

Offre de stage

Revisiting the Minimum Audible Angle in Reverberant Conditions

Context : Incorporating spatial audio into virtual and augmented reality is critical for creating immersive experiences. Because the visual cortex plays a dominant role, audio processing power is often quite limited in these contexts. It is therefore necessary that resources for rendering spatial cues be optimized for reproducing spatial cues with the highest perceptual relevance. This is made even more apparent in situations where the listener and sound sources are able to move in the virtual space (e.g., 6-degrees of freedom rendering). In the current project, we propose revisiting classic results on minimum audible angle (MAA) in reverberant environments with applications to the rendering of spatial audio in virtual and augmented reality.

Objectives : In the proposed project, you will develop an experimental protocol for studying sound source localization with the influence of visuals and room acoustics. You will then implement the experimental protocol to carry out a perceptual study with human subject and analyze the results. There is flexibility in the design of the study, from comparing real sound sources in real rooms to virtual sound sources in virtual rooms using headphone or loudspeaker presentation.

Competencies : Background in acoustics, signal processing, room acoustics, and virtual/augmented reality. Familiarity with scientific programming (e.g., MATLAB/python). Experience with virtual reality tools and frameworks (e.g., Blender, Unity, Oculus, etc) would be useful.

Contact : Elliot Canfield-Dafilou (elliot.canfield-dafilou@dalembert.upmc.fr) and Brian Katz (brian.katz@sorbonne-universite.fr)

References

- [1] William M Hartmann. Localization of sound in rooms. *The Journal of the Acoustical Society of America*, 74(5):1380–1391, 1983.
- [2] Nils Meyer-Kahlen, Sebastian J Schlecht, and Tapio Lokki. Clearly audible room acoustical differences may not reveal where you are in a room. *The Journal of the Acoustical Society of America*, 152(2):877–887, 2022.
- [3] Allen William Mills. On the minimum audible angle. *The Journal of the Acoustical Society of America*, 30(4):237–246, 1958.
- [4] David R Perrott and Kouros Saberi. Minimum audible angle thresholds for sources varying in both elevation and azimuth. *The Journal of the Acoustical Society of America*, 87(4):1728–1731, 1990.
- [5] Stephan Werner, Florian Klein, Annika Neidhardt, Ulrike Sloma, Christian Schneiderwind, and Karlheinz Brandenburg. Creation of auditory augmented reality using a position-dynamic binaural synthesis system—technical components, psychoacoustic needs, and perceptual evaluation. *Applied Sciences*, 11(3):1150, 2021.