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Editorial

Special Issue on "Advanced Technology Related to Radar Signal, Imaging, and Radar Cross-Section Measurement"

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1. Introduction

A radar system is made of many elemental and hard/software technologies. Recent applications are expanding to short-distance radars, such as security, nondestructive observation, and aerial monitoring, as well as long-distance radars, such as remote-sensing, surveillance, and weather observation. Further, short-distance radar technology is essential for car sensors in autonomous driving systems. In these various applications, the key technologies supporting radars are essentially the signal, image, and data processing in order to detect a target more explicitly, which includes synthetic aperture imaging (SAR) and inverse-SAR (ISAR), polarimetry, compressive sensing, multiple-input multiple-output (MIMO) processing, and radar beam scanning, in a broad sense. On the other hand, radar cross-section (RCS) evaluation and electromagnetic modeling technologies of radar targets are also important for the development of future smart radars.

2. The Present Issue

This Special Issue [1] focuses on the state-of-the-art investigations on various important radar technologies for future applications. We received many paper submissions for this Special Issue. After a very careful peer-review process, a total of 32 papers were accepted. These works include SAR/ISAR [2–9], polarimetry [10–12], MIMO [13,14], direction of arrival (DOA)/direction of departure (DOD) [13–15], sparse sensing [5,14,16], ground-penetrating radar (GPR) [17–19], through-wall radar [20,21], coherent integration [22,23], clutter suppression [24,25], and meta-materials, among others [26–31]. All of these accepted papers are the latest research results and are expected to be further advanced, applied, and diverted. For example, [32] introduces the analytical approach for the development of radio frequency microelectromechanical switches, and [33] explains the comprehensive SAR approach for identifying the scattering mechanisms of radar backscatter caused by vegetated terrains. This Special Issue's editors hope that these papers attract much attention in the research and development of radar technology.

3. Future

As with many applications, radar-related technology is, of course, also deeply linked to the evolution of computer cluster technology. For example, deep learning technology, which is used for the classification of radar targets, has been significantly advanced and will be applied to many applications we covered in our Special Issue. Although a high-capacity storage and high-speed processor are required, these technologies will create new areas of radar application. Furthermore, the electromagnetic scattering behavior of millimeter waves is different from that of microwaves, and it

can be a new research target. The expectation and analysis, or modeling and simulation of hardware and software signals will inevitably require knowledge of electromagnetic field theory. Consequently, the development and research of hardware and software in the radar field will be more active in the future.

The radar-related technology is mainly processed within the time and frequency domains, but at the same time, is a multi-dimensional integrated system including the spatial domain for transmitting and receiving electromagnetic waves. Based on the enormous technological assets of the pioneers, as actively discussed in this Special Issue, research and development in multi-dimensional undeveloped areas are expected to continue.

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