Chapter 25
Voice Application Generator Platform for Real Time Multimedia Vehicle Sensor Based Notifications

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ABSTRACT

Nowadays, many software applications are used to offer services or functionalities to drivers. Even though, there is a lack of applications that offer drivers the possibility to express their need to generate a specific application in real time. In this research, the authors present an innovative platform that allows users to generate multimedia web applications that use real time vehicle sensor information. The creation of applications is specified through a voice interface to allow users to generate applications while driving. Information used in the applications is collected combining mobile device sensors (accelerometer, GPS, light sensor, barometer, etc.) and vehicle real time On-board Diagnosis port information (speed, engine revolutions per minute, fuel consumption, coolant temperature, throttle, battery voltage, etc.). The domain of generated applications includes driving safety, road state, parameter notifications, social applications, etc. The generated applications can display visual information systems such as maps, audio, video and measurement gauges. For the analysis of this paper, the authors present three prototypes to demonstrate the platform capabilities.

1. INTRODUCTION

The environment surrounding road transit, driving and traffic is very dynamic. It depends on many external agents such as the state of the roads, traffic conditions and direct actions from users. There are several software application solutions that offer drivers a certain degree of assistance in their journeys that have become very popular within the recent years. The most popular are GPS based navigation systems very common in today's cars. But more applications are becoming popular; systems that remotely detect accidents (GM OnStar, BMW Teleservice, TomTom, Waze, etc.), parking assistants or systems that provide traffic information thanks to information provided by users. Collecting data from sensors in vehicles is not new, in ParkNet (Mathur et al., 2010) sensor data is collected from empty parking space generating real time empty parking space maps. On the other hand, SignalGuru (Koukoumidis et al., 2011) uses the camera sensor in Smartphones to detect traffic lights to generate real time models. Through an algorithm, it recommends users to stop accelerating to save gas when it estimates that the next traffic light will turn red. These applications are very helpful to perform frequent actions while driving, however cannot fully adjust to dynamic driving environment scenarios. Multiple unexpected situations cannot be predicted: accidents, states of the road, malfunctioning vehicles or just spontaneous actions.

Today's average road vehicle contains multiple sensors that can be used to monitor its behavior. All engine cars since 2004 in the EU must have a standard OBD (On Board Diagnosis) port where real-time vehicle operation information can be obtained, such as speed, engine RPM (Revolutions per Minute), throttle level, coolant temperature, instant fuel consumption, fuel trim, battery voltage etc. Data can be obtained with cheap Bluetooth OBD adapters that can be connected to most modern Smartphones. Merging data from sensors, mobile devices and cheap Internet data plans can result in the perfect combination to obtain information about the surrounding road environment. For instance, OBD data is already being used to remotely diagnosis vehicle problems (Chen et al., 2011).

While facing external factors a driver could find helpful information or notifications about the environment. Thanks to real time assistance generated on-demand, users could react better to unexpected circumstances thus improving their driving experience, avoiding unsafe situations or accidents, and improving reliability of their vehicles.

Nowadays, there are not any platforms that allow drivers to immediately create software applications concerning the surrounding vehicles or even their own vehicle when a new necessity occurs. The system must allow collecting, sending, storing and processing a great amount of data from vehicles, communicating with an appropriate interface that will allow users to interact with the application, and generating a module able to create real time applications based on their own necessities. Applications are fed with the information collected from the platform using data mining techniques in real time to satisfy user demands. In addition, the specification and application generation must adjust to the driving nature: the user must be able to specify his necessities while driving without losing attention to the road, therefore, a virtual assistance with speech recognition is required. Moreover, the generated applications must base their communications with users in visual systems of information that use multimedia elements similar to the ones equipped in modern vehicles.

In this work we present an innovative platform that allows users to express their own necessities within a range of domains and possibilities that will allow creating real time on-demand multimedia applications that will assist users under necessities related to road scenarios that can arise while driving. Since the platform is aimed to be used while driving, we have introduced a voice interaction interface

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