

HRA TC Meeting Notes, 13 October, 2022

Attending:

Bob Katz
John Grant
Hans van Maanen
Bob Stuart
Wieslaw Woszczyk
David Rich
Hyunkook Lee
David Jones
Jamie Angus
Sergio Liberman
Vicki Melchior
+ 2 others

Note, for the 153rd convention in NYC:

Jamie Angus will present an extension of her previous tutorial with Bob Stuart, titled "A Deep Dive into DAW Digits Part 2: How do you Dither and Noise Shape Floating Point Processing".
Weds. Oct 26, 1:30 pm EDT (online).

Planned Events for 2023.

1. We plan a large demonstration and associated workshop on the topic of binaural mixdown algorithms for immersive audio, and their comparative quality and flaws. Binaural is a major concern in recording studios. Aiming for NYC, fall 2023.
 - a. Rationale: 90% of the world listens on portables; 2-channels are important if immersive audio is to survive beyond sound bars, games, and movie theaters. But current binaural mixdown algorithms are varied and flawed.
 - b. Preferred demo set up: 7.1.4 loudspeaker system, plus headphones at each seat, in a moderate size dedicated room. Program: 2 days of rotating demonstrations
 - c. Requires sponsors for borrowed equipment and AES support
 - d. Possible loudspeaker source: Genelec. Possible headphone sources: Audeze, Sennheiser, Shure. System configuration and details are in planning stages.
 - e. We hope to attract good presenters for the demo and workshop, similar to AES immersive demos at Javits in 2019. Also included should be creators working in different genres, since their approaches are very different (creative tool versus just virtualizing a binaural mix).
 - f. Possible topics:
 1. Comparison of 7.1.4 immersive mix with binaural mixdown. What is the binaural process, what is retained, what is externalized and not. Presenters illustrate their techniques.
 2. Compare binaural with stereo

3. Blinded comparison of several binaural plugins to show large differences, pinpoint problems
 - g. Expected to be educational and interesting to the AES audience.
2. Although not a TC event, Hyunkook Lee plans a conference on the same topics of binaural and immersive audio at Huddersfield University, U.K. Timing: 3 days in late August, 2023. It will include papers, demos, and tutorials/workshops as these are very active research areas.
3. HRA TC events for spring, 2023 - Aalto University, Espoo, Finland
- a. General tutorial proposals are welcome, e.g. Jamie Angus's topics, and a previously proposed tutorial on dither based on the May, 2019 paper "The Gentle Art of Dithering" by Bob Stuart and Peter Craven.
 - b. Depending on convention timing, Bob Stuart agreed to a comprehensive tutorial on the current state of thought on the relationships between the auditory system, the time domain, and the audio channel (especially high res). This follows his 2 hr. presentation to the U.K. AES section last year, which is currently available on YouTube. Possible themes could be "the auditory system", "the importance of the time domain", etc., but the topic is important both as a needed overview and to encourage research.
 - c. Hans van Maanen and Milind Kunchur will submit a workshop for spring 2023 focusing on aspects of reproduction that aren't consistent with current theory. It would include the temporal response of microphones, which they suggest may be well below that of digital processing. Mic manufacturers rarely publish impulse response data.

Suggested future topics for workshops/tutorials.

Asynchronous rate conversion (ASRC). Bob Katz suggested ASRC as an underrated factor in the quality of D/A converters, and there are a variety of implementations, best to worst. Bob S. noted seeing converters where 3 ASRCs were used in sequence in a DAC (!)

Tutorial on the ear not being a Fourier analyzer and comparisons between basilar membrane non-linear processing and standard Fourier signal processing. Jamie mentioned this as a possibility.

Update on related work.

Hyunkook has a visiting PhD student whose field is neuroscience and they plan EEG experiments relating to immersive sound. Their objective is to show that 3D audio can be more immersive than stereo. Previous research has shown that 3D causes more arousal, more emotional response, and higher levels of attention and involvement. Additionally, they want to establish a methodology for measuring immersion using basic psychoacoustic testing

techniques. EEG measurements also aim to correlate subjective responses to different areas of brain activity.

Discussion on Current and Future Directions of the TC

The PCM “high res” format is mature but the HRA TC remit is always far wider. TC is about maintaining the highest quality audio channel, including processing, hardware, production and delivery, understanding the response of the human auditory system (psychoacoustics, neuroscience), and testing. It includes temporal, frequency, and spatial resolutions, and dynamic range.

Discussed anticipated directions in the near term:

- Previous workshop on streaming of high res can be updated
- Neuroscience and psychoacoustics; there are a limited number of people straddling audio and these areas but they are important research. Hope to invite some of the Japanese researchers to speak
- Binaural is an active current area and will be for the next several years
- Signal processing; hardware; delivery modes
- Repository of TC-related research?

We can alter the name of the TC to reflect work