Drive Safe: Texting while Driving Detection using Touch stroke Pattern Detection

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Abstract: Texting-while-driving (T&D) is one of the top dangerous behaviours for drivers. Many interesting systems and mobile phone applications have been designed to help to detect or combat T&D. Existing solutions to this problem generally rely on the user's manual input, or utilize specific localization devices to determine whether a mobile phone is at the driver's location. In this paper, we propose a method which is able to detect T&D automatically without using any extra devices. The idea is very simple: when a user is composing messages, the smartphone embedded sensors (i.e., gyroscopes, accelerometers, and GPS) collect the associated information such as touch strokes, vehicle speed. This information will then be analysed to see whether there exist some specific T&D patterns. Extensive experiments have been conducted by different persons and in different driving scenarios. The results show that our approach can achieve a good detection accuracy with low false positive rate. Besides being infrastructure free and with high accuracy, the method does not access the content of messages and therefore is privacy-preserving.

Index Terms -Mobile phone applications, data-driven pattern recognition, text, drive

I. Introduction

According to Transport and Telecommunication, 2012, Volume 13 **MOBILE PHONE ACCIDENTS – EXPERIENCE OF INDIA,** Every year nearly 1.4 million people have been killed because of they are wireless customers and their over-bearing cell phones. While in India, an estimated 1.35 lakhs people died due to road accident in 2010, which is approximately 10% of road accident fatalities worldwide and these figures are the highest in the world. Among all distracted driving activities associated with cell phones, texting-while driving
(T&D) has become the top one killer. Those who send text messages while driving are 23 times more likely to
experience a crash, compared to 2.8 times more by dialling and 1.3 times more by talking or listening. There are many systems developed for reduction of usage of phone while driving. But the key problem in these systems is the manual activation of apps. Another problem is that the systems disable calling and messaging completely while driving. This leads to missing of important and emergency calls. Another problem associated with the scenario is detecting the driver. For the purpose of detecting the driver the existing system involves installation and maintenance of heavy infrastructure like cameras. Thus, the system proposed in this system makes use of the inbuilt sensors of the mobile phone t detect the usage of phone while driving, without using any external infrastructure, and allowing important and emergency calls to be attended.

II. LITERATURE SURVEY

1. Paper Name: Detecting Drivers Using Personal Smart Phones by Leveraging Inertial Sensors
Author: Cheng Bo, Xuesi Jian, Xiang-Yang Li
Paper Explanation:

In this work, we address a fundamental and critical task of detecting the behavior of driving and texting using smartphones carried by users. We propose, design, and implement TEXIVE that leverages various sensors integrated in the smartphone and realizes our goal of distinguishing drivers and passengers and detecting texting using rich user micromovements and irregularities that can be detected by sensors in the phone before and during driving and texting. Without relying on external infrastructure, TEXIVE has an advantage of being readily implemented and adopted, while at the same time raising a number of challenges that need to be carefully addressed for achieving a successful detection with good sensitivity, specificity, accuracy, and precision. Our system distinguishes the driver and passengers by detecting whether a user is entering a vehicle or not, inferring which side of the vehicle s/he is entering, reasoning whether the user is siting in front or rear seats, and discovering if a user is texting by fusing multiple evidences collected from accelerometer, magnetometer, and gyroscope sensors. To validate our approach, we conduct extensive experiments with several users on various vehicles and smartphones. Our evaluation results show that TEXIVE has a classification accuracy of 87.18%, and precision of 96.67%.

2.Paper Name: Drive Now, Text Later Nonintrusive Texting-While-Driving Detection using Smartphone
Author: E. Bhanu, V. Kundana, S. Keerthi Reddy, Dr. Sandra Johnson
Paper Explanation:

Texting-while-driving (T&D) is one of the top dangerous behaviors for drivers. Many interesting systems and mobile phone applications have been designed to help to detect or combat T&D. However, for a T&D detection system to be practical, a key property is its capability to distinguish driver's mobile phone from passengers'. Existing solutions to this problem generally rely on user's manual input, or utilize specific localization devices to determine whether a mobile phone is at driver's location. In this paper, we propose a method which is able to detect T&D automatically without using any extra devices. The idea is very simple: when a user is composing messages, the smart phone embedded sensors (i.e. gyroscopes, accelerometers, and GPS) collect the associated information such as touch strokes, holding orientation and vehicle speed. This information will then be analysed to see whether there exist some specific T&D patterns. Extensive experiments have been conducted by different persons and in different driving scenarios. The results show that our approach can achieve good detection accuracy with low false positive rate. Besides being infrastructure-free and with high accuracy, the method does not access the content of messages and therefore is privacy-preserving.

3.Paper Name: Real-Time Recognition of Physical Activities and Their Intensities Using Wireless Accelerometers and a Heart Rate Monitor
Author: Emmanuel Munguia Tapia, Stephen S. Intille, William Haskell
Paper Explanation:

In this paper, we present a real-time algorithm for automatic recognition of not only physical activities, but also, in some cases, their intensities, using five triaxial wireless accelerometers and a wireless heart rate monitor. The algorithm has been evaluated using datasets consisting of 30 physical gymnasium activities collected from a total of 21 people at two different labs. On these activities, we have obtained a recognition accuracy performance of 94.6% using subject-dependent training and 56.3% using subject independent training. The addition of heart rate data improves subject-dependent recognition accuracy only by 1.2% and subject-independent recognition only by 2.1%. When recognizing activity type without differentiating intensity levels, we obtain a subject independent performance of 80.6%. We discuss why heart rate data has such little discriminatory power.

4.Paper Name: Sensing Vehicle Dynamics for Determining Driver Phone Use
Author: Yan Wang, Jie Yang
Paper Explanation:

This paper utilizes smartphone sensing of vehicle dynamics to determine driver phone use, which can facilitate many traffic safety applications. Our system uses embedded sensors in smartphones, i.e., accelerometers and gyroscopes, to capture differences in centripetal acceleration due to vehicle dynamics. These differences combined with angular speed can determine whether the phone is on the left or right side of the vehicle. Our low infrastructure approach is flexible with different turn sizes and driving speeds. Extensive experiments conducted with two vehicles in two different cities demonstrate that our system is robust to real driving environments. Despite noisy sensor readings from smartphones, our approach can achieve a classification accuracy of over 90% with a false positive rate of a few percent. We also find that by combining sensing results in a few turns, we can achieve better accuracy (e.g.95%) with a lower false positive rate.

5.Paper Name: THE EFFECT OF CELLULAR PHONE USE UPON DRIVER ATTENTION
Author: A. JAMES M&NIGHT and A. SCOTT MCKNIGHT
Paper Explanation:

In this study, ***150*** subjects observed a 25-minute video driving sequence containing45 highway traffic situations to which they were expected to respond by manipulation of simulated vehicle controls. Each situation occurred under five conditions of distraction: placing a cellular phone call, carrying on a casual cellular phone conversation, carrying on an intense cellular phone conversation, tuning a radio, and no distraction. All of the distractions led to significant increases in the proportion of situations to which subjects failed to respond. However,significant age differences of nonresponse appeared Among subjects over age 50, nonresponses increased by about one-third under all of the telephone distractions. The response rate of younger subjects increased by a lesser degree except under intense conversation. Results were not influenced by gender or prior experience with cellular phones. The authors conclude that older drivers might reduce their accident risk during attention-demanding traffic conditions by avoiding use of cellular phones and that other drivers might do so by refraining from calls involving intense conversation.

III. EXISTING SYSTEM

According to whether the system can distinguish driver's cellphone from passengers', existing systems to detect and/or to prevent T&D can be classified into two categories. In the first category, the systems, once activated, blindly block all the messages. For example, DriveMode [2] blocks a user from reading or typing anything. Text-STAR [4] and Textecution[5] are slightly smarter in the sense that they estimate the speed of the cell phone at the time text messages are sent and disable texting when the speed is above 10 mph or more. On the contrary, systems in the second category try to identify whether a cell phone is being used by a driver or a passenger and block driver's cell phone only. Under this category, many works utilize the location of the mobile phone in a vehicle to differentiate passengers from drivers. To determine the finegrained location of a cell phone in a vehicle, some works distinguish drivers from passengers via monitoring their activities. For example, a camera is utilized to directly monitor the driver's activity associated with making a call, sending messages, etc., The driver and passengers' activity like car boarding and seat belt fastening
are analysed using smartphone sensors.

3.1 Disadvantages of Existing System

1. Requires Manual Activation
2. Blocks all the calls and messages blindly without considering the urgency of it.
3. Installation of Heavy infrastructure.

IV. PROPOSED SYSTEM

The proposed system allows the user attain calls that are urgent and are in the emergency list. The system doesn't blindly block all the calls. The system detects the usage of phone while driving without any external hardware such as cameras or motion sensors. It uses the inbuilt mobile phone sensors like, Accelerometer, Gyroscope to detect the usage of phone considering the velocity at which the phone is moving. Thus it is a cost effective approach to reduce the accident percentage involving usage of cellphones.

4.1 Advantages of Proposed System

1. It doesn't require frequent manual activation.
2. Important calls aren't blocked.
3. Cost effective.

V. SYSTEM ARCHITECTURE

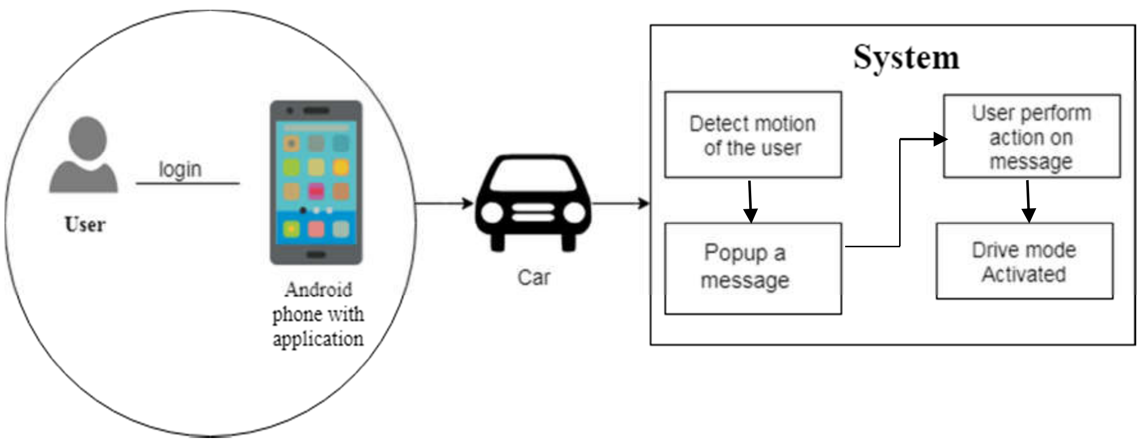

Figure 1. Proposed System Architecture

VI. CONCLUSION

In this paper, we propose a novel method which is able to detect T&D. Instead of using any extra devices, the method leverages some patterns associated with how smartphones are used in moving vehicles. In particular, some build-in sensors in smartphones collect the associated information and analyse, through hypothesis testing to see whether these T&D patterns exist. Extensive experiments have been conducted by different persons and in different driving scenarios. The results show that our approach can achieve a good detection accuracy with a small false positive rate. We believe the proposed T&D method could be utilized for usage-based insurance and provide support for many anti-T&D mobile phone applications. Thus the proposed model allows the end user to attend important calls and emergency list is maintained for contacts that are not to be blocked.

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