspeed :sensing driving conditions to estimate vehicle speed in urban environments [2]".

In the paper "context-aware driver behaviours detection system in intelligent transportation system [3]" a dedicated short range communication allow vehicles to communicate with each other or to communicate with road side equipment. Applying wireless technology in vehicular environment led to the improvement of road safety and reduction in the number of fatalities cost by road accident. From this paper a novel and nonintrusive driver behaviours detection system is taken and incorporated in my paper.

Architecture

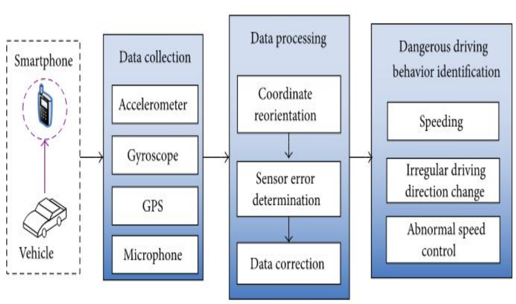

Fig 1: Architecture

Proposed system:

In this work ,In this paper, we propose an reliable dangerous driving behavior identification scheme based on smart phone autocalibration. We first theoretically analyze the impact of the sensor error on the vehicle driving behavior estimation. Then, we propose a smart phone autocalibration algorithm based on sensor noise distribution determination when a vehicle is being driven. Driving Sense leverages the corrected sensor parameters to identify three kinds of dangerous behaviors: speeding, irregular driving direction change, and abnormal speed control. We evaluate the effectiveness of our scheme under realistic environments. The results show that Driving Sense, on average, is able to detect the driving direction change event and abnormal speed control event with 93.95% precision and 90.54% recall, respectively. In addition, the speed estimation error is less than 2.1 m/s, which is an acceptable range.

Advantages

It can be used to prepare trainees to handle unpredictable or safety-critical tasks that may be inappropriate to practice on the road, such as collision avoidance or risky driving . In addition, simulators make it possible to study hazard anticipation and perception by exposing drivers to dangerous driving tasks, which is an ethically challenging endeavor in real vehicles .

3. CONCLUSION

In this paper, we address the problem of performing abnormal driving behaviors detection (coarse-grained) and identification (fine-grained) to improve driving safety. In particular, we propose a system, *D*3, to detect and identify specific types of abnormal driving behaviors by sensing the vehicle's acceleration and orientation using smart phone sensors. Compared with existing abnormal driving detection systems, *D*3 not only implements coarse-grained detections but also conducts fine-grained identifications. , i.e. *Weaving*, *Swerving*, *Sideslipping*, *Fast U-turn*, *Turning with a wide radius* and *sudden braking*. To identify specific abnormal driving behaviors, *D*3 trains a multi-class classifier model through Support Vector Machine (SVM) and Neuron Networks (NN) based on the acceleration and orientation patterns of specific types of driving behaviors.

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