Android mobile driving assistant for highway drivers

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Introduction

Mobile based driving assistant that always communicate with the driver in an interactive way, has not introduced yet. It assists the driver when he is driving on highways and driver can control the assistant through his voice command. Mobile Driving Assistant helps driver to clarify the way that he drives. In addition, the driving assistant carefully examines the facial expressions of the driver and if he is in a drowsy condition, assistant suggests alternatives to overcome from those situations. This is a friendly interactive guide for the highway drivers.

Recalling the history, in 2002 Ji and Yang (2002) has presented a detection drowsiness system based on infrared light illumination and stereo vision. This system localizes the eye position using image differences based on the bright pupil effect. Brandt et al. (2004) has shown a system that monitors the driver fatigue and inattention. For this task, he has used VJ method to detect the driver's face. Using the optical flow algorithm over eyes and head this system is able to compute the driver state. Tian and Qin (2005) have built a system for verifying the driver's eye state. Their system uses Cb and Cr components of the YcbCr color space; with vertical projection function this system localizes the face region and with horizontal projection function it localizes the eye region. Once the eyes are localized the system computes eye state using a complexity function.

Pallavi M, S. Gawali in 2012 their research paper demonstrated the new non-intrusive approach for monitoring driver drowsiness depending on the driver and driving data fusion. They use percentage of eye closure (PERCLOS) model for estimating driver status. The driving information such as lateral position and steering wheel angle also use for drowsiness detection. Multilayer perceptron neural network has been trained for optimal performance score in this research paper.

Yong Du, Peijun Ma in 2008 published a research paper on effective vision based driver fatigue detection method. In this at primary stage, the inter-frame difference approach binding color information is used to detect face. Marco Javier Flores and Jose Maria Armingol in 2008 presented the basic model for drowsiness detection. For this they used Viola & Jones (VJ) method to detect the driver's face. Once face is detected SVM is used to detect eye status from trained data.

Methodology

For implementation of the Mobile Driving Assistant application, Samsung Galaxy Core was used as the mobile device and the android version 4.1(API level 16) was used as the development environment. The internet and GPS services need to be activated in Mobile Device.

The Mobile Driving Assistant is based on android platform supported mobile phones only. Java was used as programming language and common programming language to develop android applications. ADT bundle was handled as IDE for the implementation.

Android voice recognition and android Text-To-Speech facilities were focused in order to maintain the voice discussion between the driver and the mobile driving assistant. Applications that available in Android platform can potentially make use of any speech recognition service on the device that's registered to receive a Recognizer Intent. Google's Voice Search application, which is pre-installed on many Android devices, responds to a Recognizer Intent by displaying the "Speak now" dialog and streaming audio to Google's servers. The Android platform includes a Text-to-Speech (TTS) capability. Also known as "speech synthesis", TTS enables an Android device to "speak" text in various languages. Face and eye blinking detection is the most important module of the mobile driving assistant. Haarcascade_lefteye_2splits.xml files, distributed with OpenCV package were used to detect eyes when eyes are opened. OpenCV 2.4.9.0 was used for the image processing purposes.

Results and Discussion

There are three main modules in this Mobile Driving Assistant application. First module is the identification of eye blinking pattern by using the camera of an android mobile device and give voice suggestions in order to avoid sleepiness, The second one is identification of speed of the vehicle, highway entrance points, exit points, parking locations using Global Positioning System (GPS) and the last one is detection of the call log and informs about the priority calls to the driver.

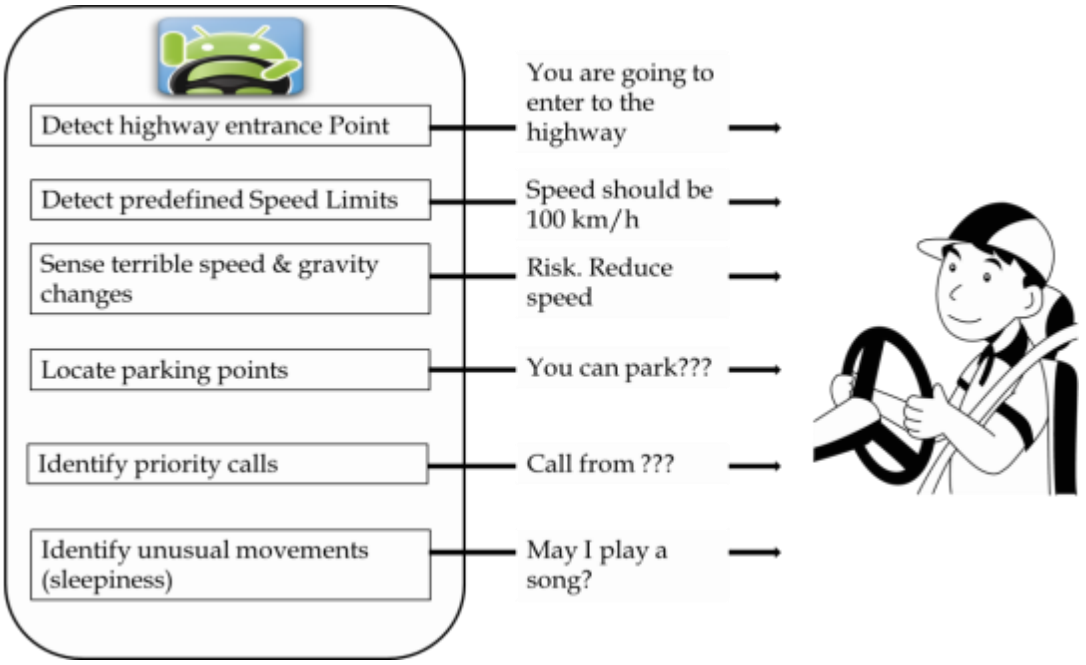

Figure 01 : Mobile Driving Assistant system Architecture

1. Eye blinking pattern is identified by using the camera of the android mobile device and express voice suggestions in order to avoid sleepiness.

Haar cascade algorithm introduced by Viola Jones, is used for face and eye detection. In here the face detection class is refreshed in every seven seconds. If it is not detected the pupil of the eye when refreshing it ask some suggestions and Driver can reply to those suggestions by using voice commands.

2. Speed of the vehicle, Highway entrance points, exit points, parking locations can be identified using GPS and longitudes and latitudes help to identify the exact location.

This module is running as service. When the phone is in the Wi-Fi range or driver on mobile data and GPS, it is always running inside the device. This module is detected the initial longitude, latitude and displays them. One of the main features of this module is that detecting the phone state using GPS and measure the speed of the vehicle. It is caught the speed as meters per second. If the car exceeds the maximum speed of the highway boundary, mobile assistant warns about this. When the driver reaches to the entrance point or parking point, it is checked the current longitude and latitude with the defined longitudes and latitudes. If this matches, it conveys the message.

3. Analyze the call log and informs about the priority calls to the driver.

This module is also running as a service. Assume that the phone is in silent mode when the driver is driving on highways. This module can be analyzed the call log. It is got the received numbers from the call log and the occurrence of each number. The missed and outgoing calls are not analyzed. When the call comes, it is checked the number and the occurrence. If the occurrence is less than the defined number of occurrence, it is considered this as a new caller and alerts this. If the occurrence is more than defined number, and when the call comes more times, it is alert this as an emergency call.

Conclusion

The implementation is based on the android mobile device. And the main expectation was to keep a higher user interaction with the system for the drivers who drive on highways. The implementation environment and the techniques used, provided excellent support for the successful development of the system. The approach outlined here was more effective in implementing solution with High-Tech, user friendly Mobile Based driving assistant where a very high precision is expected than the existing criteria.

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