How to Manage Persons Taken Malaise at the Steering Wheel Using HAaaS in a Vehicular Cloud Computing Environment

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ABSTRACT

These last years, an increasingly significant number of traffic accidents caused by a malaise at the steering wheel was observed. The management of this kind of phenomenon is difficult and presents a real challenge. Given this fact, the authors try, in this paper, to propose a work which, thanks to new technologies, let’s take care of people taken malaise while driving. Thus, they will provide a new service called HAaaS “Health-Assistance as a Service” which will allow the detection of malaise and the management of the driver and the vehicle. Moreover, the aspect of co-operation will be guaranteed thanks to a mechanism that the authors will use and that they call the Help/rescue mechanism.

KEYWORDS
Cloud Computing, Cooperation, Health Monitoring, Intelligent Transportation Systems, Road Safety, VANet

1. INTRODUCTION

Nowadays, one of the major consequences of the important evolution in the field of telecommunications is the development of the transport systems. This is due primarily to current needs in terms of availability and access to data at any time and from any place. Indeed, it aims to make networks safer, more efficient, more reliable and more environmentally friendly without necessarily having to physically alter existing infrastructure.

These new technologies in question include computer science and sensor technologies, control and communications systems; it touches disciplines such as transport, engineering, telecommunications, information technology, finance, e-commerce, automotive engineering, etc.

Intelligent Transportation Systems (ITS) contributes to all major transport policy objectives. Through the application of ITS, road networks can be operated and utilized more efficiently (International Road Federation [IRF], 2016). ITS plays an important role in both preventing accidents and mitigating their impacts (IRF, 2016); they also help to reduce the travel time and the congestions. Likewise, ITS aim to provide innovative services relating to different modes of transport and traffic management (Intelligent transportation system, 2016). As with road safety, ITS contributes to improve
user comfort by providing him a variety of information services, of decision support, guidance, monitoring and surveillance of internet access and make safer, more coordinated, and ‘smarter’ use of transport networks.

The result of ITS technology is a more efficient and reliable road transport network that operates with a minimized effect on the environment (IRF, 2016). Indeed, many applications have since emerged. One of these applications concerns road safety which consists of reinforcing this latter and to equip our cars and roads with capacities to reduce the number of accidents and make roads safer and more convivial. Much information is generated through these systems, such as traffic information, information about accidents or dangers and obstacles, weather information, etc.

As a result, many systems emerged such as the VSN (Vehicular-based Sensor Network) and VCs (Vehicular Clouds), through various forms of communication, mainly VANet.

1.1. Motivations

The traffic accidents are considered as one of the major causes of mortality in the world causing a significant number of deaths. Indeed, every year the lives of approximately 1.25 million people are cut short as a result of a road traffic crash. Between 20 and 50 million more people suffer non-fatal injuries, with many incurring a disability as a result of their injury according to the World Health Organization (2015).

Road traffic injuries cause considerable economic losses to victims, their families, and to nations as a whole. These losses arise from the cost of treatment (including rehabilitation and incident investigation) as well as reduced/lost productivity (e.g. in wages) for those killed or disabled by their injuries and for family members who need to take time off work (or school) to care for the injured (World Health Organization [WHO], 2016).

Furthermore, these accidents lead traffic jams on the roads causing a huge amount of financial costs. In 2014 and in the United States only, there was a loss of $160 billion with 6.9 billion lost hours and 3.1 billion gallons of fuel wasted (Schrank, Eisele, Lomax, & Bak, 2015).

Although they are largely predictable and preventable, for many years, road accidents remain one of leading causes of death in the world. Vigilance is considered one of the main factors of good behavior on the road, it corresponds to a waking state on which can act degradation factors such as tiredness, drowsiness, psychotropic consumption (alcohol, narcotics and/or drugs) but also sometimes repetitive or monotonous driving character. These aspects are sometimes difficult to demonstrate for an accident (Observatoire Départemental de la Sécurité Routière [ODSR], 2013).

There are no exact world statistics on the mortality rate or the number of traffic accidents caused by a malaise during driving. However, a study conducted by the INRETS in 2009 emphasized that the problems of vigilance concerned 11.9% of the drivers implied in the 1107 analyzed accidents (Institut National de REcherche sur les Transports et leur Sécurité [INRETS], 2009). These accidents are realized almost always by loss of vehicle control. Also, in these accidents, 38.8% of drivers have been victims of drowsiness or malaise. Always, according to the same study, malaise when driving affects both men and women with an average age of 45 and having health problems.

According to the French road prevention association (Association Prévention Routière [APR], 2016), the “tiredness malaise” factor appears in 9% of deaths across the network and 18% of killed on the highway. This risk appears day and night. The same factor is implicated in 8% of road deaths each year in France (ODSR, 2013). For example, over the period 2007-2011, in Gers, the factor “tiredness malaise” has been retained in 88 injury accidents (either in 9.3% of accidents), including 16 fatal accidents (12.8% of fatal accidents). The death toll stood at 19 killed (13.8% of deaths) and 196 injuries (15.7%) including 82 hospitalized (ODSR, 2013).
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