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Leveraging Sound to our Advantage

Sound is all around us. The acoustic environment is rich with information. If we only listen to a scene, we can infer much about: who (or what) is in the scene, what is happening in the scene, where the scene is, and potentially more about how things are interacting and why.

Acoustics provide a distinct perspective on qualities of objects, things, or even people. We may be informed of the ripeness of a melon by thumping it, the properties of a wall or door by knocking on it, or the general wellness of a person by the sound of their voice.

Microphones and recording devices are readily available (from special-purpose audio acquisition equipment to smartphones), providing unending sources of data to process. This endless stream of data inspires ever-increasing wish lists of what we would like to automatically identify and analyze, from speech to music to animals to warning signals and on and on.

Despite the rich source domain and readily available devices for signal capture, systems for *acoustic measurement and information retrieval* are less well known than analogous systems in other (e.g., visual) domains. The aim of this special issue is to present a spectrum (pun intended!) of acoustic instrumentation and measurement applications, particularly those that lead toward the extraction of information from audio signals. Here, we feature research from three distinct disciplines and perspectives, demonstrating the diversity of this field while suggesting opportunities for interdisciplinary collaborations.

In the paper "High Time for Temporal Variation: Improving Sonic Interaction With Auditory Interfaces," Foley and Schutz touch on something that most of us experience everyday but to which we rarely give much thought: acoustic perception. The authors argue that designers of auditory interfaces (especially for medical instrumentation in a hospital setting) have for too long ignored human factors in favor of needlessly simplistic (or historically-based) designs.

"Audio Information Retrieval and Musical Acoustics" by Olivieri *et al.*, presents a fascinating and in-depth exploration into musical acoustics, including various instrumentation and machine intelligence techniques to capture and analyze both the mechanical and perceptual (i.e., timbral) properties of violins. I will take a point of editorial privilege to commend co-author Augusto Sarti for his work in developing the world-class Music and Acoustic Engineering Program at the Polytechnic University of Milan, Italy, which will undoubtedly foster more great research in this and related areas.

Our third thematic paper is Miller's "What's the Buzz About? Progress and Potential of Acoustic Monitoring Technologies for Investigating Bumble Bees." This paper presents a survey of acoustic methods used to observe various aspects of bumble bees, illustrating the depth of information that may be extracted from such seemingly (and perhaps deceptively) simple sounds.

We hope this special issue will provide fodder for new ideas and applications of acoustic measurement while encouraging interdisciplinary collaborations and research in this field.