Magic Leap 2's Leadership Spatial Audio

White Paper
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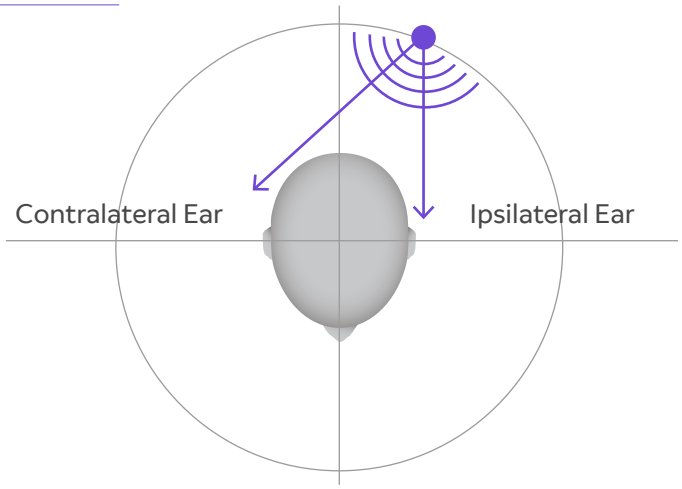
Magic Leap

Spatialized audio: How Magic Leap 2 leads the industry

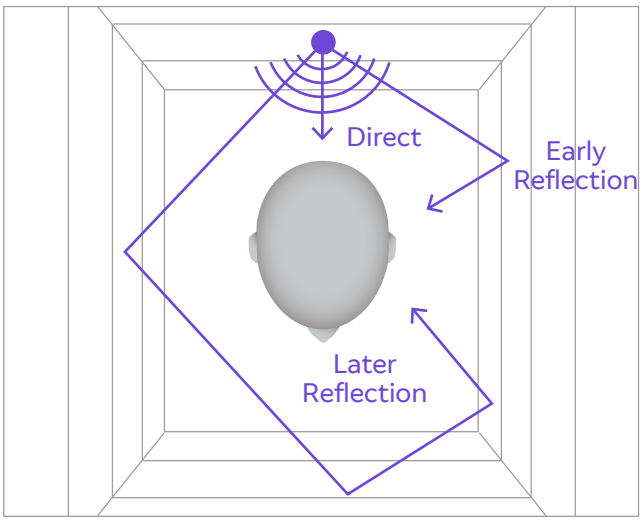
The augmented reality (AR) market often prioritizes the visual experience - how strong are each device's optics? (For the record, Magic Leap 2's are unmatched.) But another element is also critical to AR immersion – audio.

True AR immersion requires advanced spatial audio. In the physical world, our psychoacoustics enable us to naturally locate sources of sounds and formulate a basic understanding of the space they occupy. We perceive a sound's position based on temporal and qualitative differences between that sound's arrival at the closer (ipsilateral) and further ear (contralateral), combined with conditioned subconscious interpretation of head- and ear-related filtering effects. We perceive the space that a sound occupies by interpreting differences between the direct path and the reflection paths that characterize the reverberation of the space. To blend the physical and the digital, AR experiences must engage these psychoacoustic mechanisms to realistically place sounds in 3D space. This is spatialized audio – and it can unleash enterprise productivity by making AR solutions more immersive and useful.

Localization



Room Acoustics



Features: Magic Leap 2's industry-leading audio capabilities and robust developer tools

Magic Leap 2 features industry-leading spatial audio capabilities, powered by impressive compute performance and rigorously tested in custom-built labs. These capabilities include:

- Object-based binaural audio rendering
- Near-field 3D audio
- Perceptually motivated room acoustics and distance model
- Advanced source directivity model
- Per source direct to indirect (reflections and reverberation) ratio model

These capabilities are supported by robust developer tools that make it easy to integrate spatialized audio – as well as access and fine-tune more sophisticated acoustic design.

Industry-first automatic acoustic mapping takes the guesswork out of audio development.

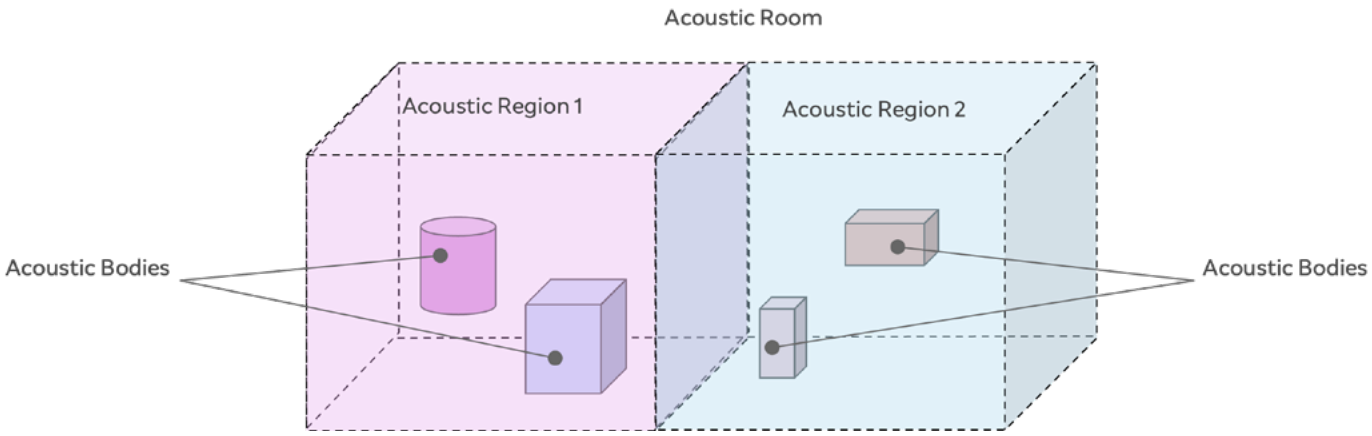
Magic Leap 2 can match reverberation to a user's environment to replicate human perception. Magic Leap 2 is the first AR platform to offer automatic acoustic mapping of a user's environment for realistic and spatially-aware AR experiences.

The microphones on Magic Leap 2's headset can listen and measure the reverberative properties of a user's current acoustic environment. This novel technique allows virtual sounds to be automatically rendered with reverberation that matches the user's physical environment, to more seamlessly blend real and virtual content.

This feature is a game-changer for AR developers, who previously needed to use guesswork in the creation of reverberation settings for environments that are not known a priori.

Acoustic scene design allows for flexible, custom audio experiences.

Acoustic scene design gives developers increased flexibility and customization to define acoustic properties of rooms, regions, and bodies, with the option of incorporating automatic acoustic mapping. This enables more realistic, useful audio for solutions; for example, customizing the amount of sound obstruction when something is placed between the user and sound source.



Acoustic Rooms

- Area effects like reverberation and late reflections

Acoustic Body

- Virtual Objects
- Sets transmission
- Surface reflections that tied to early reflections

Acoustic Regions

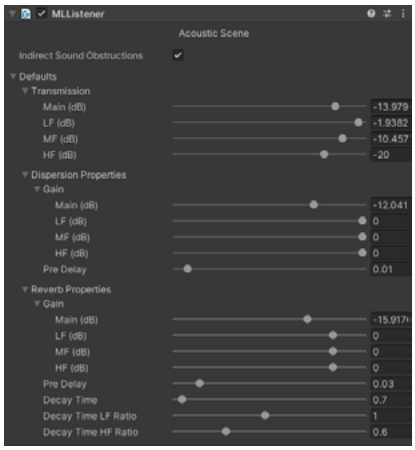
- Define specific supplemental acoustic bodies behaviors in a specific region

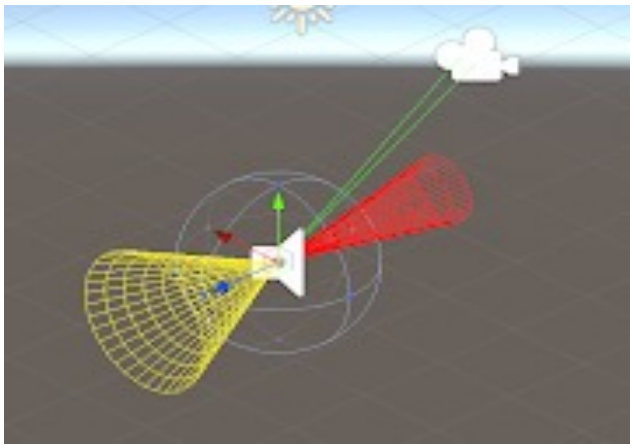
Hardware acceleration reduces latency and improves performance.

Magic Leap 2 can offload audio processing for improved performance and a seamless audio experience. Hardware acceleration enables developers to offload the audio processing from application resources to dedicated resources, to improve performance and free application resources for other tasks.

Robust development tools make integrating unique audio features easy

We built these spatial audio features with ease of development in mind. Magic Leap 2 empowers developers with easy-to-use features and finer controls. Automatic acoustic mapping, sound occlusion, and hardware acceleration are easy to implement and use in a custom Unity plug-in via C APIs. Magic Leap 2 features finer acoustic scene control to completely customize the sonic environment.

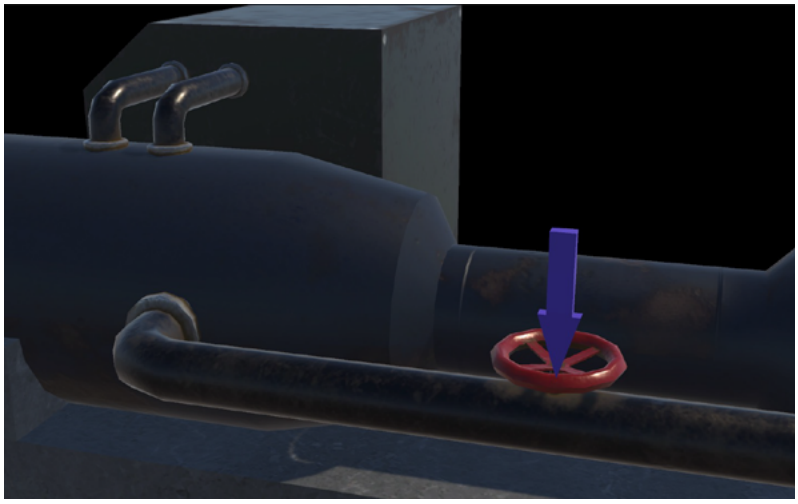




Use cases: How Magic Leap 2's audio features enable productivity

Attention steering

Attention steering allows developers to steer users' awareness to specific directions. For example, a user's attention can be redirected to something outside of their field of view using spatial audio sources. Multi-sensory spatial awareness is critical in enterprise settings.



Co-presence

In most video calls, we view a flat 2D screen that doesn't prioritize who is speaking, which conversations are most important, and where to direct your attention. This can make it difficult to understand and engage in conversations. Magic Leap 2's co-presence capability, powered by the spatial audio engine, enables users to focus on and tune into specific conversations.

Typical video call

Magic Leap 2's co-presence feature