12th Mini-Conference on Acoustics (MCA)
29 October 2018

The Catholic University of America
School of School of Engineering
Pangborn Hall, Scullen Room
Washington, DC

Washington DC Chapter of the Acoustical Society of America

Program

6:00-6:45	Upload Presentations / Ice breaker
6:45-6:50	Welcome and introduction to the Washington DC Chapter of the Acoustical Society of America and the 12th Mini-Conference of Acoustics Shane Guan (President, Washington DC Chapter of the ASA)
6:50-7:05	Timbral dimensions of cross-modal perception* Jackson Anthony
7:05-7:20	Phoneme identification of children with various auditory processing deficits* Chao Han, Olivia Pereira, Cassidy Walter, Thierry Morlet, Arild Hestvik, and Kyoko Nagao
7:20-7:35	Predicting transmission loss errors through machine learning Jennifer Cooper, CJ Della Porta, and Olivia Ott
7:35-7:50	Far-field superresolution imaging using shaped acoustic vortices Matthew Guild, Jeffrey Rogers, Charles Rohde, and Gregory Orris
7:50-8:05	An Acoustical STEAM Event For High School Students David Lechner
8:05-8:15	Break while the Judges Deliberate on Best Students Papers
8:15-8:25	Announcing Results for Best Students Paper Competition
8:25	Adjourn

* Papers qualified for the Best Student Papers Competition

Abstracts

Timbral Dimensions of Cross-Modal Perception*

Jackson Anthony
American University, Audio Technology Department, Applied Perceptual Research & Innovation Lab

Since Albert Michotte's 1963 work *The Perception of Causality*, stream/bounce illusion experiments have been used to demonstrate paradigmatic concepts in the literatures of cross-modal perception and psychoacoustics. Much has been written about how manipulating the speed and trajectory of collisions, congruence of collision sounds, visual and auditory "flanks", and visual appearance of colliding objects can create instructive perceptual differences in stream/bounce illusion experiments. (See Sekuler *et al.*, 1997, Watanabe & Shimojo 2001, Grassi & Casco 2010). It is not understood how the timbral features of collision sounds relate to these findings. My paper demonstrates how timbral cues affect the perception of stream/bounce illusions by presenting a re-designed version of the experiment using spectral centroid synthesis. Future experiments using a multimodal VR / spatial audio interface will also be outlined.

Phoneme Identification of Children with Various Auditory Processing Deficits*

Chao Han, Olivia Pereira, Cassidy Walter, Thierry Morlet, Arild Hestvik, and Kyoko Nagao

Previous studies (e.g., Cameron *et al.*, 2018) on auditory processing deficits suggested using Phoneme Identification Test to assess temporal processing difficulties in children. Temporal processing deficit represents only subcategory of auditory processing deficits. The current study examined the phoneme identification skill in children with various auditory processing deficits. Ten typically developing children (age = 9.1 ± 1.6 years old) and ten children with auditory processing deficits (age = 9.0 ± 0.8 years old) participated in the study. The stimuli included a /da/-/ta/ continuum of synthetic syllables with voice onset time ranging from 0 to 80 millisecond. Compared to typically developing children, a wider uncertainty region (where responses were neither clearly /da/ nor /ta/) of the estimated categorical function was found for the children with temporal processing deficits (p = .01), but not for the children with binaural integration deficits (p = .17). This discrepancy could be explained by the fact that the current stimuli posed challenge more to temporal processing than to binaural integration. The results suggest that a phoneme identification test can be used as a diagnostic tool to assess temporal processing difficulties. [Work supported by NIH COBRE Grant P30GM114736.]

Predicting Transmission Loss Errors through Machine Learning

Jennifer Cooper, CJ Della Porta, and Olivia Ott
The Johns Hopkins University

Uncertainty in a sound speed profile can lead to uncertainty in the associated prediction of transmission loss (TL). In order to better quantify the effect of imperfect knowledge of the sound speed profile on the acoustic propagation, a study was done comparing pairs of sound speed profiles. In each pair, one profile was treated as ground truth and the second profile was a perturbed version of the first. No single metric on the sound speed profiles, such as mixed layer depth or surface layer characteristics, correlated well with the errors in resulting TL. Several

attempts at creating a more complex metric on the profile that could predict errors in the TL were also unsuccessful. However, even a rather simple machine learning approach was able to reliably predict TL errors. Results of the study will be presented and implications discussed.

Far-field Superresolution Imaging using Shaped Acoustic Vortices

Matthew Guild, Jeffrey Rogers, Charles Rohde and Gregory Orris
U.S. Naval Research Laboratory, Code 7160

The ability to overcome the limitations on resolution due to the effects of diffraction has attracted significant attention in recent years. Previously proposed methods to overcome this limit, and therefore achieve superresolution, have largely been restricted to operating within the near-field region of the aperture. In this work, we will describe how acoustic helicoidal waves can create acoustic vortices that are well below the resolution limit, and how this can enable far-field superresolution acoustic imaging. The acoustic vortices generated in this manner propagate from the near-field into the far-field through an arrangement of stable integer mode vortices, thereby enabling the generation of far-field superresolved features in the acoustic pressure field. In this paper, theoretical and numerical results will be presented for an acoustic aperture which is capable of generating superresolved far-field features in the radiated acoustic pressure, and results will be shown illustrating the superresolution capability of this novel technique. [Work supported by the Office of Naval Research.]

An Acoustical STEAM Event for High School Students

David Lechner
The Catholic University of America

This presentation will review the methods and results of hosting our first "Acoustical STEAM" (Science, Technology, Engineering, Arts, and Math) conference as a part of the Washington DC Regional Chapter meeting in the spring of 2018. Student teams were invited from over 50 Washington DC High School clubs and physics classes, and provided a box assorted materials, and given 2 hours to create a musical video. The presentation will discuss the objectives, lessons learned, and results of the competition as well as student feedback on the event.