Smart Mobile Driver Assistance for Android

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***Abstract*—In this paper, we demonstrate the concept of the driver assistance for smartphones to fully understand the driving situation in a given scenario in a real time and to undertake actions necessary to avoid road accidents. To fulfil these, we utilize a wide array of sensors for creating a consistent and extendable description of most common dangerous situations, a situation model and situation analysis. In the situation model, on-board smartphone sensing signals are used to build up a representation of the environment around and within the vehicle.**

I. Introduction

Research and development of advanced driver assistance system (ADAS) is a hotly debated topic. Statistics shows that 90% of traffic accidents are caused by human errors [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 with the help of vibration, audible signal or visual information.

The dangerous driving events we focus on are drowsiness (strong desire for sleep) and distraction (e.g., 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. Evaluation has been done for the multi-core Lenovo K910L Android smartphone. The driver and vehicle classification pipelines, which represent the most computationally demanding modules, are written in C and C++ based on the open source computer vision library (OpenCV library) and interfaced with Java using JNI wrappers. The details can be found in [3].

Currently, using the front-facing camera our mobile application is able to recognize only two dangerous events, like as drowsiness and distraction.

A Mobile Vision Google API [4] is used that provides the well-optimized Android framework for finding 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 Lenovo K910L that is mounted on the windshield of a car, is shown in the Fig. 1.

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

III. RESULTS

In this paper, we focused on only on two in-car pipeline dangerous events such as drowsiness and distraction. The mobile application is focused on the unsafe situations that can occur inside the car like as drowsiness(strong desire for sleep) or distraction(e.g. when the driver is distracted and takes their eyes off the road).This demo version is able to not only detect dangerous situations, but also make recommendations to the driver, how to prevent road accidents.

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