FROM THE EDITOR

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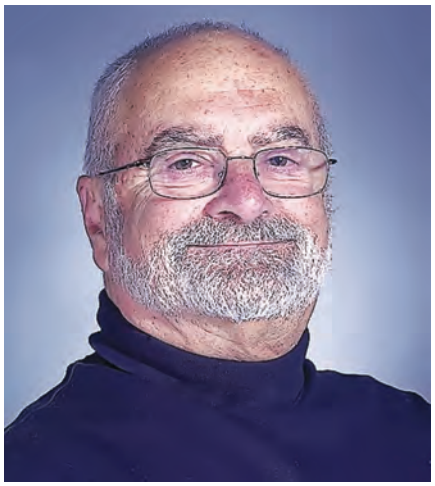

I am extremely grateful to James Candy for his outstanding work as guest editor for this comprehensive issue on signal processing in acoustics. I also wish to thank the authors for their excellent articles. Each discussed their area of expertise using applicable examples. We all hope that those not familiar with signal processing technology will see its usefulness in their own research and *give it a try*.

See you in San Diego.

Dick Stern

FROM THE GUEST EDITOR

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"Signal processing is the extraction of desired information while rejecting the extraneous," (*Acoustics Today*, Vol. 4(3), 2008). In the sequence of articles to follow, we illustrate the broad reaches of signal processing within the acoustics community. Signal processing in all of its forms can range from the simple (e.g., Fourier transforms) to the highly sophisticated (e.g., Bayesian processors) as well as a wealth of techniques that lie in-between. Perhaps the best way to illustrate the various approaches is to choose a cross-section of different focus areas, nicely organized by the Acoustical Society of America (ASA) into technical committees, and a group of researchers within to tell their stories. Even though it is clearly a limited sampling of the areas that could easily be extended into an encyclopedia (*Signal Processing in Acoustics*, Springer, 2008), these articles will provide a simple perspective of the impact of this discipline as well as show the current and potential applications of signal processing technology to a wide-berth of acoustics problems.

Perhaps one of the most challenging and advanced areas in acoustical signal processing technology is underwater ocean acoustic signal processing and as illustrated in our first article where we are given a glimpse of the recent efforts in utilizing model-based Bayesian processing techniques in ocean acoustics. Ocean acoustic signal processing has been one of the major areas heavily influenced by processing techniques. It has motivated the development and evolution of novel signal processing technologies (e.g., matched-field processing, beamforming) and a wealth of applications (e.g., time reversal, wavelets). This article focuses on sequential Bayesian model-based techniques applied to: towed array (synthetic aperture) tracking of a moving acoustic source, time delay estimation for localization and a geoacoustic inversion parameter estimation (tracking) all of which are quite challenging from a signal processing perspective. The sequential nature of the solutions are based on the fact that sound propagation in this dispersive, varying (e.g., temperature) ocean environment

requires that the processors be capable of adapting their parameters to these changes.

Our next article is the application of signal processing in physical and engineering acoustics. Each of the constituent articles illustrates the application of signal processing techniques to diverse problems in nondestructive evaluation, machine and structural failure monitoring and bullet tracking. The technologies applied are based on time-reversal, adaptive independent component analysis and array processing (wavefront curvature) techniques, respectively.

Next the application of signal processing to speech and hearing aids offers not just a brief glimpse of spectral processing techniques, but also discussions on automatic speech recognition systems and processing for hearing aids. Here technologies using simple (Fourier) spectrogram estimation to sophisticated time-frequency (Wigner-Ville) techniques are demonstrated as well as coding methodologies for recognition based on linear prediction and cepstral methods are illustrated along with the extension of compression techniques in hearing aid development.

Our final focus area is in animal bioacoustics where the applications of signal processing abound. Our glimpse here is used to demonstrate the three-dimensional tracking and identification of particular marine mammals in order to study migration patterns and behavioral habits. Classification and identification of marine animals associated with their size and orientation are discussed in processing images using gradient techniques, while the identification of whales through their clicking sounds is clearly exemplified in this contribution applying cluster analysis, spectrogram estimation, localization and change detection processing methods.

Summarizing, this issue of *Acoustics Today* provides a brief glimpse into the impact of acoustical signal processing technology using four diverse acoustical focus areas: underwater (ocean) acoustics, physical and engineering acoustics, speech, and animal bioacoustics. Clearly, searching the publications of other focus areas represented by the ASA technical committees will lead to even more diverse and sophisticated applications of signal processing in acoustics giving credence to the statement that "signal processing provides the thread that is interwoven throughout the fabric of the acoustics community."