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Editorial

Connected Vehicles, V2V Communications, and VANET

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1. Introduction

Communications between vehicles are seen as a solution for road transport problems, such as accidents, inefficiencies, traffic congestions, fuel consumption, and exhaust emissions. However, before implementing such a solution, some preliminary analysis is needed. First, the most convenient communications technologies should be selected for each application and specific communications architecture should be deployed to support such services. Standardization is essential for successful deployment.

The amount of information that can be delivered between vehicles and other road users is quite high. This fact may produce technical and practical problems. Hardware solutions and software algorithms are possible to address such contingencies.

Field Operational Tests are essential for proving the feasibility of implementing any service or system based on V2V or V2I communications. Furthermore, the penetration rate among vehicles is crucial for obtaining significant results.

This Special Issue aims to cover the most recent advances in connected vehicles, V2V communications, and VANET. Topics, such as standardization and communications security and Field Operational Tests are also quite relevant topics that should be addressed.

2. The present issue

This special issue consists of 5 papers covering some of the most relevant topics related to vehicle to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications.

In [1], the author reviews the current research challenges and opportunities related to the development of secure and safe ITS applications. It first explores the architecture and main

characteristics of ITS systems and surveys the key enabling standards and projects. Then, various ITS security threats are analyzed and classified, along with their corresponding cryptographic countermeasures. Finally, a detailed ITS safety application case study is analyzed and evaluated in light of the European ETSI TC ITS standard. An experimental test-bed is presented, and several elliptic curve digital signature algorithms (ECDSA) are benchmarked for signing and verifying ITS safety messages. To conclude, lessons learned, open research challenges and opportunities are discussed.

As an example of practical application, [2] presents a sensor which can be included in an Advanced Driver Assistance System (ADAS) that is compliant with the Vehicle to Infrastructure communication standard (V2I). This system allows estimation of the vehicle lateral position in real time by ensuring cooperation between an on-board vehicle system and passive transponders integrated in the lateral white strips of the road. Based on an optimization method, the lateral position vehicle is provided with a distance error less than 3 cm. In this paper, experimental results are presented in order to evaluate the robustness of the proposed system in a realistic environment. Three scenarios are considered to take into account the bitumen properties, the presence of parasitic reflectors in different positions around the system and the interaction between transponders.

In order to support several ADAS, a novel algorithm for geo-broadcast communications is presented in [3], based on the evolution of previous results in vehicular mesh networks using wireless sensor networks with IEEE 802.15.4 technology. This algorithm has been designed and compared with the IEEE 802.11p algorithms, implemented and validated in controlled conditions and tested on real vehicles. The results suggest that the characteristics of the designed broadcast algorithm can improve any vehicular communications architecture to complement a geo-networking functionality that supports a variety of ADAS.

Another topic that is quite relevant is the impact of buildings. Buildings are important elements of cities for VANETs, since these obstacles may attenuate communications between vehicles. Consequently, the impact of buildings has to be considered as part of the attenuation model in VANET simulations of urban scenarios. However, the more elaborated the model, the more information needs to be processed during the simulation, which implies longer processing times. This complexity in simulations is not always worth it, because simplified channel models occasionally offer very accurate results. In [4], the author compares three approaches to model the impact of buildings in the channel model of simulated VANETs in two urban scenarios. The simulation results for our evaluation scenarios of a traffic-efficiency application indicate that modeling the influence of buildings in urban areas as the total absence of communication between vehicles gives similar results to modeling such influence in a more realistic fashion and could be considered a conservative bound in the performance metrics.

Finally, in vehicular ad hoc networks (VANETs), besides the original applications typically related to traffic safety, we can nowadays observe an increasing trend toward infotainment applications, such as IPTV services. Quality of experience (QoE), as observed by the end users of IPTV, is highly important to guarantee adequate user acceptance for the service. In IPTV, QoE is mainly determined by the availability of TV channels for the users. In [5], the author presents an efficient and rather generally applicable analytical model that allows one to predict the blocking probability of TV channels, both for channel-switching-induced, as well as for handover-induced blocking events. We

present the successful validation of the model by means of simulation, and we introduce a new measure for QoE. Numerous case studies illustrate how the analytical model and our new QoE measure can be applied successfully for the dimensioning of IPTV systems, taking into account the QoE requirements of the IPTV service users in strongly diverse traffic scenarios.

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Conflicts of Interest

The author declares no conflict of interest.

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