

A Review on Rash Driving Detection and Alert System

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Abstract: *The usage of vehicles is increasing day by day. Most of the people disobeys the rules of traffic and may do the rash driving. Rash driving may be abrupt change in speed, continuous change in lane etc. Rash driving is most dangerous for people. If there is more number of vehicles moving on a road, then there is more possibility of accident. Now day's mobile phones are equipped with numerous sensors that can help to aid in safety enhancements for drivers on the road. There is lot of sensors used to detect the rash driving. These sensors are being discussed a in this survey. This paper provides a survey of various methods for analyzing driver behaviour.*

Keywords: *Rash Driving, Three-axis accelerometer, Gyroscope, Gravity Sensor, Android-based smart phone with GPS.*

I. Introduction

Now day's it is highly risky to drive a vehicle. Because, various kinds of vehicles are available that provides convenience in human daily life and due to the developments of new technologies it makes the vehicle running fast. Travelling in India by roads is considered as dangerous; people drive fast, recklessly without obeying the traffic rules, cross speed limits and overtake others without signalling, drive dangerously. Many people are intentionally or unintentionally driving rashly. So many accidents is occurring while driving. Number of accidents caused by alertness in vehicle drivers pose a serious danger to people, not only the drivers who are driving their vehicle but also to the general public pose a serious threat due to unsafe driving. In order to monitor the driver behaviour smart phone sensors are used. This paper provide the survey on determine the rash driving detection using various smart phone sensors. This paper is organized as follows, section 2 discusses survey of driver behaviour detection techniques, section 3 describes brief overview of Smartphone sensors currently being used in analyzing driver behaviour, section 4 contains challenges and section 5 provides the conclusion.

II. Literature Survey

Various researchers have tried to monitor driver behaviour using both dedicated sensors deployed inside car, roadside and smartphone inbuilt sensors. In paper[1], P. Singh et al. developed an android based application. This application collects data from accelerometers, GPS and also record sounds with the help of microphone, and then data is combined and analyzed to detect rash driving patterns. The various patterns such as speed breaker, lane-change left/right, left/right turn, sudden breaking and sudden acceleration were analyzed.

In paper[2], Fazeen et al. have proposed a innovative application using a mobile smartphone that are integrated inside an automobile to evaluate driver style. They have used the three-axis accelerometer of an Android-based smartphone to record and analyze various driver behaviours and external road conditions that could potentially be hazardous to the health of the driver. They have utilized x-axis and y-axis accelerometer data to measure the driver's direct control of the vehicle as they steer, accelerate, and apply the brakes.

In paper[3], Chigurupa et al. developed an android application which uses data from accelerometer sensor, GPS sensor and video recording is done with the help of camera to give rating to the driver. The feedback can be used to aware the driver and improve performance. The range of acceleration or deceleration values is given for the safe driving. Whenever the accelerometer values exceed the safe limits it would be considered as an event.

In paper[4], Johnson et al. proposed an approach for predicting driving style. They categorized driving style into normal, aggressive and very aggressive. They collect data from various sensors (accelerometer, gyroscope, magnetometer, GPS, video) and fused related data into a single classifier based on Dynamic Time Warping (DTW) algorithm. Their system is known as MIROAD: A Mobile-Sensor-Platform for Intelligent Recognition of Aggressive Driving. The system can provide audible feedback if a driver's style becomes aggressive as well as the information leading up to an aggressive event.

In paper[5], author has proposed a highly efficient system for detection and alert of dangerous vehicle maneuvers (weaving, drifting, swerving, turning with a wide radius, accelerating or decelerating suddenly, braking erratically, driving with tires on centre on lane marker, driving without headlights at night) basically related to drunk driving. They implemented the detection system on Android G1 phone.

In paper[6], author has designed their system which aimed at early detection and alert of dangerous vehicle driving patterns related to rash driving. The entire implementation requires only a mobile phone placed in vehicle and with accelerometer. Once any confirmation of rash driving is detected, the mobile phone was automatically alert the driver first and if same driving persists then call 100.

III. Smart Phone Sensors

This section describes the brief description of various types of sensors present in Smartphone which are currently being used in analyzing driver behaviour.

a. Accelerometer An accelerometer is an electromechanical device that will measure acceleration forces. An accelerometer is a sensor which measures the tilting motion and orientation of a mobile phone.

b. Gyroscope Gyroscope detects the current orientation of the device, or changes in the orientation of the device. Orientation can be computed from the angular rate that is detected by the gyroscope. It basically works on the principle of angular momentum. It is expressed in rad/s on 3 axis.

c. Global Positioning System (GPS) GPS is a satellite based Navigation tracking often with a map showing where you have been. It gives us the value of longitude and latitude which determines the point of location on earth.

d. Camera Camera is a device used to capture images. In smartphone, camera can be both used to capture images and video chat. In detecting various human behaviour camera plays a vital role as it captures the live image of a human.

e. Gravity Sensor The gravity sensor provides a three dimensional vector indicating the direction and magnitude of gravity.

f. Rotational Vector sensor The rotation vector represents the orientation of the device as a combination of an angle and an axis, in which the device has rotated through an angle around an axis (x, y or z).

IV. Challenges

Although various researchers have contributed in monitoring driver behaviour but there are still some research directions which various researchers can explore.

1. **Environmental Factor**-Environmental factors such as rain, wind need to be taken into account while predicting driver behaviour.
2. **Crowd sourcing**-The data from multiple vehicles should be obtained to determine under what conditions driver drives rashly. For example driver applies brakes frequently due to congestion or its own habit.
3. **Road Conditions**-Road conditions must also be considered for accurately determining driving style.
4. **Anonymization**-As most of research papers use GPS sensor for predicting the driver style. But by determining the location, ones privacy is breached. So there must be some technique to anonymize these values.
5. **Sensor fusion**-Data from multiple sensors should be used rather than using a single sensor to detect driver behaviour as it will increase the efficiency of the system. As by using accelerometer, gravity and gyroscope in conjunction we can get more accurate reading of device orientation.
6. **Virtual Reorientation**-As the phone can be at any location inside the car, so there must be some mechanism to virtually reorient the device to align the device axis along with vehicle axis.

V. Conclusion

Driver safety can be enhanced by monitoring driver behaviour, recording their aggressive driving events and giving feedback of recorded events. Monitoring driver behaviour using inbuilt sensors of smartphone has been evolving as a new trend because of less cost and considering the fact that many people already own it. This paper surveys various methods of detecting driver behaviour. The rash driving detection techniques can be provided along with the sensors and the techniques can be useful. These techniques can even be extended and enhance the security features to the common people.

References

Journal Papers:

- [1] Singh, P., Juneja, N., Kapoor, S., Using mobile phone sensors to detect driving behavior, *Proceedings of the 3rd ACM Symposium on Computing for Development*, 2013.
- [2] Fazeen M., Gozick B., Dantu R., Bhukhiya M., Gonzalez M.C., Safe Driving Using Mobile Phones, *IEEE Transactions on Intelligent Transportation Systems*, 2012.
- [3] Chigurupa S., Polavarap S., Kancherla Y., Nikhath K.A., Integrated Computing System for measuring Driver Safety Index, *International Journal of Emerging Technology and Advanced Engineering*, 2012.

- [4] Johnson D.A., Trivedi M.M., Driving Style Recognition using a smartphone as a sensor platform, *IEEE 14th International Conference on Intelligent Transportation System*, 2011.
- [5] Dai J., Tang J., Bai X., Shen Z., Xuan D., Mobile phone based drunk driving detection, *Proc. 4th Int. Conf. Pervasive Health NO PERMISSIONS*, 2010.
- [6] Vaibhav Bhoyar, Priyanka Lata, Juilee Katkar, Ankita Patil and Deepali Javale, Symbian Based Rash Driving Detection System, *International Journal of Emerging Trends & Technology in Computer Science(IJETTCS)*, 2013.