

2017 Belmont University Research Symposium

Audio Engineering

Moderator: Wesley A. Bulla, Ph.D.

April 20, 2017, 7-9 p.m.

JAAC 4098

7:00 p.m. – 7:15 p.m.

Listener preference of low-end spectral balance in popular music recordings.

Justin A. Bennington

Faculty Advisor: Wesley A. Bulla, Ph.D.

Modern innovations in recording technology and sound reproduction allow more low-end than ever before to be contained in distribution-quality musical works. The ability for a recording to possess more low-end frequencies is a result of the shift away from vinyl records, which physically possess limitations on the amplitude of any record below around 200 Hz. In contrast to the popular music of the 50s and 60s, music with artificially high levels of low end has now become the norm in most pop music songs. Research related to the overall music listener preference of low-end spectral balance is limited. Results from research here provides insight to the question of whether or not listeners prefer to have more or less relative low-end in music.

7:15 p.m. – 7:30 p.m.

Subjective analysis of coincident and near-coincident microphone techniques.

Tyler B. Stewart

Faculty Advisor: Wesley A. Bulla, Ph.D.

Coincident and near-coincident pairs are commonly used stereo microphone techniques. With the coincident pairs, it has been argued that the lack of the inter-channel time delay provides a lack of a sense of space. In contrast, some studies have shown a preference of near-coincident techniques showing that clarity due to good localization, overrode the judgement of spaciousness. This experiment pits jazz trio, quartet, and sextet recordings made with XY-coincident against ORTF near-coincident microphone techniques in an evaluation the perceptual differences for both preference and evaluation of spatial attributes of each.

7:30 p.m. – 7:45 p.m.

What makes drum tracks groove?

Morgan A. Matyjevich

Faculty Advisor: Wesley A. Bulla, Ph.D.

The purpose of this research is to investigate whether or not listeners prefer a drum track that “grooves” on the backbeat as opposed to one that is perfectly in time. This question is derived from the so-called “Muscle Shoals sound” where the snare hits on beats 2 and 4 are claimed to be slightly late in reference to the true timing of the rhythmic pulse in the recording.

This experiment will attempt to determine whether or not timing on the snare is a factor in the perception of “groove.”

7:45 p.m. – 8:00 p.m.

Timing cues in the presence of elevation: a study on the Precedence Effect

Paul G. Mayo

Faculty Advisor: Wesley A. Bulla, Ph.D.

The effects of inter-channel timing differences (ICTDs) on a sound source’s perceived location are well understood in a horizontal loudspeaker configuration. But do the same rules apply for other configurations? This experiment tests the effect of loudspeaker elevation on a listener’s ability to localize sound sources in systems with ICTD. Listeners were asked to localize a sound image created using ICTDs and respond by aiming a laser pointer at the sound’s perceived location. The experiment was implemented in such a way as to be a comparison to standard horizontal precedence effect experiments but tested non-traditional loudspeaker arrangements. Data will be analyzed using sign and ANOVA tests with listeners’ responses being visualized graphically. Outcomes are expected to follow a predicted model assuming localization will be concentrated at the leading loudspeaker. Provided this is true, Haas delay effects and time-delay panning can be confidently used for mixing in multichannel surround sound formats, such as NHK 22.2 or Dolby Atmos.

8:00 p.m. – 8:15 p.m.

Discrimination of absolute polarity of live and reproduced sources

James A. Kaiser

Faculty Advisor: Wesley A. Bulla, Ph.D.

This study investigated conditions under which the “absolute polarity” of live and reproduced electronic signals may be discernable by a listener. Competent listeners were introduced to situations under which a music production professional may be susceptible to the effects of “in” and “out of” absolute polarity signals. Based on new evidence generated here, as well as previous research of this phenomena, this presentation will discuss whether or not subjects were able to reliably detect ‘absolute polarity’ while self-generating the stimulus and/or while listening to prerecorded musical selections.

8:15 p.m. – 8:30 p.m.

Surround sound localization and threshold testing

Ashley Burns, Gabe Schatz, Kamauliola Agunat, Alex Mehner

Faculty Advisor: Wesley A. Bulla, Ph.D.

The focus of this study aimed to investigate two questions in relation to 5.1 AES standard set up of surround sound; how accurate can a semi-trained listener localize stimuli, and to determine what was the threshold for that stimuli within immersive crowd noise. The null hypothesis of the experiment read: there will be no measurable threshold of all three stimuli, and subjects will

identify the location of each stimulus with no consistency in accuracy. The research question that guided the experimental design and experiment was: “In a 5.1 surround sound setup with a constant, ambient 65 dB crowd noise, how accurately can subjects map the location of dog barking, gun shot, and a door bell samples, and what is the threshold level of each stimuli at a given location?” The results assert that listeners perceive localization mapping in a individually unique and experiential ways. Statistical results for threshold demonstrate that leading and testing bias is a more insidiously present problem within data interpretation. There were so many occurrences of phantom perception that it was difficult to establish a clear threshold. The results of this study apply to motion picture arts in order to better understand the process behind localization and threshold detection within the encompassing audio of 5.1 surround.

8:30 p.m. – 8:45 p.m.

The selective nature of inter-aural suppression as it relates to the precedence effect.

Austin B. Arnold

Faculty Advisor: Wesley A. Bulla, Ph.D.

This study was an analysis of inter-aural suppression in the context of the precedence effect. The precedence effect occurs when the brain receives two analogous signals, where one is time-delayed less than 600us. The brain will hear the signal as though it is sounding from the leading side even though both the leading and lagging side ears are receiving the same signal intensity. The inter-aural suppression that our brain applies to the lagging ear receiving the time-delayed signal during the precedence effect sensation may either be selective to the time-delayed signal, a full band stop suppression to the time delayed signal, or it may perform as some combination of the two. This study investigated the nature of this inter-aural suppression by presenting subjects with a low-passed series of stereo white noise pips and a high-passes series of stereo white noise pips. The subject was asked to localize both noise pips in the stereo field. New information about how the auditory system performs suppression could be useful for applications in 3-D and immersive audio, and for further understanding of the autonomic functions of the human auditory system.

8:45 p.m. – 9:00 p.m.

Audio-video synchronicity of ADR for human and animated characters

Owen Z. Bolig

Faculty Advisor: Wesley A. Bulla, Ph.D.

This study analyzed the ability of viewers to identify when dialogue in film was out of sync with its corresponding picture. With the increased popularity of animated films, dialogue synchronicity has become more difficult for production teams. Visuals and audio have to be manipulated to match up. Because of concise lip-movement, this process is much easier with human-based film. The test of this experiment was designed to analyze viewers’ ability to notice dialogue being out of sync when comparing animated and human films. The collection of clips consisted of dialogues between live people, animated people, and animated dinosaurs. The audio from all three clips was extracted and manipulated to imitate voice-overs that were out of sync.

Findings show a significant difference between reactions to the three different cases. The participants were about 25% more likely to say the dialogue of the animated people was out of sync compared to that of the live action scene. They were 50% more likely to say the dialogue of the animated dinosaurs was out of sync.