Editorial

Emerging Technologies for Vehicular Communication Networks

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Next-generation intelligent transportation systems (ITS) are envisioned to greatly improve the transportation safety and efficiency by incorporating wireless communication and informatics technologies in the transportation system [1–3]. As the cornerstone for ITS, vehicular communication networks enable vehicles to exchange information with other vehicles and the external environments and play a significant role in supporting a variety of services such as road safety, traffic management, and entertainment

Vehicular communication networks face many technical challenges such as network scalability, highly dynamic topology, vulnerable wireless links, energy consumption of roadside units, poor network coverage, and bursty traffic. To address these challenges, various emerging technologies have been introduced in vehicular communication networks, such as software defined space-air-ground integrated vehicular network [4], fog computing in vehicular networks [5], drone-assisted vehicular networks [6], and machine learning for data delivery [7]. This special issue collection aims to present the vision, research, and dedicated efforts on the emerging technologies for vehicular communication networks. In this special issue, there are 15 submissions in total. After peer-review, 6 papers are selected for publication.

The first article, "Software-Defined Collaborative Offloading for Heterogeneous Vehicular Networks" by W. Quan et al., proposes a software-defined collaborative offloading (SDCO) solution for heterogeneous vehicular networks, to efficiently manage the offloading nodes and paths. The offloading controller is equipped with two specific functions:

the hybrid awareness path collaboration (HPC) and the graph-based source collaboration (GSC). HPC is in charge of selecting the suitable paths based on the round-trip time, packet drop rate, and path capacity, while GSC optimizes the offloading nodes according to the minimum vertex cover for effective offloading.

The second article, "Performance Analysis of Space Information Networks with Backbone Satellite Relaying for Vehicular Networks" by J. Jiao et al.*, studies the Space Information Network (SIN) with backbone satellites to relay information for vehicular networks, in order to support diverse vehicular services in a seamless, efficient, and cost-effective manner in rural areas and highways. The authors investigate the performance of SIN aided communications via an amplify-and-forward (AF) backbone satellite for VN communications*.

The third article, "Quality Utilization Aware Based Data Gathering for Vehicular Communication Networks" by Y. Ren et al., proposes a fine-grained data collection framework for achieving high-quality data gathering for vehicular communication networks. A metric named "Quality Utilization" (QU) is introduced to quantify the quality of the collected data. A Quality Utilization Aware Data Gathering (QUADG) scheme is proposed to collect the most appropriate data and to best satisfy the multidimensional requirements (mainly including data gathering quantity, quality, and cost) of vehicular applications.

The fourth article, "Concurrently Deniable Group Key Agreement and Its Application to Privacy-preserving VANETs" by S. Zeng and Y. Chen, presents a novel

transformation from an unauthenticated group key agreement to a deniable (authenticated) group key agreement to deal with the security issues in vehicular networks. An authenticated and privacy-preserving communication protocol is proposed for VANETs by using the proposed deniable group key agreement.

The fifth article, "Routing protocol in VANETs Equipped with Directional Antennas: Topology-Based Neighbor Discovery and Routing Analysis" by H. Li and Z. Xu, proposes a novel neighbor discovery algorithm which makes vehicles sense the topology changes around them and arrange their directional antennas accordingly. Moreover, a routing protocol is proposed for vehicular networks, which is based on the conventional epidemic routing protocol, whereby the vehicles make their routing decisions according to the information collected during the neighbor discovery process.

The sixth article, "A Fuzzy-Rule Based Data Delivery Scheme in VANETs with Intelligent Speed Prediction and Relay Selection" by Y. Zhou et al., aims to deal with the issues of data delivery in vehicular networks, such as high mobility and constant topological changes. A fuzzy-rule based wireless transmission approach is designed to optimize the relay selection, considering vehicle speed, driving direction, hop count, and connection time. In the proposed solution, each roadside unit (RSU) is equipped with a machine learning system (MLS) to make the selected relay link more reliable without GPS through predicting vehicle speed at next moment.

Conflicts of Interest

We declare that there are no conflicts of interest or private agreements with companies regarding our work for this special issue. We have no financial relationships through employment, consultancies, or either stock ownership or honoraria, with industry.

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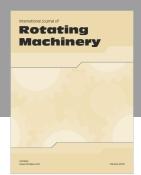*Ning Lu*
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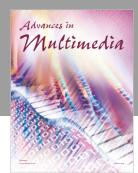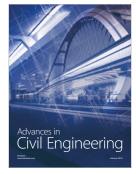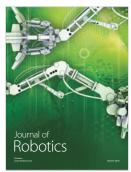Electronic Components

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