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Editorial

Advances in Antenna Array Processing for Radar 2014

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Arrays today are the configuration for nearly all kinds of sensors (electromagnetic, acoustic, optical, etc.). Consequently, array processing is today one of the most important and dynamic fields of research. For radar, RAP (radar array processing) has received attention for nearly four decades and considerable results have been obtained. However, we are still far from a full understanding of all effects and promising improvement seems to be possible. RAP comprises theoretical and more academic issues as well as practical issues of implementation and aspects of system engineering.

The topics of RAP include nearly all aspects of radar processing: antenna aspects, signal processing aspects, and radar data processing and radar management aspects. Particular topics are as follows: pattern shaping and sidelobe reduction; adaptive interference suppression, including ABF (adaptive beam forming), ASLB (adaptive sidelobe blanking), and fast-time STAP (space-time adaptive processing); clutter mitigation (slow-time STAP); adaptive detection; parameter estimation (adaptive monopulse and superresolution direction finding); array error calibration; optimization of array configurations, and so forth.

Today, the main characteristics of RAP are as follows.

(1) The achievable capabilities of the algorithms for different applications are constrained by some hardware factors, for example, channel errors.

(2) The amalgamation and integration of multiple RAP techniques are a trend, such as the combination of ABF, adaptive monopulse, and superresolution.

(3) The subarray optimization is still a complicated and open problem, compared with the algorithms due to constraints with very little flexibility: mechanical constraints, feasibility of production, and cost.

(4) The exploitation of knowledge of RAP features in radar data processing can exploit the full potential of array systems (for instance, in adaptive tracking). This can improve the overall performance significantly.

(5) MIMO (multiple-input multiple-output) radar offers a multitude of applications for RAP. Hybrid MIMO-PAR (phased array radar) can promote and deepen the development of the RAP.

The current challenging works in RAP are in the following areas:

(1) RAP to counter MLJ (mainlobe jamming);

(2) joint cancellation of mixed interferences like CW (continuous wave) interference; impulsive interference, and clutter;

(3) amalgamation of modern RAP and adaptive detection;

(4) RAP for thinned arrays;

(5) RAP for conformal arrays (e.g., used for seekers);

(6) subarray optimization;

(7) RAP for dual/multiple use antennas, for example, combining radar and communication functions;

(8) DSP and FPGA implementation.

The special issue "Advances in Antenna Array Processing for Radar" was published in 2013 for the first time. It presented

research achievements in the field of RAP, in particular, including contributions of world's leading radar experts, as U. Nickel, P. Lombardo, A. Farina, F. Colone, Y. L. Wang, and so forth. Inspired by this, we decided to edit this special issue.

In this 2014 special issue, we have collected 19 papers covering various aspects of the latest RAP research and development. We received 53 submissions with an acceptance rate of 35.8%, to guarantee the standard of the journal.

We would like to thank all authors for their highly professional contributions and all reviewers for their time and effort. A special thank goes to Dr. U. Nickel for his constructive guidance. We hope that this special issue will stimulate interest and draw valuable ideas to solve open research problems in the area of RAP and its applications.

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