



Foreword to the special issue on intelligent vehicular network and applications

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Recently, the vehicular network and communication systems have represented an area of importance research topic in the increasingly connected and mobile globe. Effective vehicular connectivity techniques can significantly enhance efficiency of travel, reduce traffic accidents and improve safety, lessen the impact of congestion, and provide a more comfortable experience for everyone.

Today, the research of intelligent vehicular network and networking systems is gaining attention around the world. In particular, radio spectrum has been allocated in North America, Europe, and Japan for the dedicated short range communications (DSRC) to facilitate intelligent transportation. The United States Department of Transportation has been taking steps to enable vehicle-to-vehicle (V2V) communication technology in 2017 for light vehicles to avoid vehicle crashes.

In the same time, 3GPP finalized cellular V2X (C-V2X) communication standards in 2017, whereas V2X stands for vehicle-to-everything communication. V2X communications and its solutions enable the exchange of information between vehicles and between vehicle network infrastructures. The goal of V2X is to improve road safety, increase the efficient flow of traffic, reduce environmental impacts and provide additional communications, traveler information services.

However, because vehicular networking has different characteristics from other conventional wireless network-

ing problems, numerous research challenges need to be addressed in order for vehicle and vehicle-infrastructure communications to be widely deployed. Vehicular networking and its applications also demand stringent communications performance requirements that are not seen in conventional wireless networks.

This special issue, entitled “Intelligent Vehicular Network and Applications”, comprising of seven papers is focused on the state-of-the-art in the emerging vehicular network technologies and applications for V2X, including vehicle-to-infrastructure (V2I), vehicle-to-vehicle (V2V), vehicle-to-network (V2N), and vehicle-to-pedestrian (V2P). In addition, the architectures, algorithms and protocols for data dissemination, processing, and aggregation in vehicular networks are also in the topics of interest. Papers were selected on the basis of fundamental ideas and application concepts. The papers selected in this special issue are organized as follows:

This special issue starts with the first paper with the title of “Weighted link quality and forward progress coupled with modified RTS/CTS for beaconless packet forwarding protocol (B-PFP) in VANETs”. This paper proposed a beaconless packet forwarding protocol (B-PFP) with weighted link quality, forward progress and directional greedy mode coupled with modified RTS/CTS for VANETs. The proposed protocol optimally routes the data packets towards the destination in urban areas. B-PFP is based on distributed self-election by modified 802.11 RTS/CTS frames. The protocol has two modes of operations: between and at the intersection to deal with high mobility and dynamic nature of topologies in VANET. The experimental results show B-PFP has better performance in terms of packet delivery ratio and network delay compared to existing state of the art beacon and beaconless protocols. The proposed protocol is suitable for file sharing, chatting, and many other applications.

The second paper selected in this special issue came with the title of “A novel road network change detection algorithm based on floating car tracking data”. In this paper, a novel road network change detection and update method

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based on floating car tracking data is proposed. This proposed method can detect newly-added or rebuilt roads rapidly and can effectively keep the road network up-to-date. Moreover, this method uses scanning and sniffing grid based on the direction, which makes the position and the through point information of the newly-added road could be obtained accurately, rapidly and automatically. With the proposed method, electronic map information can be updated in acceptable time.

The title of the third paper is “Traffic collisions early warning aided by small unmanned aerial vehicle companion”. This paper proposed a traffic collisions early warning scheme aided by small unmanned aerial vehicle (UAV) companion. Basically, it is a vision-based driver assistance system, and the difference in comparison with the available schemes lies in the camera is flying along with the host vehicle. The small UAV works in two switchable modes, i.e., high speed flight or low speed motion. The high speed flight corresponds to the host vehicle moving in highway, while the low speed motion includes hover, vertical takeoff and landing. The technique proposed in this paper provides an eye in the sky for the driver with a UAV system. On one hand, when the UAV flies with the moving vehicle in highway, it works as a fixed-wing airplane due to the high speed mobility requirement. On the other hand, when the UAV takes off or land on the vehicle, or hovers beyond it, it is operated as a quad-copter.

The fourth paper focuses on the topic of “EETP-MAC: energy efficient traffic prioritization for medium access control in wireless body area networks”. This paper, the EETP-MAC stands for energy efficient traffic prioritization for medium access control protocol, which could provide sufficient slots with higher bandwidth and guard bands to avoid channels interference causing longer delay. The proposed EETP-MAC protocol is compared with existing MAC protocols. The channels of the EETP-MAC are designed to avoid interference with each other which provides sufficient bandwidth to the channels. With dynamic slot allocation, the critical and reliability-oriented packets are transmitted in their dedicated slots of the contention free period (CFP) without performing any contention. Thus, the reliability of the critical data is assured with the transmission of an alert signal to the particular slot of emergency beacon. The delay and energy consumption of BMSs are minimized with the utilization of the dedicated slots to both types of a patient’s data and transmission of data in the same beacon interval (BI).

The fifth paper has title of “A new position based routing algorithm for vehicular ad hoc networks”. This paper presented a new algorithm for VANET class routing protocol that covers sparse and coarse region of vehicles. The proposed position based routing algorithm named Vehicular Traffic Aware Routing Algorithm (VTARA) is used for real-time vehicular traffic information. This algorithm uses

real-time GPS tracking system to obtain traffic information for creating road based paths from source node to destination node. The optimization of forwarding is used to figure out the forwarding node along the road pattern that form the path to deliver the data packets. The results shows that the proposed algorithm obtain better results considering the various simulation parameters. The VTARA algorithm forward data along the road pattern and take real traffic on the road into account. The delay of the packet delivery is improved if the routing protocols take into account the density of vehicles in each possible route as well as the travel direction and movement of the vehicles.

The sixth paper is entitled of “Mixed Broadcast Techniques of Leisure Information in Vehicular Ad-Hoc Networks”. This paper proposed an interest-aware probabilistic dissemination (IAPD) of leisure information in VANET, which combines probabilistic broadcast and timer-based broadcast techniques. This paper also develops a state transition system for leisure-information dissemination. The IAPD is significantly different from other information-dissemination algorithms, which focus on driving safety. The proposed method compares the restriction flooding, simple scheme and IAPD in simulation. Simulation shows that the packet reception rate of the proposed IAPD was almost the same high with the restriction flooding method. IAPD always exhibits low redundant reception no matter what the value of interested percentage is.

Finally, the seventh paper with the title of “Performance optimization of tethered balloon technology for public safety and emergency communications”. This paper describes the performance of tethered balloon technology as one of the space technologies for public and emergency communications. It focuses on the analysis of the optimal performance of proposed technology for delivering services to rescue and relief team in emergency situations. The results proposed in this paper show that rescue and relief teams are given high priority for performing their duty effectively and efficiently. In order to evaluate the performance of proposed technology, delay, throughput, traffic in both directions and SNR have been considered in testing network performance.

The guest editors would special like to thank all of the authors who submit their contributions to this special issue. The guest editors are also grateful to the reviewers for their constructive and helpful comments as well as suggestions. With the helps provided by the reviewers, this special issue could finally select these seven high quality and original papers related to the intelligent vehicular network and applications.

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