Javier Gozalvez
Editor-in-Chief

Welcome to the June Issue!

In addition to our regular columns, this issue includes 10 open-call articles that address various aspects of mobile radio, connected and automated vehicles, automotive electronics, and railways.

In "Perceptive Mobile Networks: Cellular Networks With Radio Vision via Joint Communication and Radar Sensing," Zhang et al. address the joint communications and radio-sensing (JCAS) paradigm applied to cellular networks. JCAS transforms cellular networks from communication-only networks to perceptive mobile networks (PMNs) with integrated communication and radio-sensing capabilities. The objective is for PMNs to serve as a ubiquitous radio-sensing network while providing uncompromised communication services. In the article, the authors review PMNs and present a system architecture for such networks, including the required modifications on current mobile networks and hardware. The authors also present the available mobile signals for sensing and discuss the potential of PMNs, some of their applications, and open research challenges as well as opportunities for integrating radio sensing into mobile networks.

THE JOINT COMMUNICATIONS AND RADIO-SENSING PARADIGM TRANSFORMS CELLULAR NETWORKS FROM COMMUNICATION-ONLY NETWORKS TO PERCEPTIVE MOBILE NETWORKS WITH INTEGRATED COMMUNICATION AND RADIO-SENSING CAPABILITIES.

The second article focuses on the design of green wireless networks for beyond 5G. Energy efficiency is a key objective in the design of beyond-5G and 6G networks to reduce the environmental footprint of cellular networks. In "Intracell Frequency Band Exiling for Green Wireless Networks: Implementation, Performance Metrics, and Use Cases," Ozyurt et al. propose an intracell frequency-band-exiling technique for green wireless networks. In the proposed method, the operating frequency bands of mobile users are assigned from the upper to lower frequency bands by suitably adjusting their coverage area to provide energy-efficient communications. The authors analyze the tradeoffs between energy and area spectral efficiency, derive the optimum operating point, and provide a cell-exiling manager system to illustrate the applicability of the proposed technique for various implementations.

In "Multinode Component Carrier Management: Multiconnectivity in 5G," de la Bandera et al. propose a radio resource management mechanism to exploit the potential of multiconnectivity (MC) in 5G. MC is one of the solutions in 5G to handle services with diverse requirements ranging from enhanced mobile broadband to ultrareliable low-latency communications. To do so, MC aggregates component carriers from several base stations. The authors show that their MC proposal can improve throughput and network efficiency in scenarios of load imbalance.

"Laser Intersatellite Links in a Starlink Constellation: A Classification and Analysis" discusses the laser intersatellite links (LISLs) envisioned between satellites in upcoming satellite constellations. Within a constellation, satellites can establish LISLs with other satellites in the same or different orbital planes. Chaudhry and Yanikomeroglu present a classification of LISLs based on the location of satellites within a constellation and the duration of the LISLs. The authors then study the effect of varying a satellite's LISL range on the number of different types of LISLs it can establish with other satellites. The study is conducted considering a satellite constellation for phase 1 of Starlink. The authors observe a relevant number of temporary LISLs between satellites in crossing orbital planes (in addition to permanent LISLs), which can play an important role in achieving low-latency paths within next-generation optical wireless satellite networks.

We start the series of articles on connected and automated vehicles and automotive electronics with "A Definition and Framework for Vehicular Knowledge Networking: An Application of Knowledge-Centric Networking," by Deveaux et al. The authors define a structure for vehicular

Digital Object Identifier 10.1109/MVT.2021.3073188
Date of current version: 24 May 2021

I HOPE THAT YOU ENJOY READING THIS ISSUE AND THAT YOU'LL LOOK FORWARD TO THE SEPTEMBER ISSUE, WHICH WILL INCLUDE TWO SPECIAL ISSUES ON AUTOMATED VEHICLES AND ADVANCED AERIAL MOBILITY.

knowledge description, storage, and sharing. Knowledge can help operate vehicular applications, such as automated driving, and can be extracted from information using machine learning or artificial intelligence (AI). The knowledge structure proposed by the authors seeks to address the current lack of a unified framework for knowledge to be cooperatively created and shared. The authors first analyze the meaning and scope of knowledge applied to vehicular networks and then expose the potential benefits for network load and delay of the proposed knowledge structuring. This is illustrated in the article by considering the case of passenger comfort-based automated driving.

In "Adaptive Content Seeding for Information-Centric Networking Under High Topology Dynamics: Where You Seed Matters," Turcanu et al. propose a scheme to adaptively seed content into fog nodes in information-centric vehicular networking architectures. The proposal is based on a purely virtual clustering approach that reduces the exchange of control messages among vehicles and the additional load that seeding might generate. The authors show that the proposed approach can reduce the load on the radio access network even if the information about the location of nodes is reduced to the location of the serving infrastructure node.

"Designing Hybrid Vehicle Architectures: Utilizing an Automatic Generation and Optimization Approach," by Kabalan et al., presents an automatic methodology for the optimization and comparison of hybrid electric vehicle powertrains. This is in contrast to the heuristic approaches usually considered to compare the efficiency of different architectures for hybrid powertrains. The authors consider the components of series-parallel hybrid architectures (except planetary gears) and generate all of the possible architectures. These are then filtered and automatically assessed and optimized using a general hybrid model. The proposed method includes a genetic algorithm, and the conducted evaluation shows that it can reduce consumption and powertrain size and cost.

In "Reliability of Automotive Multidomain Controllers: Advances in Electronics Cooling Technologies," Korta et al. discuss the thermal management of autonomous driving (AD) controllers. AD relies on onboard sensors, data processing units, and communications and control units that operate in (near) real time. The fusion, interpretation, and decision-making tasks of AD are frequently performed in multidomain controllers (MDCs). MDCs are high-performance computing platforms that offer advantages in terms of signal processing but can face thermal energy management challenges in densely packed electronics, as high-density heat fluxes need to be dissipated. The article provides an introduction to the subject of thermomechanical reliability in modern automotive AD controllers.

The last two feature articles of the issue are dedicated to railway developments. In "EH-Edge—An Energy Harvesting-Driven Edge IoT Platform for Online Failure Prediction of Rail Transit Vehicles: A Case Study of a Cloud, Edge, and End Device Collaborative Computing Paradigm," Yang et al. address the design of online failure-prediction systems of rail vehicle core components using big data and AI. The authors study the case of vibration energy-harvesting (EH) sensor networks that provide a green and low-cost way of collecting data from rail vehicle core components but still face challenges for an effective integration with AI. To solve these, the authors propose an EH-driven cloud–edge end-collaboration Internet of Things platform; they deploy over the platform a two-level collaborative AI failure-prediction function to reduce the energy consumption of sensor nodes, amount of data uploaded, and time delay of failure prediction.

In "A Contribution to Safe Railway Operation: Evaluating the Effect of Electromagnetic Disturbances on Balise-to-BTM Communication in Railway Control Signaling Systems," Franco et al. discuss the design and development of laboratory simulation tools to support zero onsite strategies for testing electromagnetic disturbances and compatibility issues in railways. These are some of the most common problems affecting railway communication and signaling systems, and they currently require extensive and expensive field tests. The article studies the link between electromagnetic compatibility threats and the quality of service or key performance indicators of a generic railway control signaling system. The authors explore the use of their platform to analyze the communication link between the balise equipment and the balise-transmission module (BTM) onboard unit, existent interferences, and their impact on the upper layers.

I hope that you enjoy reading this issue and that you'll look forward to the September issue, which will include two special issues on automated vehicles and advanced aerial mobility. Please keep safe, and don't hesitate to get in touch if you have any comments, ideas, or proposals to improve *IEEE Vehicular Technology Magazine*. **VT**