INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

SoundBlender: Exploring Sound Manipulations for Mixed-Reality Awareness

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OVERVIEW

SoundBlender is a customizable sound management framework that enhances how users perceive mixed-reality environments by separating, prioritizing, and transforming real and virtual sounds.

- **Core Features:** Six manipulators (Ambience Builder, Feature Shifter, Earcon Generator, Prioritizer, Spatializer, Stylizer) organize and fine-tune real and virtual audio streams across volume, timing, spatial placement, and style.
- **Valuable Market Opportunity:** Empowers accessible, context-aware audio experiences for AR/VR platforms, with direct applications in assistive tech, productivity tools, and immersive media—especially for visually impaired users and environments with complex audio demands.

BACKGROUND

The convergence of real-world and virtual audio via augmented and mixed-reality devices (such as smart headphones, AR glasses, and hearing aids) is rapidly changing how people interact with digital information and their physical surroundings. However, simultaneous real and synthetic sounds often overlap, masking critical alerts, reducing immersion, and increasing cognitive overload.

Current audio technology mostly toggles between either acoustic transparency (playing all sounds as-is) or noise cancellation (blocking everything except the virtual channel), failing to offer nuanced control.

With the proliferation of spatial computing (see trends in AR, remote work, virtual events, and accessibility), there's a strong market need for smarter, more customizable soundscapes—especially where clarity, safety, productivity, or inclusion are essential. This is true for industries ranging from assistive technology (supporting blind/visually impaired users) to enterprise collaboration, entertainment, and IoT-enabled environments.

INNOVATION

SoundBlender works by identifying individual audio sources (like a voice assistant, a construction noise, a virtual meeting participant, or ambient street sounds) and allowing users to manipulate them independently across time, space, and sound properties.

- **Novelty:** Unlike conventional noise cancellation or ambient pass-through devices, SoundBlender offers fine-grained controls—users can amplify important sounds, suppress distractions, reposition audio spatially, style sounds for easier identification, or sequence alerts based on urgency.
- Each manipulator can be combined or extended through a user-friendly interface (e.g., mobile app, Unity platform), with real-time response.
- The system leverages the ability to recognize and separate real and virtual sounds—transforming a chaotic soundscape into a curated, personalized experience that both enhances awareness and reduces mental effort.

In user studies with blind/visually impaired and sighted participants, SoundBlender outperformed existing approaches in helping users perceive critical information, respond faster to important events, and feel less overwhelmed—all foundational for environments where auditory navigation or quick decision-making is vital.

ADDITIONAL INFORMATION

REFERENCES: "SoundBlender: Exploring Sound Manipulations for Mixed-Reality Awareness"