Han, G.; Shu, L.; Rodrigues, JJPC.; Kim, K.; Lloret, J.; Wu, H. (2016). Guest Editorial Special Issue on Advances in Underwater Acoustic Sensor Networks. IEEE Sensors Journal. 16(11):3994-3994. https://doi.org/10.1109/JSEN.2016.2550282

Guest Editorial
Special Issue on Advances in Underwater Acoustic Sensor Networks

WITH the advances in vehicle and sensor technologies, there is a growing interest in the design and deployment of Underwater Acoustic Sensor Networks (UASNs). A typical UASN employs underwater nodes, surface sinks, autonomous underwater vehicles and low-power gliders to collaboratively perform underwater operating missions. For the ease of deployment as well as the ability in intellectualization information processing, UASNs are envisioned to enable marine applications for oceanographic data collection, pollution monitoring, offshore exploration, disaster prevention, assisted navigation and tactical surveillance. Compared with traditional monitoring technologies, e.g., remote sensing or sonar sweeping, USANs have clear advantages in terms of infrastructureless, real-time, high-precision and low-cost detection.

While sensor network systems are beginning to be fielded in applications today on the ground, underwater operations remain quite limited. In contrast with the fundamental issues of terrestrial sensor networks, UASNs are constrained by limited bandwidth, impaired underwater channel, serious propagation delay, high bit error rates, temporary loss of connectivity, as well as fouling and corrosion of electronics devices. Due to the unique characteristics of underwater environment and acoustic communication, most of marine applications require practical distributed and centralized algorithms and introduce novel theoretical models or evaluation methodologies to address various kinds of research problems originated from UASNs.

The goal of this Special Issue is to present and highlight the advances, the novel and emergent technologies and applications in the field of UASNs. The reported high-quality research is pushing the theory and practice forward for a deeper understanding in the fundamental algorithm, modeling, and analysis techniques of UASNs. The Special Issue contains sixteen regular papers organized into five groups, focusing on: reliable and/or real-time data transfer; cross-layer design and optimization; cooperative communications for UASN nodes; network coverage and node placement; ocean currents modeling.

There has been much attention on UASNs during the past decades. It is clear from this Special Issue that UASNs have great potential to provide promising solutions for efficiently exploring and observing aqueous environments. At the same time, it is also clear that there are scientific and technological issues which have yet to be resolved before UASNs can be widely accepted as one of the mainstream technologies in marine applications. We hope this Special Issue provides the research community a platform to reveal current advances as well as opportunities in UASNs (e.g. in underwater communications, protocol designs and applications of UASNs, etc.), by the constant supply of emerging sensing modalities, techniques and engineering solutions.

ACKNOWLEDGMENT

The Guest Editors are deeply indebted to many colleagues who served as reviewers for this Special Issue.

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