

## **Sound Localization in Partially Updated Room Simulations**

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Room auralization systems have many applications in virtual reality and neuroscientific research. These systems can simulate many different types of spaces in a controlled manner, allowing for the investigation of both low-level cognitive processes (such as localization or loudness perception) and higher-level ones (such as auditory scene analysis or stream segregation) in realistic acoustic environments.

One of the present challenges is to extend these systems with real-time capabilities. The goal is to facilitate changes in the room simulation while the simulation is running, such as a moving source or receiver. The main challenges relate to the use of computing resources, as room simulations are computationally intensive, but need to be recalculated quickly enough in a real-time scenario in order to draw conclusions about perception in a similar real-life scenario.

Here, in preparation for implementing real-time simulations, a study was conducted to examine how a partial update in the room simulation with a moving source affects sound localization. The study employed our Simulated Open Field Environment system that has been used extensively in psychoacoustic research. Room reflections were simulated using the image source method, where the source location is mirrored repeatedly across the boundaries of the room to determine the spatial position and timing of individual reflections, and where computation time increases with reflection order. Therefore, the goal of this study is to examine the effects on localization when: (1) image sources are recalculated for a new position up to a finite order and (2) higher-order image source locations are retained from the previous position. Current results from five listeners show that the required update order of image sources is highly influenced by the source-receiver distance, with smaller distances being more robust to inaccuracies in the room simulation.

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