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Car Driver Detection and Accident Prevention System

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ABSTRACT

According to a survey, over 147,000 people get killed every year in road accidents in India, that is more than the number of people killed in all our wars put together. Out of many reasons, Driver Distraction contributes 25% to the road accidents. Nowadays smartphone is the main cause of Driver Distraction. Hence there is need of a system which will prevent distractions occur while driver is driving. Tracking driving behaviour can help raise driver's awareness of their driving activity and associated risks, thus, which help us in order to reduce careless driving and enforce safe driving practices.We propose a system which will detect Driver in a car and block his smartphone notifications to prevent distraction and ultimately prevent an accident. Our system will be basically an android application system which will be installed on every smartphone. This system assures 75% Driver Detection accuracy. System will be useful for everyone who drives a car and it will prevent accidents which occur mainly because of Driver Distraction and will save many lives.

Keywords— Driver Detection System, Near Field Communication, Support Vector Machine

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I. INTRODUCTION

We intend to develop a smartphone application that will distinguish between passengers and driver in an automobile and will ensure that driver will not be distracted while driving. We propose a system which will be a smartphone application basically. This application will detect driver in an automobile and automatically block all the incoming calls, messages and any notifications to ensure that driver will not get distracted from driving.By taking advantage of sensing, computing, and communication on modern smartphones, we can perform activity recognition, ranging from simple activities such as walking and running to more complex ones like, whether the user is laughing in a social gathering or is riding a car, bus, or a train. We assume that the driver and the passenger perform various small set of differentactivities that can be captured and discriminated through multi-modal sensing. Driver detection enables several useful applications, one application is to control

notifications based on user attention, since in-vehicle information delivery is readily affected towards its user state. Human Activity Recognition (HAR) technique will be used in discriminating driver and passengers. There are various human activity recognition approaches including a activity running in the foreground on a mobile phone, cameras in the environment, RFID readers on people, but we will use in built sensors of the smartphone like accelerometer, gyroscope etc. to detect and discriminate passenger and driver. After detecting driver in an automobile, our system will not let smartphone to distract driver until he finishes driving.Car Driver Detection and Accident Prevention System uses a small set of sensors, not mounted or worn in a special manner, and used in a noisy environment, can still be used to improve our information about an important user state and detection of driver. Experimental evaluations on real user in this paper showed that DDS achieves a practically useful accuracy of 85% in a majority of phone carrying positions, without requiring individual user training. The design also uses triggers to significantly reduce the energy overhead, illustrating a useful design principle for sensing applications that operate continuously.

II. LITERATURE SURVEY

In present days mobile phones plays most important role in every human life, but at the same time use of mobile phones while driving is the main reason of road accidents of automobiles. The use of mobile phones affected driving in various ways. A driver's wrong exits, which makes them unable to follow traffic signals, and forgot to adjust the speed according to the limit. According to the data, Over 1,47,000 people were killed in road accidents in 2013 alone in India, that is comparatively greater than the total number of people killed in all wars put together. It is very shocking to hear that 16 children die on Indian roads daily. People in India, specially drivers are always been very reluctant to follow traffic rules. These traffic rules must be followed to ensure road safety of people both inside or outside the vehicle. There must be a system which will prevent accidents by making drivers conscious while driving and restricting or blocking things which distracts drivers while driving[1].

Hence we intend to develop a smartphone application that will distinguish between passengers and driver in an automobile and will ensure that driver will not be distracted while driving. We propose a system which will be a smartphone application basically. This application will detect driver in an automobile and automatically block all the incoming calls, messages and any notifications to ensure that driver will not get distracted from driving.

III.RELATED WORK

This problem can also be solved by special installations in new high-end vehicles for example Near Field Communication (NFC) but it will not be compatible with other vehicles. All people may not afford such systems in their vehicles. But our Driver Detection System (DDS) that relies entirely on smartphone sensors is compatible with all automobiles and everyone can afford a smartphone.

Some other systems like pressure sensors on car seats could be used to measure the persons weight on the driver seat, knowing the weights of people who are likely to drive that car could facilitate driver detection or another system like most cars have audio speakers, which can be used to detect driver through some programming. While all these approaches indeed identify the driver, they require some degree of modification to the car's inner workings. This approach is not compatible with all cars[7].Some commercial products for disabling phone use in car are available but they do not distinguish between drivers and passengers. Our system proposes detection of driver among set passengers in an vehicle and disables all the distractions to drivers smartphone only. Some apps also provide Drive Mode, but only restricts texting and driving, such apps does not prevent distractions to occur which are main cause of accidents. Such apps need to launch manually before you start driving, so there are chances that people may forget to launch the app.Communicating using Bluetooth devices is preferred over cell phone devices, but Bluetooth devices are not entirely safe. Long term exposure to microwave signals from Bluetooth devices can cause so many health hazards like ear pain, hearing loss, brain cancer, and headache. Bluetooth radiations may affect individuals differently but problems arises due to microwave radiations interrupt cell functioning and natural transmission of energy.

IV.PROPOSED SYSTEM

The main aim of an accident prevention system is to save lives from road accidents and provide a safety mechanism for the driver. Every hour, 40 people under the age of 25 die in road accidents. Accidents occur mainly due to driver carelessness. An effective way to prevent this is to providemechanism for awareness and safety measures to the driver. Major cause of vehicular accidents is due to Driver Distraction. This paper introduces methods such as activity detection of driver and a personal identity system and discusses how it can be implemented in orderto avoid accidents which results in safety of driver.

Our key idea behind this system is simple. We hypothesize that the driver and the passenger perform non-identical micro-activities that can be captured and discriminated through multi-modal sensing. For instance, a driver inserts her left foot inside the car first, while the passenger does the opposite. Thus, if the inserting foot has a particular motion signature on the phone's accelerometer, then observing that signature reveals that the phone is either on the right pant pocket of the driver, or the left pant pocket of the passenger. Now, if it is the former, then the driver should be pressing the pedals and breaks with his right foot such motion signatures should be easily detectible. However, if such set of activities are absent, it gives the possibility to conclude that the owner of the phone is a passenger.

Of course, the problem is actually more complicated because the user may carry the phone in her shirt pocket, or even in her purse. If the phone is in the upper pocket, one observation must be taken into consideration that the driver is likely to turn slightly towards the left to pull the seat belt, while the passenger would again perform the set of opposite activities. Gyroscopes in modern smartphones are capable of measuring rotational along a vertical axis, called yaw. By observing the direction of the yaw, we should be able to perform the driver-passenger classification. Of course, the women's purse is harder to detect; nonetheless, we find that if the user throws her purse in with a reasonable motion, then the direction of the motion (left to right, or right to left) can be used for classification. Finally, if a car has some passengers in the rear seat, then it is also necessary to differentiate between the driver and the person who is sitting exactly behind the driver. Since both their motion signatures could well be identical, we utilize the audio sound as a method coming from the car stereo as a way to discriminate between them. This system is an implemented system that aggregates a range of signatures and combines them to achieve consistent classification.

Of course, identifying signatures for each of the small set of activities is non-trivial – several discriminating patterns lay hidden in the raw sensor signals and there is need to be extract it with precision. Moreover, the system needs to be developed with energy constraints in mind. Finally, the system needs to recognize when the confidence of classification is low, and offer this failure notification to the user. This may be importantif the system is used for law-enforcement type applications. In such scenarios, it would be necessary to learn about the confidence of classification.

V. WORKING

The detection of multiple relevant micro-movements for various phone positions and orientations leads to multiple cases that DDS design should address. Fortunately, simplifications and commonalities across cases exist. Firstly, to overcome the different phone orientation, we map all signals to a reference orientation. The phone compass and accelerometer data can be collected in order to get the earth's gravity vector and magnetic field which suffice to generate this mapping. The Android OS and iOS provide APIs to support this calculation. Secondly, movement constraints help prune the search space of movement signatures in each case. For example, a driver enters the car using her right leg first while the front passenger enters using her left leg first. The pedal press should be searched only if the phone is in the leg pocket that enters first. Figure 3.1 presents a systematic combination of multiple sensor signal signatures for various possible phone orientation (lower body pockets, upper body pockets, and handbag), to determine if the user is a passenger or a driver.

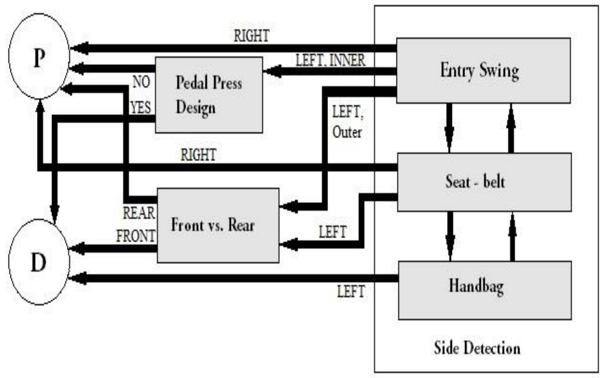

Fig.1 Decision Flow: P = Passenger and D = Drive, Denote the outputs

Entry Swing:

This block determines if the user is in the right or left side of the vehicle cabin, for the phone carried in a lower body pocket. The swing in the user's lower body reveals the direction of entry (left vs. right). Furthermore, the movement can be separated into two significant parts to determine if this signature occurred first on the leg closest to the phone or the other one, revealing if the phone is in the pocket on the innermost leg (the one that entered the vehicle first) or not. Accelerometer, compass, and gyroscope data are used. Seat-belt: This block detects right vs. left side for the phone carried in an upper body pocket. The users on the left will wear their seat belt by first turning left and then turning right as they pull the seat belt to the fastener. The motion is reversed for the other side. Accelerometer, compass, and gyroscope data are used for the purpose of driver detection.

Pedal Press:

This block determines if the user's leg is being used for pressing the brake or gas pedals. The sensor data is matched with pedal press patterns using a clustering algorithm. This block is used only if the above block outputs that the user is in the left side of the cabin and the phone is in the user's inner leg pocket. Accelerometer, compass, and gyroscope data are used.

Handbag L/R:

This block detects left vs. right for the phone carried in a handbag, if the other two side detection blocks fail. The detection is based on approach to the driver location and is similar to the front vs. rear detection described below.

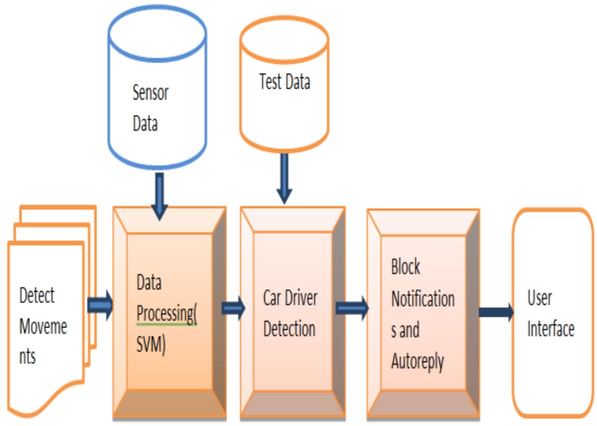

Fig. 2 System Architecture

Results

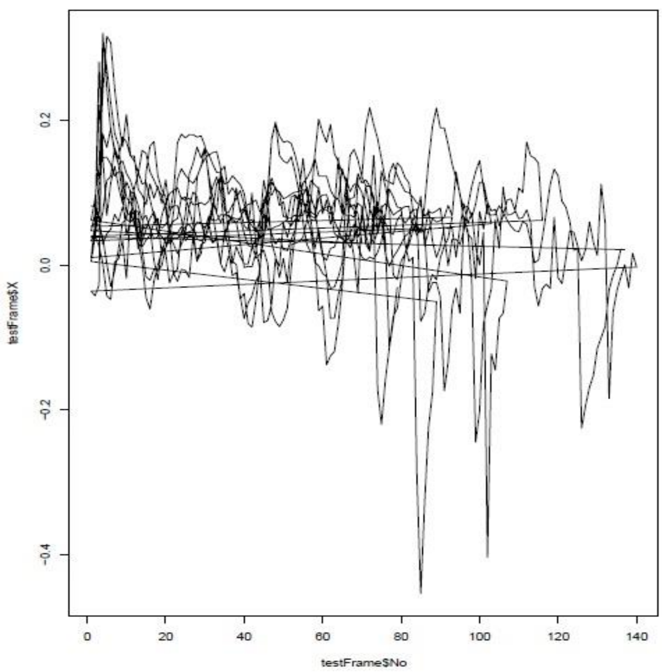

Fig. 3 Combined graph of 10 data samples for Steering Wheel movement

We have developed our application as a service on Android platform to allow it to run in the background. The application is divided into two parts: data collection and analysis. The application collects data from accelerometers and Gyroscope. The combined data is then analysed to detect driver. For analysing we performed particular action n number of times and drawn combined graph for that purpose. Then we generalized it as shown in Fig. 4 and set a threshold value for that action and compared them with instantaneous values of android sensors for detection of driver.

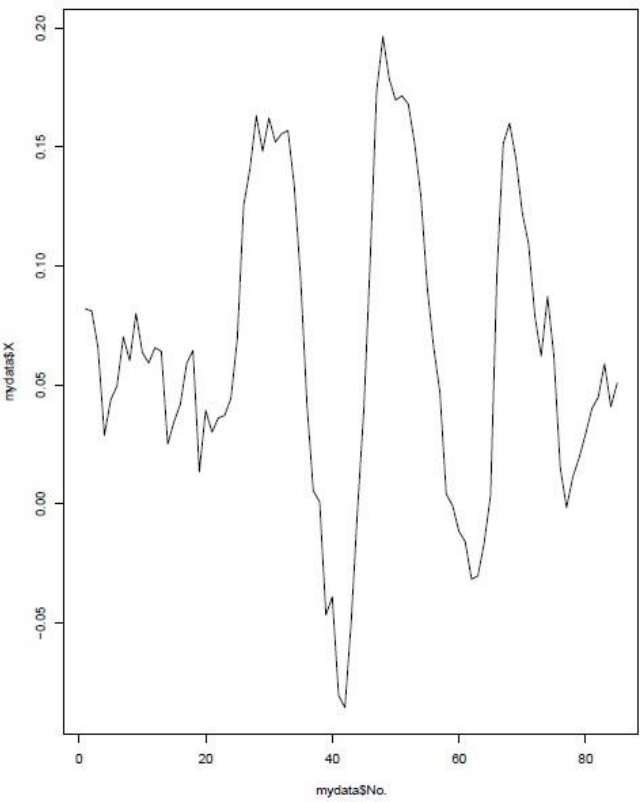

Fig. 4 Generalised graph for Steering Wheel action

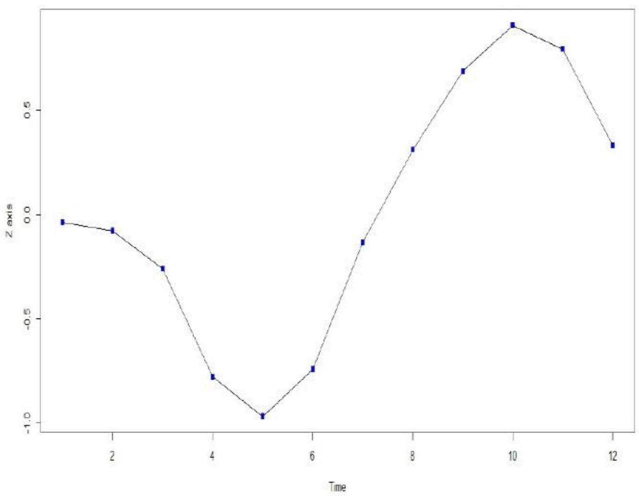

Fig. 5 Generalised graph for Paddle Movement

VI. CONCLUSION

Driver Detection and Accident Prevention System uses a small set of sensors, not mounted or worn in a special manner, and used in a noisy environment, can still be used to improve our information about an important user state and detection of driver. Experimental evaluations on real user in this paper showed that DDS achieves a practically useful accuracy of 75% in a majority of phone carrying positions, without requiring individual user training. The design also uses triggers to significantly reduce the energy overhead, illustrating a useful design principle for sensing applications that operate continuously.

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