Editorial

Design of localization systems using low-cost and low-complexity sensor arrays has been the active research area in the fields of radar, sonar, geophysics, wireless systems, and acoustic tracking for years. Advanced source localization technology using sensor networks becomes an important topic that attracts significant research interest. This interest is expected to grow furthermore with the proliferation of sensor network applications. A critical goal for the near-field source localization is to be able to locate closely spaced sources in the presence of considerable noise by using collective information from sensor arrays.

In this special issue, ten selected quality papers are presented to address a variety of emerging topics. The multi-input-multi-output (MIMO) radar imaging system is explored in the sensor networks for the surveillance purpose. A new cognitive radio technology that concatenates the available narrow-band white spaces to increase the precision of the range estimation system is addressed. A pseudogradient algorithm is proposed for navigation of autonomous mobile robots operating in unknown environments. The theoretical performance bounds for orthogonal frequency-division multiplexing (OFDM) ranging systems operating in multipath channels are derived subject to Fisher information analysis. An extensive measurement campaign is presented, where data from heterogeneous sensors are collected simultaneously to characterize the diversity of navigation systems in real environments. A new measure for non-line-of-sight identification is demonstrated for wireless localization systems built upon the MIMO-OFDM technology. The approximate maximum likelihood algorithm to estimate the direction-of-arrivals of multiple acoustic sources is studied. A new energy-based acoustic source localization scheme is proposed and the associated Cramer–Rao lower bound analysis is presented. A novel acoustic target tracking system is presented using the random set theory. A new system using the nonlinear extended Kalman filter and the particle filter (PF) along with interacting multiple model algorithm is proposed for maneuvering mobile station tracking with bearings-only measurements. These ten papers cover a broad scope of experimental measurements, algorithm design, system integration, and theoretical analysis. They may help the scientists to better understand and utilize sensor networks in advanced localization and target-tracking applications for both civil and military purposes.

The guest editors made a lot of efforts to maintain the balance between the depth and the breadth regarding the topic area. Although the ten accepted papers do help well address this objective, there still remain much more open questions than we try and are able to answer.

Famous Plato quotes, “The learning and knowledge that we have, is, at the most, but little compared with that of which we are ignorant.” Perhaps not the first step, this special issue is devoted to the entire society as a hopefully sparkling milestone along the long scientific journey. So, please saddle up and enjoy this wonderful and promising ride.

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Hsiao-Chun Wu (S’97-M’99-SM’05) received the Ph.D. degree in electrical and computer engineering from the University of Florida, Gainesville, FL, USA, in 1999.

From March 1999 to January 2001, he was with the Motorola Personal Communications Sector Research Labs as a Senior Electrical Engineer. In 2001, he joined the faculty in the Department of Electrical and Computer Engineering, Louisiana State University, Baton Rouge, LA, USA. From August 2008 to December 2008, he was a Visiting Associate Professor at the Department of Electrical Engineering, Stanford University, Stanford, CA, USA. He has published more than 170 peer-refereed technical journal and conference articles in electrical and computer engineering.

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In 1998, he joined Computer and Communications Research Laboratories, Industrial Technology Research Institute, Hsinchu. Since 2003, he has been a Faculty Member with the Department of Communication Engineering, National Central University, Jhongli City, China. His current research interests include multirate and adaptive digital signal processing, OFDM, and digital transceiver algorithms and architecture design.

Dimitrios Stratogiannis (S'01-M'05) received the Diploma in electrical and computer engineering from the Democritus University of Thrace, Xanthi, Greece, in 2005, the Master in Business Administration degree from the Athens University of Economics and Business, Athens, Greece, in October 2008, and the Ph.D. degree from the National Technical University of Athens (NTUA), Athens, Greece, in 2010.

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Dr. Stratogiannis was commended by the State Scholarship Foundation and the Technical Chamber of Greece for his academic progress and excellence. He has participated and served as the Chair and TPC member in many international conferences. He is a member of the IEEE Communications Society and the Technical Chamber of Greece.

Kung Yao received the B.S., M.A., and Ph.D. degrees in electrical engineering all from Princeton University, Princeton, NJ, USA.

He is currently a Distinguished Professor at the Electrical Engineering Department, University of California, Los Angeles, CA, USA. He is the lead co-author of Detection and Estimation in Communication and Radar Systems (Cambridge Press, 2012). His current research and professional interests include 4G cellular network systems, digital communication theory and systems, and beamforming in sensor array systems.

Dr. Yao was a recipient of the IEEE Signal Processing Society's 1993 Senior Award in VLSI Signal Processing and the 2008 IEEE Communications Society/Information Theory Society Joint Paper Award.