Natural Sound Projection

Embed personalized spatial cues automatically for natural listening.

Accurate Localization

Localize sound from front, back, side and all around you.

Real-time Processing

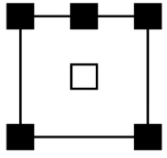
Instantly capture and process audio stream for playback, with low latency.

Externalized Sound

Bring headphone sound out of your head and improve sound depth perception.

Immersive Ambience

Render the sound environment to create the sensation of “being there”.



Stereo and Surround Compatible

Adapt 3D sound rendering to different channel-based audio formats.

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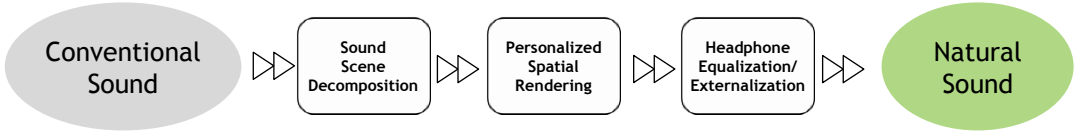
Real-time Audio Signal Processing Platform for Natural 3D Sound Rendering

3D Headphones

Sound That Surround You



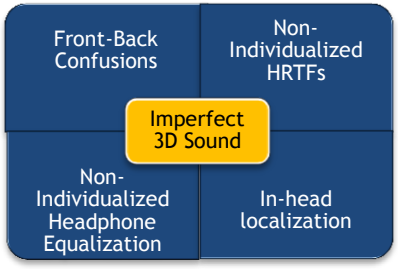
Nguyen Duy Hai, He Jianjun, Phyo Ko Ko, Gan Woon Seng

Introduction

- Human hearing is highly idiosyncratic. Human pinna can be considered as an "acoustic fingerprint"
- Sound waves undergoes reflections, and diffractions with the pinna cavities on its path to the eardrum
- The interaction with the external ear cause unique direction dependent spectral patterns at the eardrum

Challenges

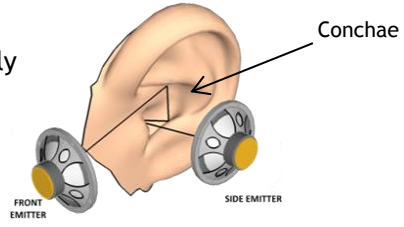
Use of non-individualized binaural recordings will degrade the veracity of the sound



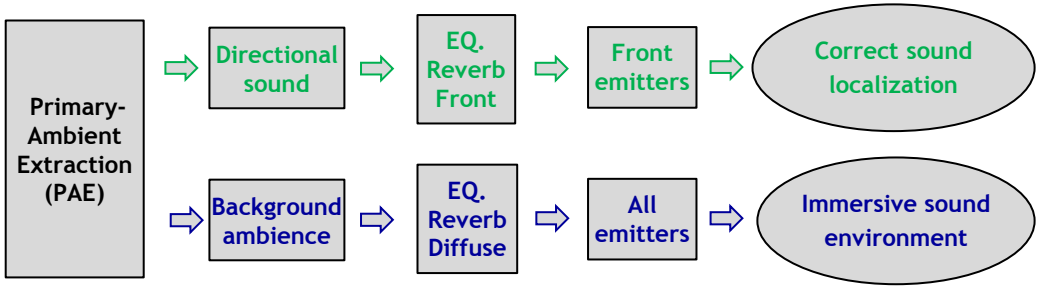
Solution

Natural Sound Projection

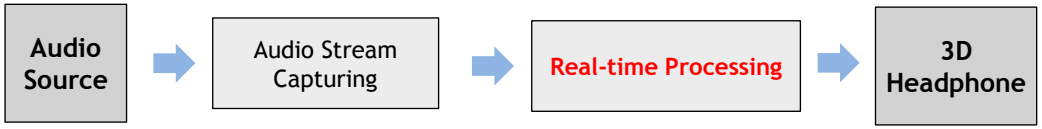
- Embeds individualized pinna cues automatically during playback
- No individualization measurements required
- Reduces Front-Back Confusions
- Lesser timbral coloration



Natural Sound Rendering



Real-time Processing



Specification

- Capturing audio stream and processing instantly during playback
- Software-based, plug & play, no additional hardware required
- Latency: Less than 10s
- Memory Usage: 4 MB
- CPU Usage: 10%

Tested on Intel(R) Core(TM) i7-3770 CPU 3.40GHz

Additional Algorithms:

- Artificial Reverberation
- Stereo widening
- Virtual Surround sound

Performance and Features

3D Audio Headphone	Compared with conventional techniques
Front-Back Confusion	Reduced by 50%
Externalization	Clearer externalization of sound image
Sound Scene Decomposition	Reduce extraction error 10 dB, and extract accurate spatial cues
HRTF Personalization	Select the closest HRTF from 35 subjects CIPIC database
Head Tracking	Adapt to natural head movement

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