Editorial

Recent Advances in Design and Signal Processing for Antenna Arrays 2020

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Compared with a single physical antenna, an antenna array has the capability for effective interference suppression/beamforming, direction of arrival (DOA) estimation, target tracking, and localization with its additional spatial degrees of freedom (DOFs) exploited by advanced signal processing algorithms [1–4]. It has received considerable attention given its wide range of applications in radar, sonar, sensor networks, navigation, biomedical engineering, wireless communications, etc., and one good example is the 2020 IEEE 5-Minute Video Clip Contest (5-MICC) about beamforming with more than 5000 researchers casting their votes in the process [5]. In particular, the antenna array design and signal processing is one of the fundamental techniques in wireless communication systems of the 5G and beyond since the two underpinning 5G technologies, massive multiple-input multiple-output (MIMO) and millimetre wave communications, are all based on antenna array systems [6, 7]. It will continue playing a significant role in many other aspects in the future, such as Internet of Things (IoT) and integrated sensing and communication (ISAC) [8–10], both of which are potential technologies for 6G wireless communication systems and intelligent transportation systems with extensive research activities already attracted in the community.

Given the continued importance of design and signal processing for antenna arrays and also following the success of the first special issue published in 2016 focusing on the same topic [11], we were approached by the journal office to organize a second special issue with the same topic. The aim of this current special issue is to present the most recent advances in the area of design and signal processing for various antenna arrays and their applications, by inviting both review articles and original contributions from researchers working in this very important area, and in total, we received 15 submissions and 6 were accepted for publication.

The accepted papers cover a wide range of topics within the specified area of the special issue. Roughly speaking, they fall into the following four main topics. The first topic is antenna design for array applications, including one paper titled "Development of a Pin Diode-Based Beam-Switching Single-Layer Reflectarray Antenna" [12]; the second topic is antenna array pattern synthesis, including one paper titled "Two-Dimensional Beampattern Synthesis for Polarized Smart Antenna Array and Its Sparse Array Optimization" [13]; the third topic is direction/angle of arrival estimation, including two papers, titled "Thinned Virtual Array for Cramer Rao Bound Optimization in MIMO Radar" and "Nonuniformly Spaced Array with the Direct Data Domain Method for 2D Angle-of-Arrival Measurement in Electronic Support Measures Application from 6 to 18 GHz" [14, 15], respectively; the last topic is target detection and localization (range/velocity/angle estimation) based on antenna arrays, including two papers, titled "Spread Sea Clutter Suppression in HF Hybrid Sky-Surface Wave Radars Based on General Parameterized Time-Frequency Analysis" and "Maximum Likelihood Angle-Range Estimation for Monostatic FDA-MIMO Radar with Extended Range Ambiguity Using Subarrays" [16, 17], respectively.

Conflicts of Interest

Acknowledgments

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