“Drive Safely” – Driver Assistance Application for Android

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Abstract—**In this paper, we demonstrate the “Drive Safely” application for the driver assistance while driving to understand the driver behaviour in a real time using a personal smartphone and provide relevant context-based recommendations for a driver to avoid road accidents. Processing the video stream from front-facing camera and a wide array of built-in smartphone sensors, used to build up a representation of the environment around and within the vehicle, we attempt to recognize driver behaviors and vehicle characteristics accurately anticipating dangerous events and alerting the driver immediately using audible signals, information text and vibration.**

I. Introduction

Research and development of advanced driver assistance system (ADAS) is a hotly debated topic. According to the statistics of traffic fatalities for the first half of 2016, a total of 17,775 people died in motor vehicle traffic crashes in the U.S. [1]. A way to implement the advanced safety solution is a mobile application for smartphones that detects dangerous situations and alerts the drivers. There are many mobile applications that are aimed at implementing driver assistance while driving; the analysis of these applications is presented in [2]. It is important to highlight that analyzed mobile applications are concentrated on the dangerous situations that may occur only outside of the car and do not take into account the situations observable inside the car.

Most modern smartphones are not only a combination of telephone and computer; they also come with a variety of built-in sensors such as accelerometer, gyroscope, ambient light sensor, proximity sensor, magnetic field sensor and GPS, that are capable of measuring some physical quantity and converting it into a signal. These sensors provide raw data with high precision and accuracy for measuring the respective sensor values. For example, gravity sensor can be used to track gestures and motions, such as tilt, shake and so on. At the same time, smartphones are also equipped with front-facing and rear-facing cameras able to track the driver behaviour and road conditions relatively. Smartphones are able to generate alerts for a driver using vibration, audible signals or visual information.

The dangerous driving events we focus on are drowsiness (strong desire for sleep) and distraction (when the driver is distracted and takes their eyes off the road).

We demonstrate the driver assistance while driving as a mobile application on Android for detecting dangerous events and alerting driver by displaying an attention icon on the phone’s touch screen along with an audible alert.

II. Implementation

To fully understand the driving situation in a given scenario in a real time, the smartphone’s front-facing camera and sensors are used together as necessary.

The implementation of proposed mobile driver assistance system has been developed for Android-based mobile device. A Mobile Vision API framework [3] provided by Google is used for finding and recognizing objects in photos and videos. The framework includes detectors, which locate and describe visual objects in images or video frames, and an event driven API that tracks the position of those objects in video. The example of application for situation analysis, running on the smartphone Samsung Galaxy S6 that is mounted on the windshield of a car, is shown in the Fig. 1. The details can be found in [4].

Fig. 1 The use of mobile application, running on the smartphone mounted on the windshield of a car

Currently, using the front-facing camera the mobile application is developed able to recognize only two dangerous events, like as drowsiness and distraction. If the mobile application detects drowsiness, the application alerts the driver by playing a signal tone. Then, using the smartphone’s GPS sensor, the application immediately retrieves the driver’s current actual location and checks whether there are any cafes or hotels close by a driver. If the driver is on the country roads, the application suggests driver to take a rest through the distance of 100 kilometers. Otherwise, if driver goes through the city, the observable distance of rest spots is limited to 20 minutes of driving. If a place for power nap is found, the application will route to the nearest one to drink a cup of coffee. If there are no hotels neither cafes, it will recommend the driver to listen to music, talk to passengers without being distracted, cool the car interior, sing the driver yourself or pull over and take a nap. The application screenshot at normal state is shown in Fig. 2. If the application detects the driver's drowsiness (as it shown in Fig. 3), it alerts the driver by playing a voice recording, a warning tone and flashing the smartphone's screen.

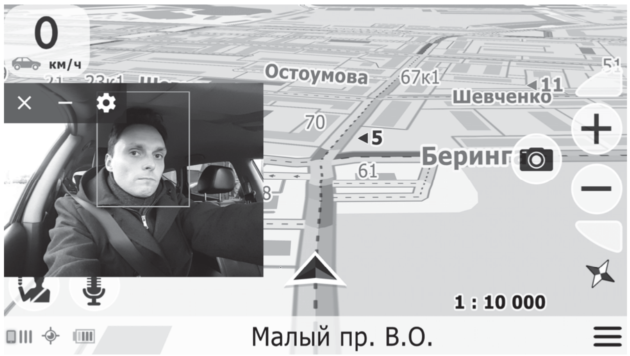

Fig. 2 The running mobile driver assistant, showing the normal state of the driver

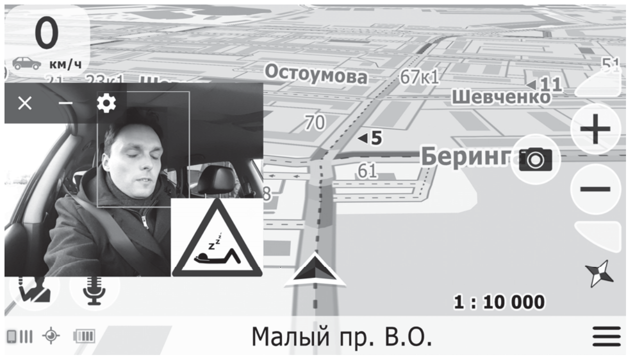

Fig. 3 The running mobile driver assistant, showing the drowsiness state of the driver

REFERENCES

[1] National Center for Statistics and Analysis. (2016, July). Early Estimate of Motor Vehicle Traffic Fatalities for the First Half (Jan–Jun) of 2016 (Crash Stats Brief Statistical Summary. Report No. DOT HS 812 332). Washington, DC: National Highway Traffic Safety Administration

[2] A. Smirnov, I. Lashkov, "State-of-the-art analysis of available advanced driver assistance systems", *in Proc. 17th Conference of the Open Innovations Association FRUCT*, Yaroslavl, Russia, Apr. 2015. pp. 345–349.

[3] Google Developers official website, Introduction to Mobile Vision, Web: https://developers.google.com/vision/introduction

[4] I. Lashkov, A. Smirnov, A. Kashevnik, V. Parfenov, Ontology-Based Approach and Implementation of ADAS System for Mobile Device Use While Driving, 6th International Conference on Knowledge Engineering and Semantic Web, Moscow, 2015, CCIS 518, pp. 117-131.