Underwater Acoustic Propagation Physics and Signal Processing Techniques for Shallow Water Acoustic Communications Special Issue

This special issue focuses on the rapidly evolving techniques in shallow water acoustic communications, and how underwater acoustic propagation models based on shallow water physics may be harnessed with signal processing techniques for high-resolution channel estimation, equalization, and resolving cross-layer challenges to achieve high data rate communications in shallow water. The definition of shallow water is relatively broad in scope, and applications are not limited to any particular frequency range. Any underwater acoustic channel that exhibits significant multipath and rapid fluctuations in delay spread can be included.

High data rate communications in shallow water environments face three related signal processing challenges:

(i) Robust estimation of the rapidly fluctuating shallow water acoustic channel delay spread,

(ii) Compensation for diverse channel effects that result from time-varying multipath arrivals via adaptive channel equalization, and

(iii) Appropriate cross-layer optimization techniques for effective design of the interface between physical, data and network layers (e.g. minimizing the impact of short-term channel estimation errors on dropped packet rates, adapting local network throughput in a distributed acoustic sensor system to regional channel dynamics, etc.)

However, these signal processing challenges in underwater acoustic communications are deeply tied to the underlying physical phenomena of acoustic propagation in shallow water. The special issue features an overview of the present state of shallow water acoustic propagation physics models, signal processing, optimization and related computational techniques and their applications to shallow water acoustic communications, with the goal of evoking discussions on the current challenges and future developments.

The topics include all aspects of shallow water acoustic communications, such as algorithm design and inversion techniques, signal processing and optimization techniques within and across the physical, data-encoding and network layer of underwater communication system, as well as underwater acoustic propagation models. Examples include but are not limited to adaptive techniques for channel estimation, equalization, data encoding and cross-layer optimization, performance of underwater acoustic propagation models for communications under different ocean and sediment conditions, design of channel-cognizant distributed underwater acoustic sensor networks, theoretical explorations combining shallow water acoustics with information theory, as well as novel applications of shallow water acoustic communications that employ knowledge of shallow water acoustic propagation physics.

The special issue will feature invited papers from the IEEE OES community, spanning interdisciplinary expertise across underwater acoustics, signal processing, communications and information theory, and network analysis.

Individual papers in the collection will be published electronically on IEEE Xplore immediately on approval of the final version of the paper to enable access in advance of publication in the regular issue of the Journal.

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Important Dates:
January 15, 2018:   Manuscripts submitted before this date will be considered for publication in the special collection.   All manuscripts must be submitted through the Journal's website: http://joe.msubmit.net

Authors should include a cover letter when submitting their manuscript indicating that the contribution is intended for this special issue.

January 2019: Anticipated issue publication