Drunk Driver Alerting System: Mobile Application

Tanmoy D. Goswami, Student, Dept of Comp Engg, Dr.Seema Quadri Inst of Tech, Aurangabad.
Kanchan B. Mahajan, Asst. Prof, Department of Computer, SITRC,Nashik,India.
Monika S. Deshmukh, Asst. Prof, Department of Computer, SITRC,Nashik,India.

ABSTRACT

The driving in intoxicated situation is a major cause of road accident. In this paper we proposed a concept to alert drunk driver at early stage before actual accident take place. Complete system works on a mobile phone . The program calculates the sensor reading and matches with the pattern already present in system, if match found then an alert will give to driver and also a text message will send to the relative asking for help with location details. This system will design on an android based cell phone. Our proposed system will prevent many accidents to occur and save lives.

Keywords - Acceleration Cell Phones, Rush Driving, Sensor.

I. INTRODUCTION

Risk in driving a vehicle has increased the chances of accident. Crashes due to rush driving is a serious danger not only to the drivers themselves but also to the public present on the road. Government of India, Ministry of Road Transport & Highways, says during 2011, there were 4.98 lakh road accidents killing 1.42 lakh people and injuring more than 5 lakh persons. Many of them are disabled for rest of their lives [1]. A major cause of road accidents is either rush driving or driving after having alcohol. In this paper, we proposed a very efficient android cell phone based rush and drunk driver alerting system. The cell phone, which is located in the moving vehicle, collects and analyzes the information from its orientation sensor and accelerometer to identify any irregular or dangerous driving behaviors typically related to driving under alcohol influence. In our future work, we plan to improve our identification system by integrating all available sensing data on a cell phone, e.g., GPS data and camera image also improve the communication part by using free SMS services. Efficiently alert the driver who is driving rashly. Identification of risk and taking preventive action to minimize risk is a vital challenge in front of current technology. So now time demands a real time monitoring and alerting system that will minimize such driving risks with fast response time. Despite the fact that driving under the influence of alcohol is a major problem, detection of drunk driver is not so easy and it till depends on visual observations by patrol officers. Drivers under the influence of alcohol show a marked decline of perception, recognition, and controlling of vehicle, so they tend to make certain types of dangerous moves. One of the portable devices that we all have with us is cell phone. It can function very effectively and at the same time its communication services have a wide coverage. Hence a system that addresses this issue can be easily designed and implemented using cell phone technology. An alert can be given to the careless or a rush driver by measuring the speed and orientation of the vehicle. Those values can be gathered by using accelerometer and orientation sensor. We will calculate separately the longitudinal and lateral acceleration values and match the result multiple times with a predefined pattern to identify the rush or drunk driver. After that the alert will be given to the driver. Introduction of the paper should explain the nature of the problem, previous work, purpose, and the contribution of the paper. The contents of each section may be provided to understand easily about the paper.

II. LITERATURE SURVEY

Some researchers have already done great work in the field of driving monitoring tools. Some of them are known as driver vigilance monitoring. It works on detecting and preventing fatigue of the driver. Other researchers focus on real-time driving pattern recognition. Visual observation is an option to detect driver fatigue. Two cameras were used on dashboard to collect the visual cues of drivers, such as head movement, eyelid movement, facial expression, and gaze movement in order to detect fatigue with a probabilistic model [2]. Issue of sleep onset from the global analysis of the physiological state of fatigue, and take eyes opening and closing as cues of sleep onset is also a major area of concern in case of fatigue driving [3]. Help of vision-based system to monitor the eyes conditions in order to predict fatigue in driving is discussed. Two fixed cameras to capture the driver's sight line and the driving lane path for the purpose of driving pattern and status recognition is dealt. Correlation coefficients calculated to monitor the driving status and patterns [4]. These methods all required one or more cameras to be installed in the vehicle and just in front of the driver. It will cause some potential safety issues to the driver. Besides visual methods, the interaction at the vehicle-human interface also gives clues to driving information monitoring. It is assumed that the time derivative of force exerted by the driver at the vehicle-human interface, such as pressure on the accelerator pedal, can help to decide the level of alertness of the driver.

Practically, a force sensor on the accelerator pedal to capture the exerted force to predict driver fatigue used [5]. Saab, automobile manufacturer has designed an experimental product AlcoKey, which used the breath sample of drivers. It collects the breath sample before they start the vehicle. Then the AlcoKey's radio transmitter sends a signal to the vehicle's electronic control unit. Now the control unit will decide wither the vehicle to be started or not based on the level of alcohol present in the breath sample. These researches worked based on the interactions between human and vehicle to determine drunk driving. It also required that the vehicle need to be tightly coupled with the auxiliary add-ons, so their compatibility have been compromised most of the time [6]. Architecture for driving information system using GPS receiver and specific sensors is implemented. They recorded acceleration and GPS data and used pattern matching to detect and classify driving styles. The work shows that the acceleration reflects the measures of driving pattern. However, it do not only aim on the acceleration signature, but also take help of GPS data. The devices required in their system are specific and not conveniently compatible [7]. Tanmoy D Goswami et. al proposed a very efficient android cell phone based rush and drunk driver alerting system. The cell phone is located in the moving vehicle uses its orientation sensor and accelerometer to identify any irregular or dangerous driving behaviors. [10]

NHTSA [8] has studied many driving behaviors when vehicles are drive under influence of alcohol. They found some patterns of driving behaviors for these drivers. Based on this research we can conclude that there are some categories related to drunken driving behaviors. All these driving behaviors are related to the vehicle movement. Also depends on the driver's vigilance & judgment. The hints to solve this problem can be classified as follows. Clues related to vigilance problem and judgment: Example: such as poor response to traffic signal, Failure in identifying lane markers and driving without headlights at dark and drive on wrong side of road. Hints related to maintaining Speed issues. S udden acceleration or deceleration and breaking inappropriately and stopping carelessly. Stimulus related to lane position maintenance problem. Driving with twist and turns, swerving, drifting, rough turning or taking a wide radius turn.

**Fig 1: Problem in maintaining the lane position: [9]
(a) Weaving (b) Drifting (c) Swerving (d) turning with wide radius**

- These driving patterns produce clear idea about driving under the influence of alcohol.

- The pattern related to maintaining lane position & speed control is the prime categories for good enough to conclude drunken drive identification.

- If we focus on these hints we can implement the identification system for drunk driving or rush driving.

III.   PROPOSED METHODOLOGY

Normally, the prime reason of abnormal or irregular curvy movements is the lane position maintenance which causes weaving, drifting, weaving and turning with a w ide radius. Result of these all d riving behaviors is an extraordinary change on lateral acceleration. NHTSA's report releases the clear representation of these situations, as shown in Fig. 1. As demonstrated in Fig. 1(a), weaving in simple words means moving a vehicle in zigzag manner. Probably, the lateral movement is caused by rotating a steering wheel toward one direction and a next coming steering toward the other direction. Similarly as stated above, the drifting, swerving and turning with a wide radius have the abnormal lateral movements, as shown in Fig. 1(a) (b) (c) (d).

A rush driver or a driver who is driving vehicle under the influence of alcohol unable to keep proper speed and so he often experiences difficulty in driving. Sudden acceleration or deceleration, eccentric braking and shaky stop are some strong hints that concludes the driver is an under influence of alcohol. They all cause an inappropriate change in longitudinal acceleration. We pretend that the longitudinal acceleration is positive toward the head of the vehicle. So the concise acceleration of vehicle will lead to an extensive increase of longitudinal acceleration i.e. in positive values. And on the converse, the concise deceleration, eccentric braking or shaky stop will cause an immense decrease of longitudinal acceleration i.e. in negative values.

IV.   DESIGN OF PROPOSED SYSTEM

We describe the design of our proposed alerting system for drunk driver in four components, as presented in Fig. 2.

They are:

1. Surveillance module

2. Calibration module
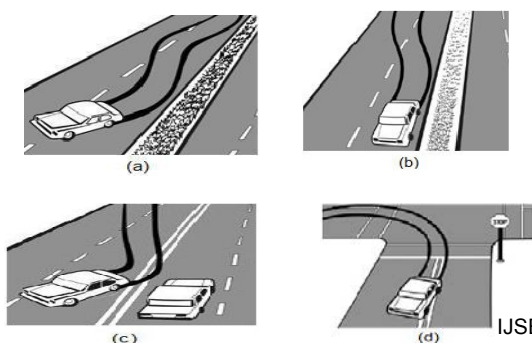
3. Data processing and pattern matching module

4. Alert and communication module.

The third module marked by a dashed box will implement the identification algorithm. Our design will consume very less power, as the screen is only activated when required. The work flow of our rush and drunken driving alerting system is also illustrated in Fig. 2.
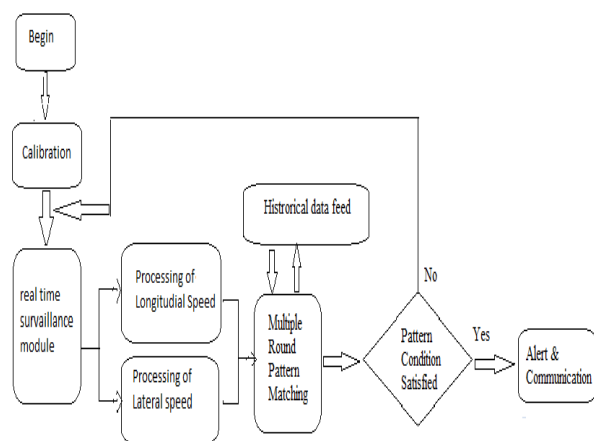

Fig.2. Work function of the rush and drunk driver alerting system.

When the system starts manually, a c alibration i.e. computation procedure will start working when the system identifies that the cell phone is placed in a running vehicle. Then the main program launches, and will work as a background function. This vigilance procedure monitors the behaviors of d river in real time and gathers acceleration readings using the sensors. The gathered information will consist of lateral and longitudinal acceleration. They will be processed separately, and used as inputs to the multiple round pattern matching modules. At the same time, the historical data will be uploaded in the system. This information will support in pattern matching process. If the match found, which indicates a drunk or rush driving is identified; and finally one signal is send to trigger an alert. The cell phone may also alarm several time the driver or automatically contact the relatives of driver for help using SMS service. If the pattern matching condition is not satisfied, execution returns to the Real-time surveillance module immediately.

V.   EXPERIMENTAL RESULT

In general, I separate the driving behaviour data collected into two sets, one for training and the other for evaluation. In the experiments, we drove a 2013 Hyundai eon car, having a Samsung grand p hone with our rush and drunk driver alerting system in the car.

In total, I have obtained 55 sets of data for Rush driving related movement, including weaving,

swerving, turning with a wide radius and erratically changing speed (accelerating or decelerating); and we also collected 20 sets of data for regular driving, each of these driving's lasts for 10 to 15 minutes.

We test the detection performance by these data with the same threshold set before. Table 1.1 shows the results. In these special cases, the FN rate for detecting abnormal curvilinear movement is 0%, and the FP rate is 0.43%; the FN rate for speed control problem is 0%, and the FP rate is 2.78%. The result shows that the slide of mobile phone has obvious impacts on the detection accuracy, especially for detecting abnormal curvilinear movements. Because if the phone slides when the vehicle is making curvilinear movements, the phone is very likely to rotate around an axis. So the lateral acceleration of the phone and that of the vehicle will have a quite large difference. In other words, it is hard to use the lateral acceleration of the phone to determine the moving trend of vehicle in lateral direction. To solve the problems caused by position and orientation changes when phone slides during driving, we may add an additional calibration procedure in the detection algorithm to improve the detection performance in this special case.

	ABNORMAL LATERAL MOVEMENTS	PROBLEM OF CONTROLLING LONGITUDINAL MOVEMENT
FN RATE (%)	0	0
FP RATE (%)	0.43	2.78
FN RATE (%)- MOBILE NOT IN POSITION	13.94	0
FP RATE (%)- MOBILE NOT IN POSITION	1.17	2.65

TABLE 1

VI.   CONCLUSION

In this paper, we proposed a very efficient android mobile phone based drunk driver alerting system. The android based mobile phone, which is located in the moving vehicle, collects and analyzes the information from its orientation sensor and accelerometer to identify any irregular or dangerous driving behaviors typically related to driving under influence of alcohol.

We plan to improve our identification system by integrating all available sensing data on a cell phone in future, GPS data and camera image also improve the communication part by using free SMS services.

REFERENCES

[1]. Report on "Road Accidents in India 2011" by ministry of Road Transport and Highway Transport Research Wings New Delhi" in June 2012

[2]. Z. Zhu and Q. Ji, "Real Time and Non-intrusive Driver Fatigue Monitoring", in The 7th International IEEE Conference on Intelligent Transportation Systems, pp. 657-662, Oct. 2004.

[3]. A. B. Albu, B. Widsten, T. Wang, J. Lan and 1. Mah, "A Computer Vision-Based System for Real-Time Detection of Sleep Onset in Fatigued Drivers", in 2008 IEEE Intelligent Vehicles Symposium, pp. 25-30, June 2008

[4]. J. Lee, J. Li, L. Liu and C. Chen, "A Novel Driving Pattern Recognition and Status Monitoring System", in First pacific rim symposium, PSIVT 2006, pp. 504-512, December 2006.

[5]. A. V. Desai and M. A. Haque, "Vigilance Monitoring for Operator Safety: A Simulation Study on Highway Driving", in Journal of Safety Research, Vol. 37, No. 2, pp. 139-147, 2006.

[6]. "Saab AlcoKey Helps Drivers", http://www.saabnet.comltsnlpress/061013a.html.

[7]. V. D. Lecce and M. Calabrese, "Experimental System to Support Real Time Driving Pattern Recognition", in Advanced Intelligent Computing Theories and Applications With Aspects of Artificial Intelligence Annals of Emergency Medicine, pp. 1192-1199, 2008.

[8]. U.S. NHTSA, "Traffic Safety", http://www-nrd.nhtsa.dot.govlPubs/811172.pdf

[9]. "Mobile Phone Based Drunk Driving Detection Jiangpeng Dai" Jin Teng, Xiaole Bai, Zhaohui Shenj and Dong Xuan Digital Object Identifier 10.410BIICST.PERVASIVEHEALTH2010.8901 http://dx.doi.org/10.410BIICST.PERVASIVEHEAL TH2010. 8901

[10]. "Android Based Rush and Drunk Driver Allerting System" Tanmoy D Goswami, S R Zanwar, Zafar Ul Hasan *Int. Journal of Engineering Research and Applications, ISSN : 2248-9622, Vol. X, Issue X, XXXX-XXXX 2013, pp.XX-XX*