Immersive Audio for VR

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VR landscape

- Interactive
  - Games
  - Interactive Movies
- Linear
  - Experiential (e.g., Sports events, concerts, tourism, virtual cinema, etc.)
  - Storytelling / Cinematic
  - Post-Produced
  - Live
Soundfield and object-based representations

packaged product channel-based, PCM only

ingredients+instructions PCM+metadata
Soundfield and object-based representations

Direct capture

Full artistic mix
Be cool, honey bunny
Live and Let Die
Mixing workflow for post-produced VR
Live VR workflows

• Mixing for multiple viewpoints
Artistic controls for VR audio

• Choose how each element behaves
  – Diegetic vs. non-diegetic; Effects, Dialog, Music, etc.
  – Headtracked vs. non-headtracked
  – Rendering modes (stereo, binaural)

• Binaural processing impacts timbre
  – Stereo can be a good thing

• Interactivity
  – Gaze-based activation or emphasis
Panning interfaces for VR

- Matching the video/interaction space
  - Cartesian coordinate automation is good for room reference
Panning interfaces for VR

• Matching the video/interaction space
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Automated panning
Mixing VR in VR?
The Isolator
By HUGO GERNSBACK
MEMBER AMERICAN PHYSICAL SOCIETY

The author at work in his private study aided by the Isolator. Outside noises being eliminated, the worker can concentrate with ease upon the subject at hand.
VR Object Audio on the Web

• Web Audio v1 is incredibly powerful. . .

• . . . but it’s missing some integration with delivery mechanisms

• Consider a Linear content stream
  – 360 Video bitstream
  – Object Audio bitstream

• How do we actually render this packaged object audio?
Mixing workflow for post-produced VR
Components of VR Object Audio Playback

Decoder
- Bitstream
- Audio Objects
- Metadata

Renderer
- Orientation & Position
- Playback Configuration

Rendered Audio
Render at decoder

Bitstream

Orientation & Position

JavaScript

Native

Decoder

Audio Objects

Metadata

Renderer

Rendered Audio

Playback Configuration
Render in Web Audio

Diagram:
- Decoder
  - Bitstream
    - JavaScript
    - Native
  - Audio Objects
    - Metadata
- Renderer
  - Orientation & Position
  - Playback Configuration
  - Rendered Audio
Conclusions

• VR audio is more than head-tracked spatialization over headphones
• Physically-based audio is great but audio production is also art
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• Physically-based audio is great but audio production is also art
• Ego-centric, single-point, audio capture and delivery can be limiting.
• Creating compelling VR experiences requires realism, NOT reality
Conclusions

• VR audio is more than head-tracked spatialization over headphones
• Physically-based audio is great but audio production is also art
• Ego-centric, single-point, audio capture and delivery can be limiting.
• Creating compelling VR experiences requires realism, NOT reality
• Web Audio v1 gets us very close to streaming delivery of linear VR
• Looking forward to making further steps with v.next!