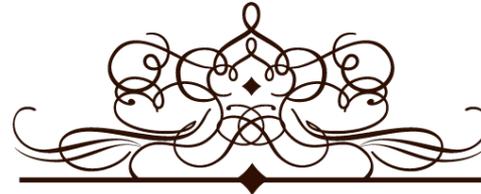# Acustica degli ambienti reali e virtuali… in Unity

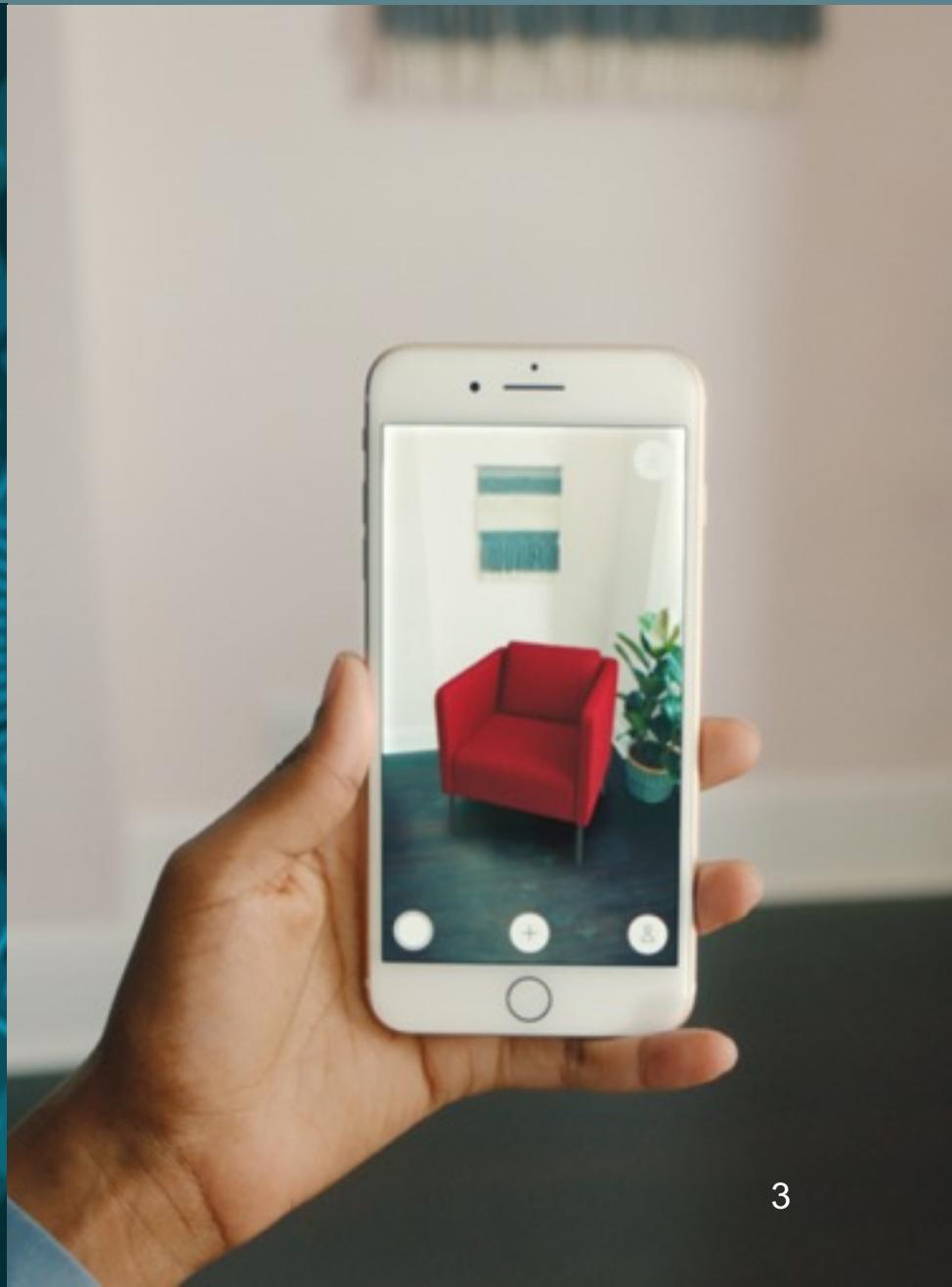Alessandro Privitera

privitera.alessandrogiuseppe@spes.uniud.it
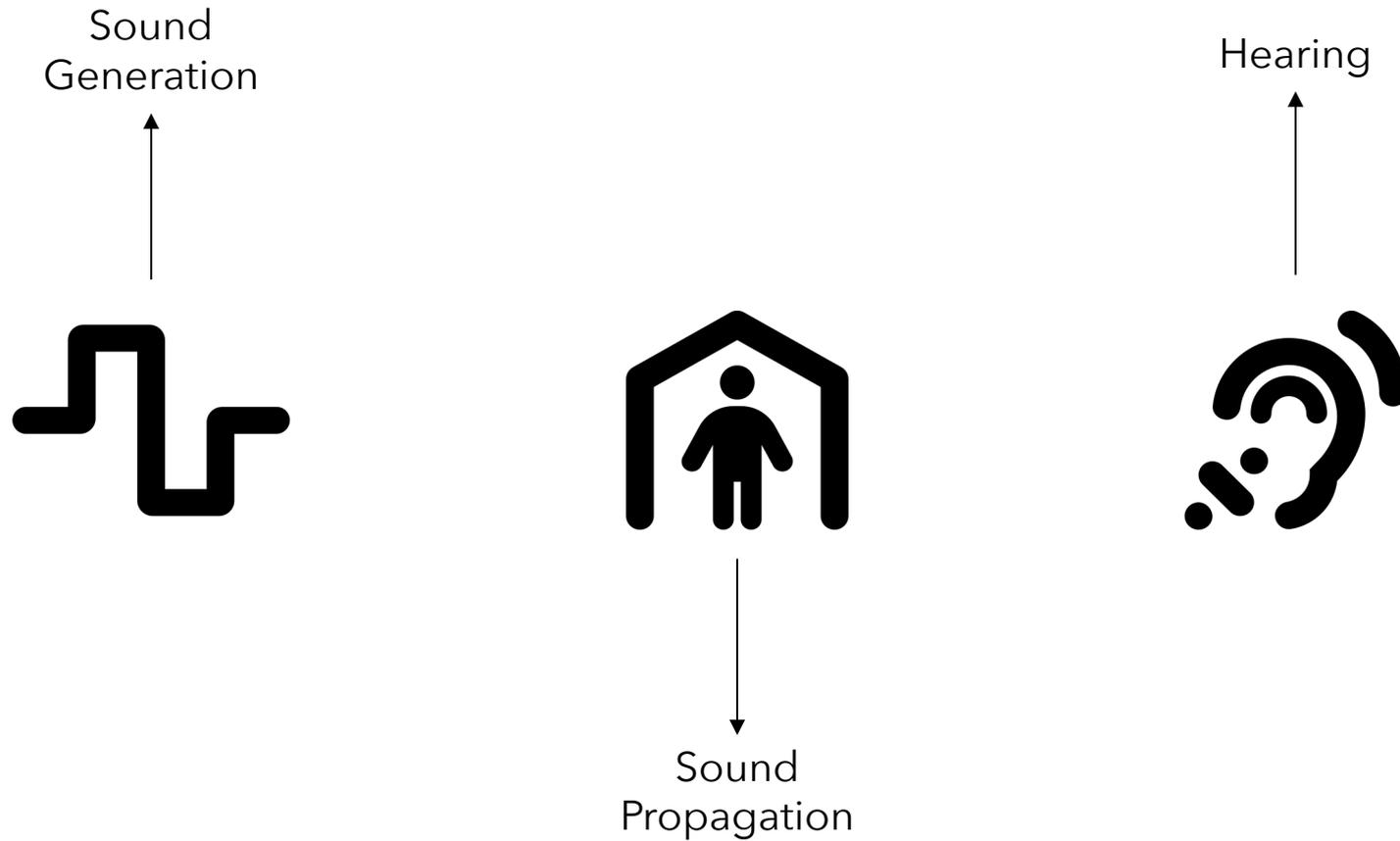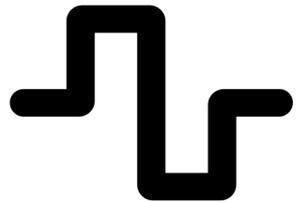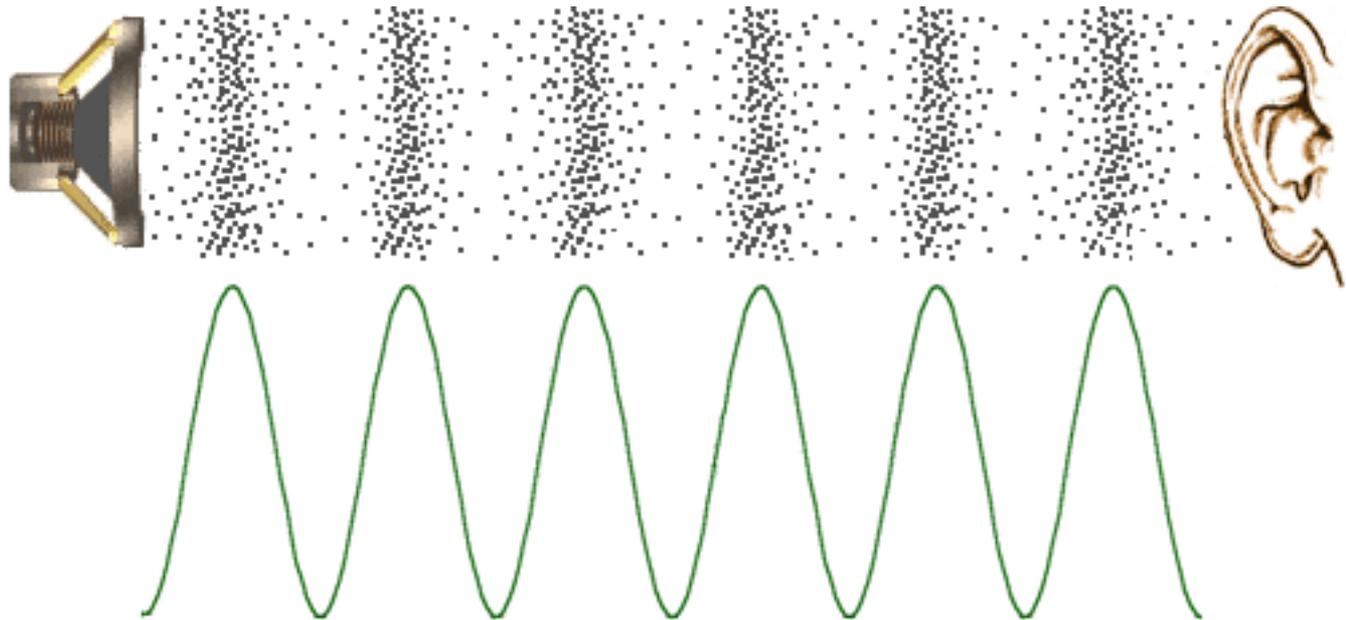
MENU

- 💡 AR vs VR
- 💡 Audio: generation, propagation, hearing
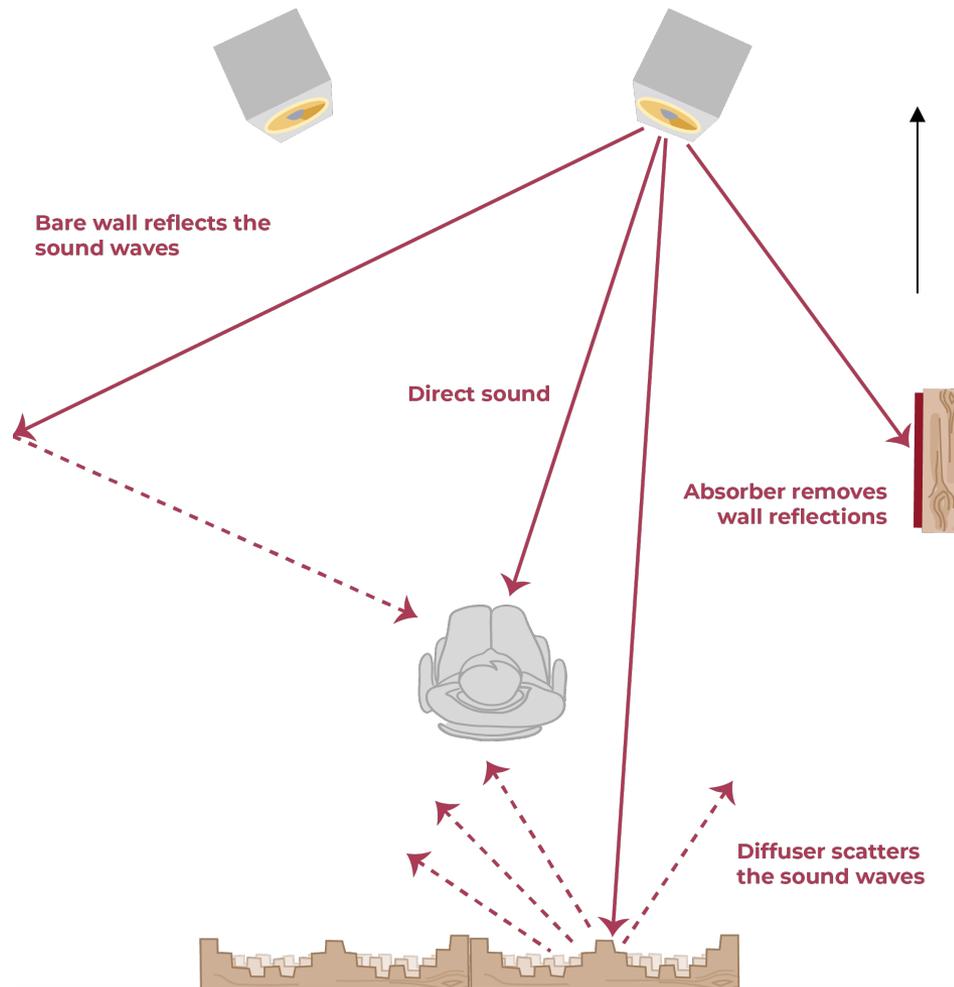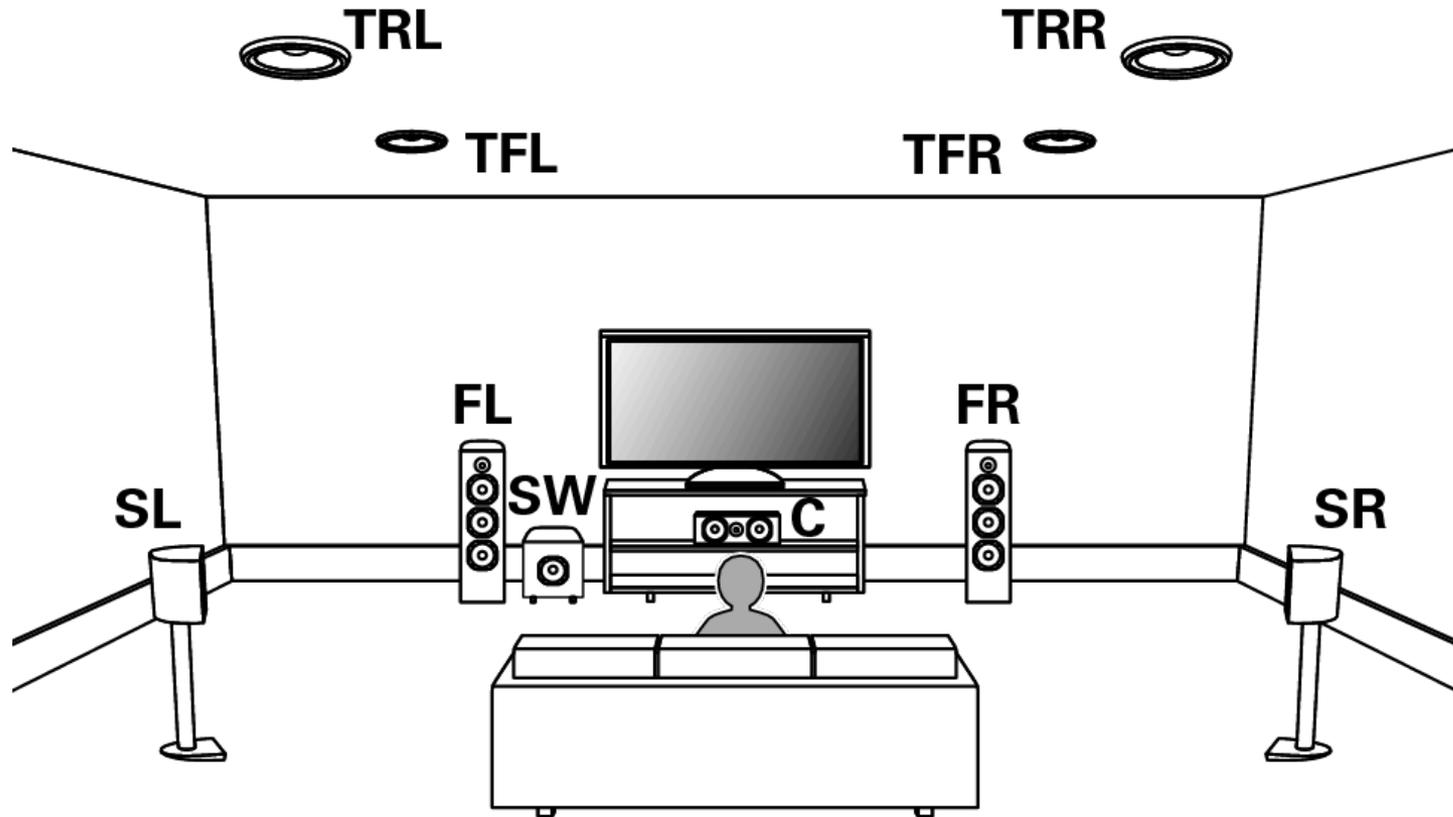- 💡 Audio Design tips
- 💡 Unity Examples

Sound
Generation

Hearing

Sound
Propagation

Sound
Generation

Sound
Propagation

Bare wall reflects the sound waves

Direct sound

Absorber removes wall reflections

Diffuser scatters the sound waves

6

5 . 1 . 4

Horizontal → 5

Subwoofer (Low Freq) → 1

Ceiling → 4
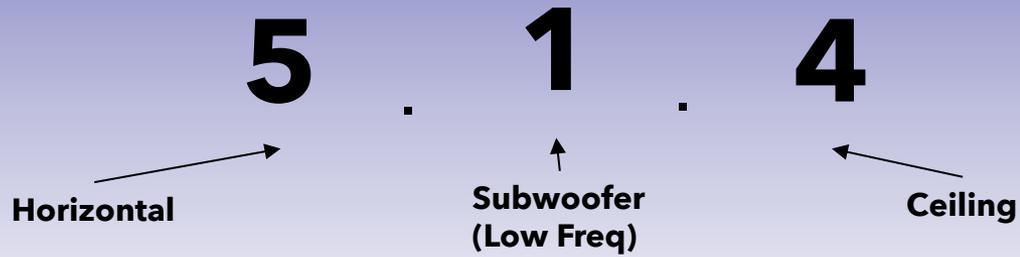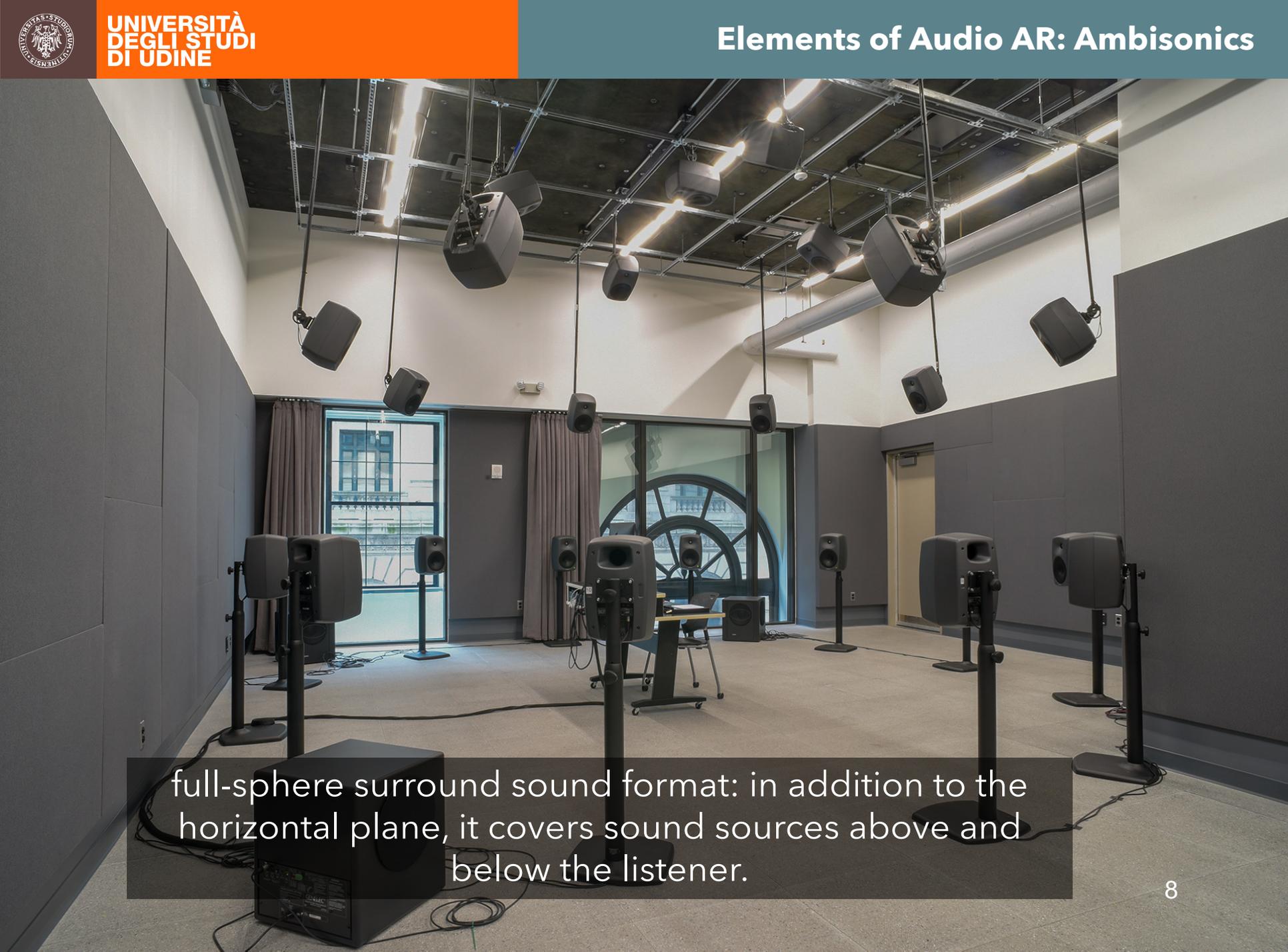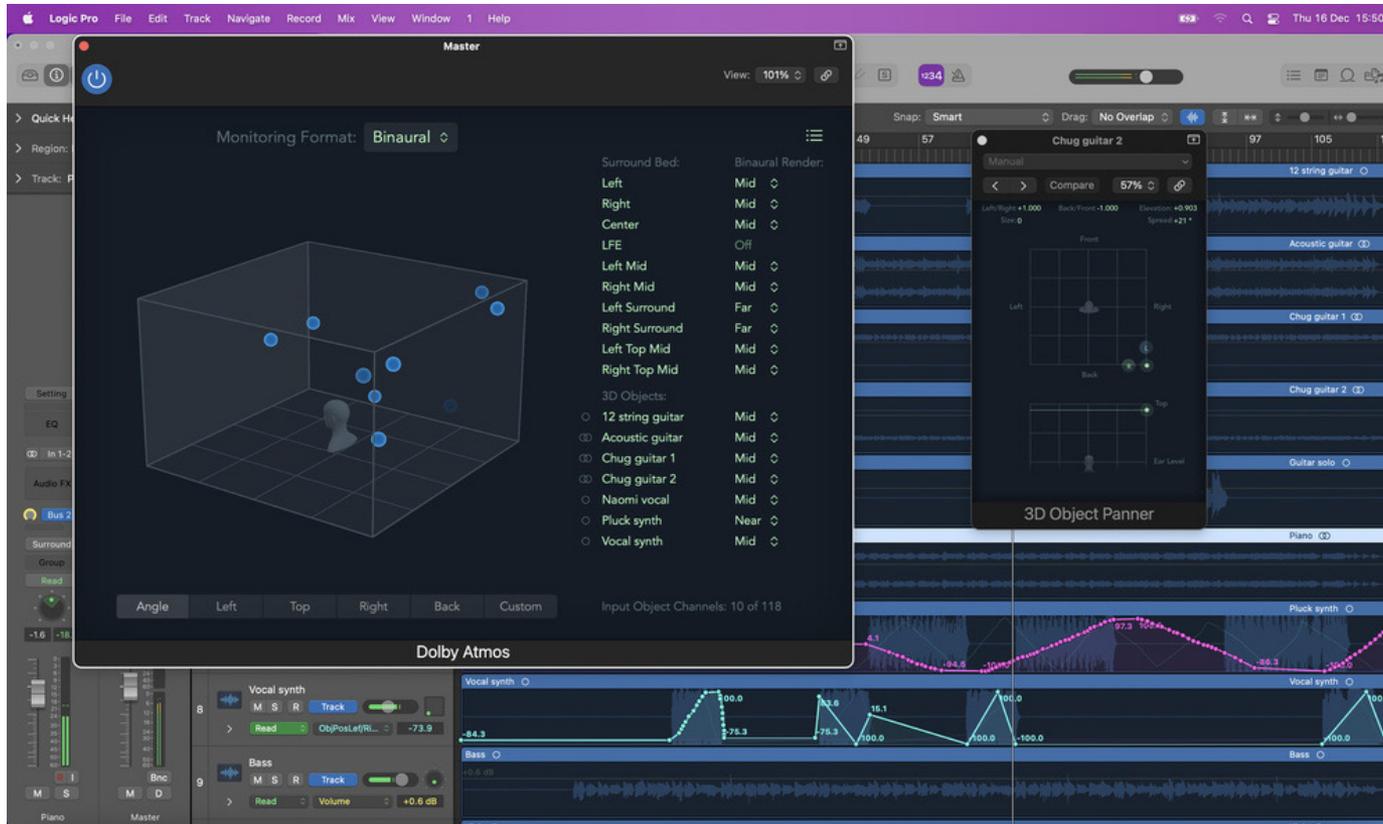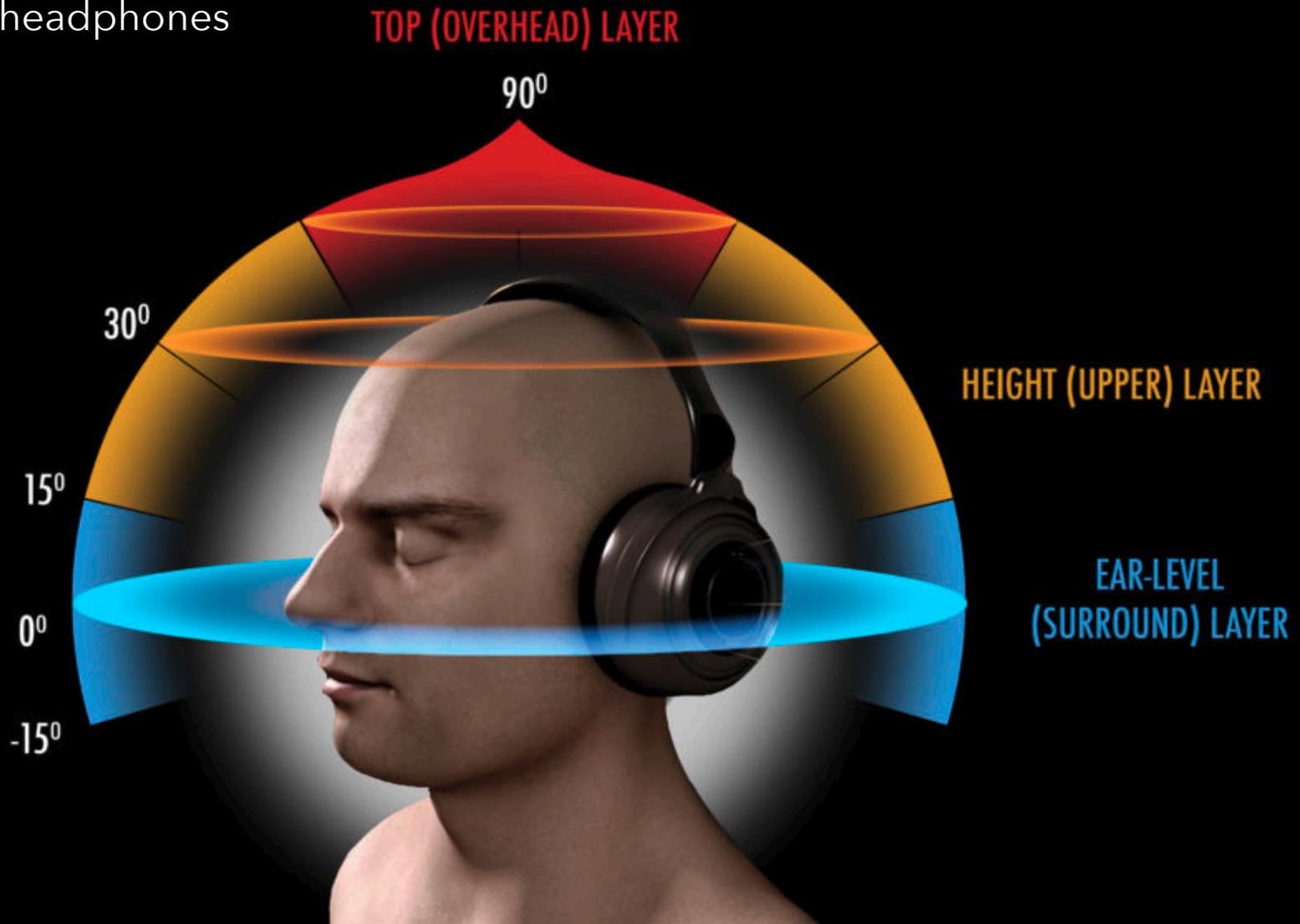
full-sphere surround sound format: in addition to the horizontal plane, it covers sound sources above and below the listener.

Up to 128 audio «objects» with associated spatial
audio (location, pan, automation, etc.)

LINK
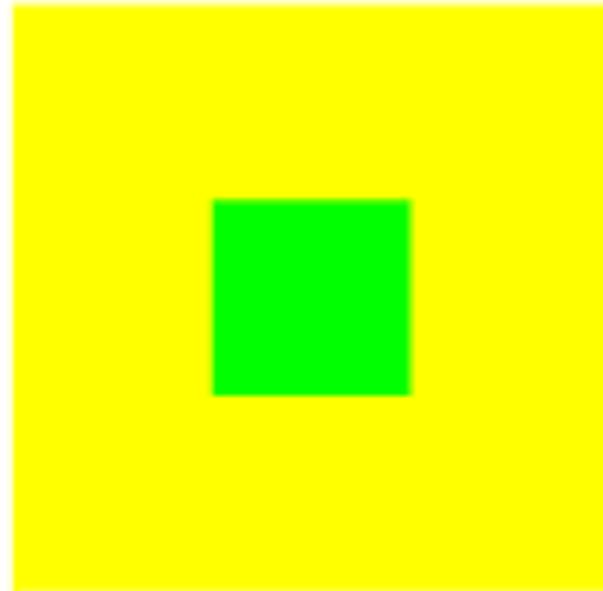
Technology for spatial audio listening using headphones

Hearing

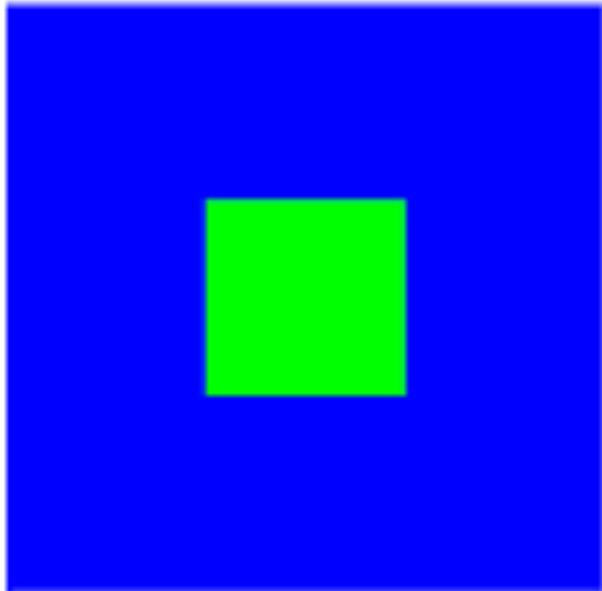UNIVERSITÀ
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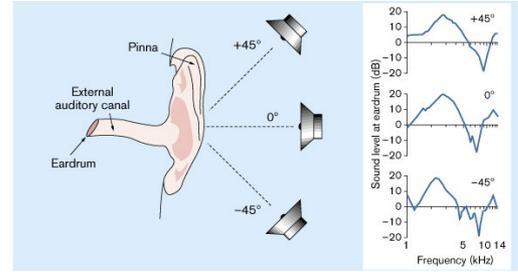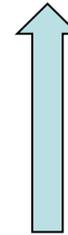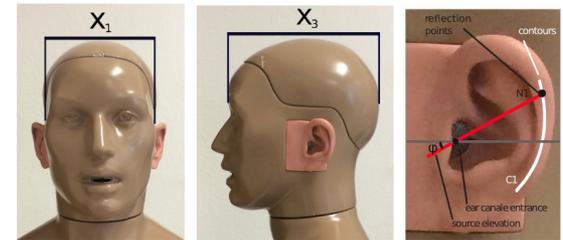
Problems

Front-back
Confusion

Sound Elevation
Perception

Head tracking

Human experience
is Multimodal

Head/Ear dimensions
are not personalised

Experienced Audio AR users…

Audio-Visual Mix

LINK

14

Full Transparency — Full noise cancellation

Noise Cancellation
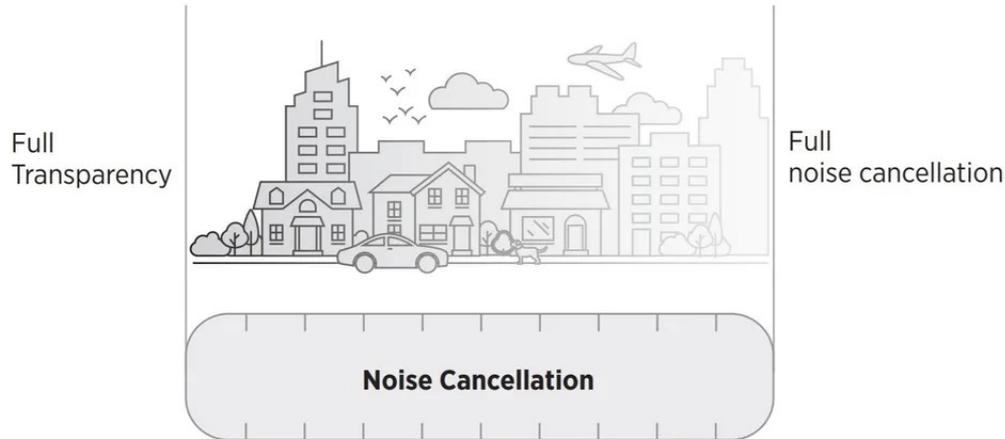
Enviromental sounds are not modified by hearing devices (headphones, earphones, etc.)

Unfortunately,
the state-of-the art...

Audio Engineering Society

Convention Paper 10611

Presented at the 152nd Convention
2022 May, In- Person and Online

This convention paper was selected based on a submitted abstract and 750-word precis that have been peer reviewed by at least two qualified anonymous reviewers. The complete manuscript was not peer reviewed. This convention paper has been reproduced from the author's advance manuscript without editing, corrections, or consideration by the Review Board. The AES takes no responsibility for the contents. This paper is available in the AES E-Library (http://www.aes.org/e-lib), all rights reserved. Reproduction of this paper, or any portion thereof, is not permitted without direct permission from the Journal of the Audio Engineering Society.

An open dataset of measured HRTFs perturbed by headphones

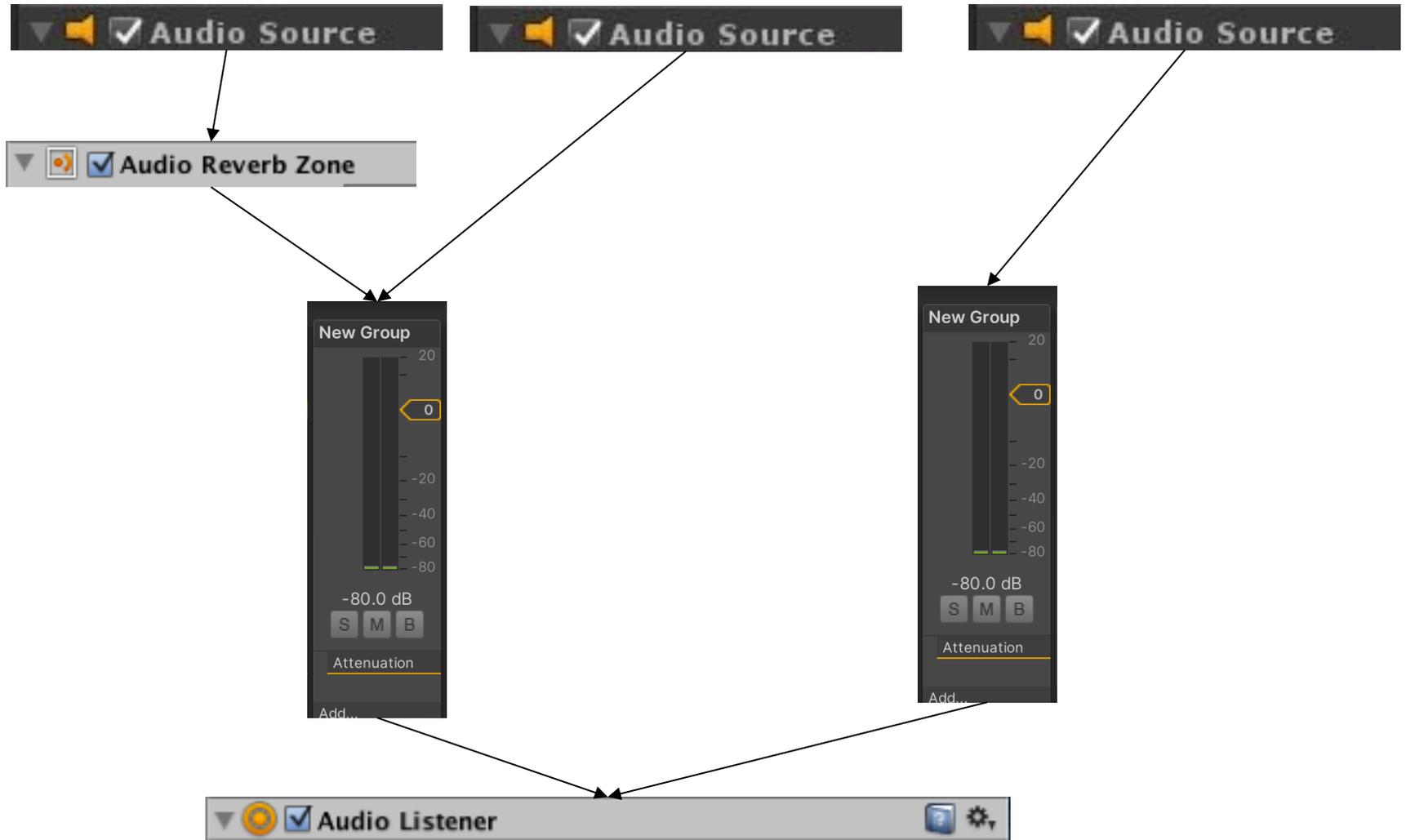Roman Schlieper[1], Stephan Preihs[1], and Jürgen Peissig[1]

[1]*Gottfried Wilhelm Leibniz Universität Hannover*

Correspondence should be addressed to Roman Schlieper (`schlieper@ikt.uni-hannover.de`)
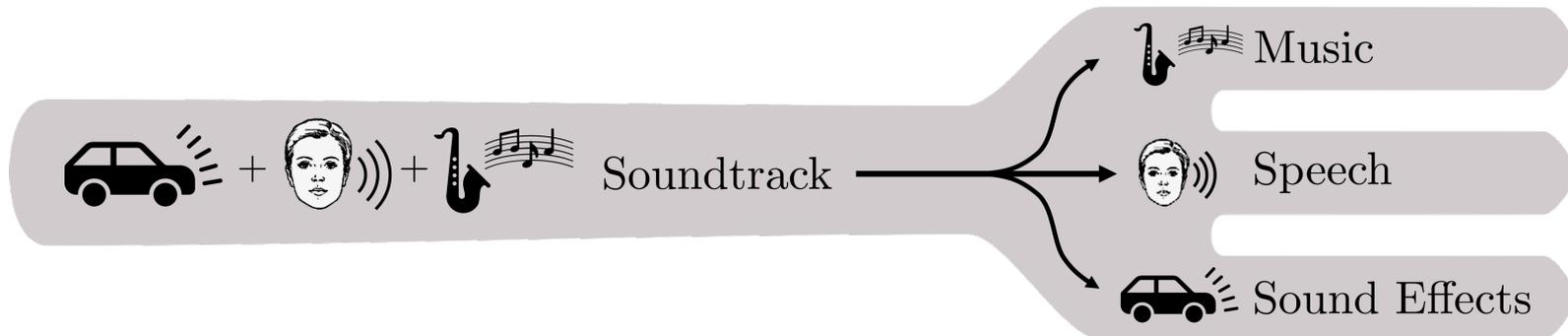
Tips for an engaging game/XR audio:

- Less loops, adaptive music
- Less is more, avoid ear fatigue

Generates Spatial Audio

Platform Optimisations

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Audio Sources Goes Here

Audio Reverb Zone	
Min Distance	10
Max Distance	15
Reverb Preset	Generic
Room	-1000
Room HF	-100
Room LF	0
Decay Time	1.49
Decay HFRatio	0.83
Reflections	-2602
Reflections Delay	0.007
Reverb	200
Reverb Delay	0.011
HFReference	5000
LFReference	250
Room Rolloff Factor	0
Diffusion	100
Density	100

No Reverb

Gradient Reverb

Full Reverb

Min Distance
Max Distance
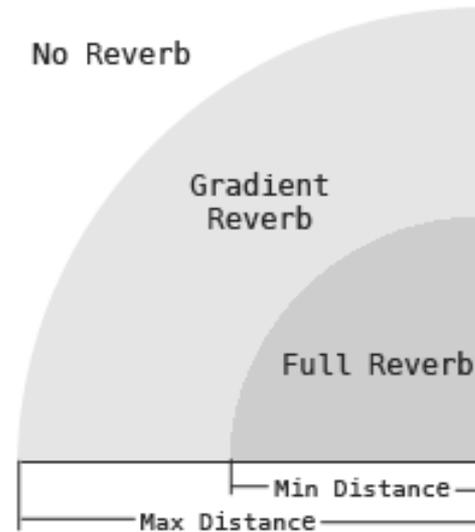
Reverb Zones take an Audio Clip and «distorts» it depending where the audio listener is located inside the reverb zone. They are used when you want to gradually change from a point where there is no ambient effect to a place where there is one, for example when you are entering a cavern.

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To Audio Mixer

Loop File

Use spatial algorithm

Use Reverb Zone

More specific 3D settings

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https://bit.ly/priviteraUniud

An alternative to standard Spatializer
(With first reflections, occlusion and HRTF)