Javier Gozalvez
Editor-in-Chief

Welcome to the March 2022 Issue

I write this editorial column as we finish 2021 and, also, the term of our colleague and friend Prof. Abbas Jamalipour as president of the IEEE Vehicular Technology Society (VTS). Abbas has led our Society over the last two years while the COVID pandemic has tremendously impacted our personal and professional lives. Maintaining a vibrant technical Society at a time when our work has been dominated by remote employment and virtual meetings has been a tremendous challenge but one that Abbas and his team have passed with honors.

I would like to start my column by thanking Abbas and his group for their great leadership and efforts to maintain—and actually augment—our Society activities and impact during this challenging time. I also take this opportunity to congratulate Prof. Jae Hong Lee for his election as VTS president for 2022. Jae Hong is a professor emeritus at Seoul National University in Korea as well as a very active and experienced volunteer at the VTS and IEEE, where he has held several key positions.

This issue of *IEEE Vehicular Technology Magazine* includes eight open call papers addressing topics in the areas of 6G and beyond-5G networks as well as connected and automated vehicles. The first article, "Six Critical Challenges for 6G Wireless Systems," discusses six key issues that the authors believe must be overcome before the development and deployment of 6G systems. The challenges discussed include opening the subterahertz (sub-THz) spectrum, pushing the limits of semiconductor technologies for operation within sub-THz bands, transceiver design and architectures for sub-THz, achieving peak data rates of terabits per second, the realization of submillisecond latencies at the network level, and backward compatibility.

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In "Metasurface-Coated Devices: A New Paradigm for Energy-Efficient and Secure 6G Communications," Tsiftsis et al. discuss metasurface-coated devices, a new paradigm for 6G communications. The authors focus on energy efficiency, energy harvesting, and secure performance using power-collecting metasurface-coated devices capable of supporting ultralow-power transmissions. To quantify their efficiency, the article provides a holistic model for the utilization of metasurface shells and uses this to derive preliminary results showing that metasurface-coated devices can achieve a higher performance than reconfigurable intelligent surfaces (RISs). The article then reviews the main advantages of metasurface-coated devices, their role and potential in the design of future 6G networks, and possible research directions on this topic.

In "LiFi Through Reconfigurable Intelligent Surfaces: A New Frontier for 6G?", Abumarshoud et al. explore the design of RIS-assisted light fidelity (LiFi) systems. Both technologies have been proposed to be part of future 6G networks. LiFi systems are based on visible light communications (VLC), so their performance is impacted by a line-of-sight blockage. RISs have been proposed to transform the physical propagation environment into a fully controllable and customizable space with low cost and power. The authors envision that the integration of RISs in LiFi-enabled networks can help support blockage mitigation and provision complex interactions among network entities. In this context, the article explores the underlying RIS architecture from the perspective of physics and outlines potential operational elements in LiFi supported by RIS-enabled transceivers and environments. Finally, the authors discuss major challenges for RIS-assisted LiFi systems and future directions.

The article "Intelligent Reflecting Surface-Aided Visible Light Communications: Potentials and Challenges," by Sun et al., also addresses the design of intelligent reflecting surface (IRS)-aided VLC systems to overcome the practical

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limitations of VLC systems resulting from blockage and high path loss. The authors first address system implementation aspects of the integration of RIS and VLC technologies from the point of view of the signal modeling and hardware architectures. They then review the benefits provided by IRS-aided VLC as well as discuss principles and potential usages, including signal coverage expansion, illumination requirement relaxation, and signal power enhancement. The article also introduces the use of artificial intelligence for the optimization of IRS-aided VLC systems. Finally, Yang et al. discuss open issues and future research directions.

In "Service-Oriented Wireless Virtualized Networks: An Intelligent Resource Management Approach," Hu et al. discuss wireless network virtualization and the design of dynamic and intelligent resource management solutions in wireless virtualized networks. They overview key enabling technologies and challenges for the efficient management of resources in service-oriented wireless virtualized networks. They then present a deep reinforcement learning framework for the efficient utilization and management of resources in wireless virtualized networks. Finally, the authors review opportunities and future research directions for the efficient management of wireless virtualized networks.

"Toward Smart and Secure V2X Communication in 5G and Beyond: A UAV-Enabled Aerial Intelligent Reflecting Surface Solution" introduces the concept of using unmanned aerial vehicle-enabled aerial IRSs (UAIRSs) for assisting vehicle-to-everything (V2X) communications. The article presents an overview of UAIRS-assisted V2X communications, including several promising application scenarios, open problems, and relevant research challenges to be addressed. Finally, the authors analyze a case study that shows how the UAIRS concept can help improve V2X communications.

In "High-Speed, Low-Latency In-Vehicle Network Based on the Bus Topology for Autonomous Vehicles: Automotive Networking and Applications," Choi et al. focus on in-vehicle network (IVN) technologies for connected and autonomous vehicles, which require high-speed and low-latency IVNs for ensuring the timely and reliable in-vehicle transmission and sharing of data coming from an increasing number of sensors and safety-critical systems. To this aim, the authors analyze the possibility of improving the performance of bus topology-based IVNs using wideband high-order modulations with equalizers as well as preemption methods for achieving ultralow latency for critical data transmissions.

Finally, "A Data-Driven, Vehicle-Independent Usage Monitoring System for Shared Fleets" presents a data-driven approach for monitoring the usage of vehicles along both the longitudinal and vertical directions. The technique uses data coming from a telematic e-box, which can be easily installed on existing vehicles without the need to access the internal CAN bus signals. The authors also show how to construct a data-based index to monitor the vertical vehicle wearing and model the effects of wear acting on the longitudinal direction by capturing its energy- and power-related dimensions. The proposed approach is validated using data collected on six different vehicles over nearly 10,000 km of road trips.

I hope that you enjoy reading this issue. 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*.

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