

A person wearing a VR headset and headphones, illuminated with blue and purple light. The person is looking slightly to the right. The background is a gradient of purple and blue.

CRMT250 Immersive Audio

Week 1: Module Launch

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Definitions



Definitions

- **Definition:** Becoming completely Involved (Cambridge University Press 2023)
- **Synonyms:** Enveloping / Fascinating (Thesaurus.com 2023)
- Pauline Oliveros - Deep Listening (Sounds Good 2021)

Definitions




In the module, we will be looking at achieving immersion through:

- Involvement through engaging audio content (e.g. composition, recording)
- Involvement through interactivity (e.g. games, sensors)
- Involvement through spatial envelopment (e.g. binaural, 5.1)



Industry Context

A person wearing a VR headset and headphones is shown in a studio setting, interacting with a virtual environment. The person is holding a controller and looking towards a virtual character. The background shows a studio with various equipment, including a table and a chair.

Industry Context

- Games
- Film
- Live music / events
- Music streaming
- Audiobooks

- Museums / heritage
- Podcasts
- Installations
- Architecture
- Web audio

- Health & well-being
- AR & VR
- Nightclubs
- Funded projects
- Research



Module Overview

Module Overview: Context

- Ties together music production, composition & sound design
- Bridges to more independent study in final year
- Doesn't follow linear structure
- Introduction to several topics
 - Select one to concentrate on
 - Benefit from knowledge of others
 - Work sessions and tutorials to provide tailored support
 - Seek to push yourself beyond your comfort zone
- Focus on creating content with immersive audio technology, rather than technology itself

Module Overview: Topics

Week 1: Module Launch

Week 2: Game Audio

Week 3: 5.1 Sound for Film

Week 4: Non-Teaching Week

Week 5: Binaural Composition

Week 6: Interactive Installations

Week 7: Immersive Performance (TBC)

Week 8: Formative Feedback Tutorials

Week 9: Dolby Atmos

Week 10: Mobile Composition (TBC)

Week 11-13: Work Session + Live projects

Week 15: Summative Feedback Tutorials

Module Overview: Other Immersive Audio Topics

- Web audio
- AR / VR
- Podcasts
- Audiobooks
- ASMR
- Music mixing
- Sound Therapy / Well-being
- Surround mixes for Spotify / streaming
- Soundwalks

Module Overview: Assessment

1

AUDIO
STEMS

2

SPATIAL
AUDIO
PROJECT

3

INDIVIDUAL
REPORT

- See Learning Space for full Assessment Brief
- Read it carefully!
- Get feedback on your work
- Importance of research
- Support available



Immersive Experience

Immersive Experience

A person is standing on a beach, facing the ocean. They are wearing a dark jacket and a backpack. They are holding a binaural recording rig, which consists of a vertical pole with two microphones at the top, one for each ear. The background shows waves crashing on the shore and a cloudy sky.

- We see and hear the world in 3D
- We can hear in 3D because of the head-related transfer function (HRTF)
 - There are inter-aural differences between our ears
 - The shape of our outer ears and shoulders introduce filtering and delays
- Our 3D sound experience is therefore unique
- This can be partially replicated through binaural recording and spatialisation (TEDx 2020)



Historical Context

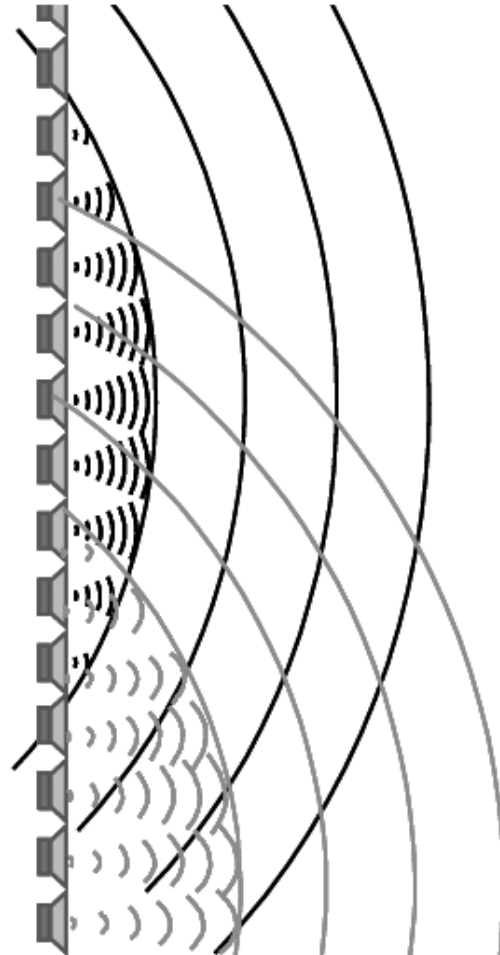
Historical Context – Live Music




- Cathedrals were designed to create an immersive experience
- Composers thought about positioning of (groups) of musicians (Holman 2008)
- Personal Address (PA) systems
- Stadium & arena concerts – speakers around venue
- Combination of performance and playback (TEDx 2020)
- Wave Field Synthesis (Paterson 2022)...

Wave Field Synthesis (WFS)

2D position
of sound
sources on
stage...



...replicated b
interference
patterns of
multiple
speakers



Historical Context – Music Production

- Beatles recordings in mono (TEDx Talks 2020)
- Stereo – extreme panning (TEDx Talks 2020)
- Quadraphonic – short-lived format
- Surround mixes in 5.1 e.g. Tony Visconti (Buskin 2003)
- Dolby Atmos mixes for streaming services (Rothermich 2021)

Historical Context – Experimental Music

- Acousmonium (1970s-1980s) – diffusion system designed by Francois Bayle in 1974
- Used at GRM (Groupe de Recherches Musicales)
- 3D arrays BEAST / MANTIS / SARC

SONIC LAB

SONIC ARTS RESEARCH CENTRE

Historical Context – Personal Systems

- Personal stereos: mobile immersion
- iPods + mp3 players
- Mobile phones
- Streaming apps: higher level of interactivity?
- Streaming services: spatial audio now available

Historical Context – Cinematic Surround Formats



- Various experimentation with screen and surround speakers
- Adoption of 5.1 with release of Star Wars
- Immersivity through ‘direct-ambient’ approach and use of LFE channel
- See Holman (2008) for more detail
- Dolby Atmos: Object-based and 3D

Historical Context – 360° audio

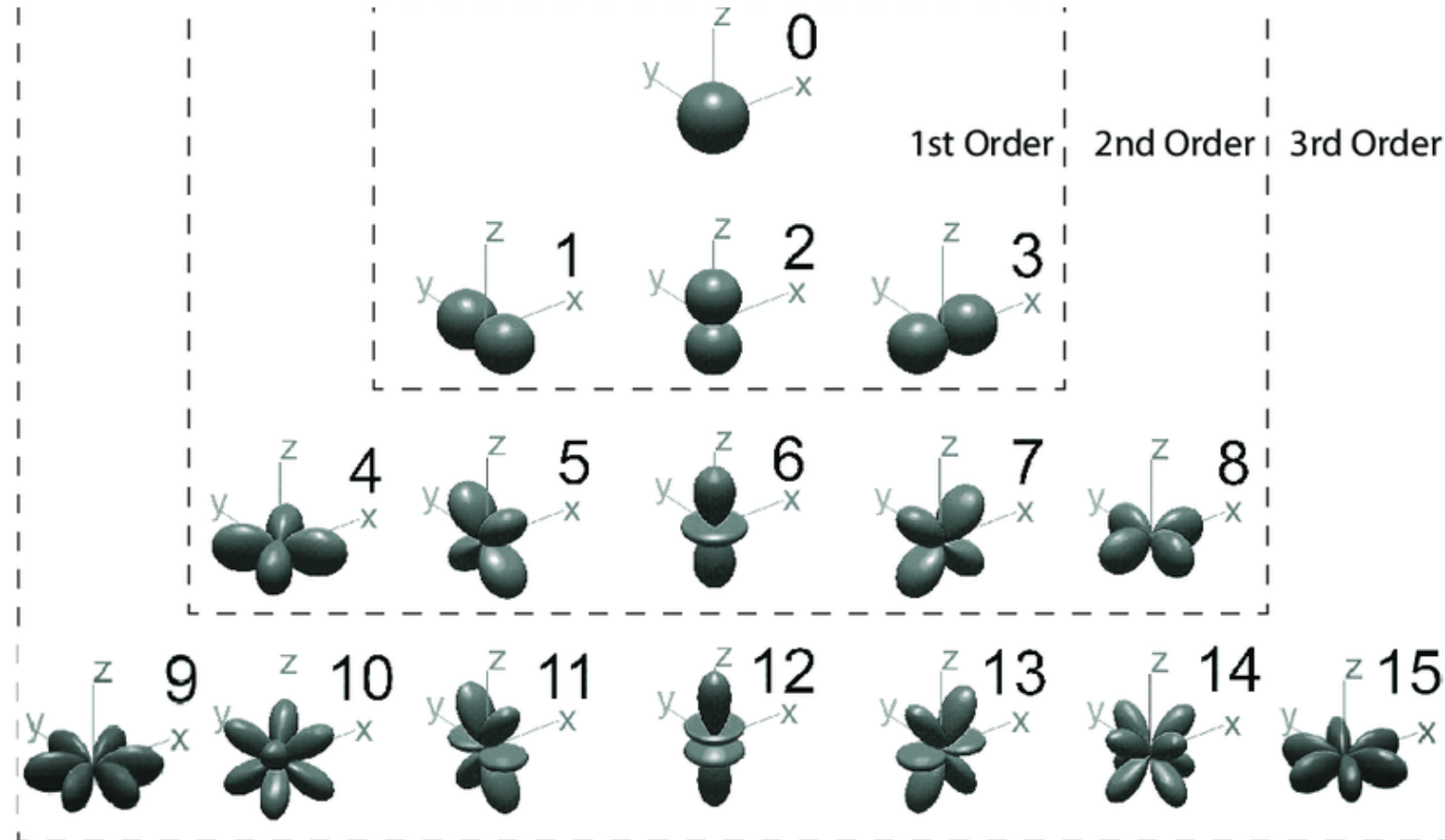
- Facebook & YouTube support 360° video
- Need for 360° audio to support this
- Similarly with games engines and interactive online content



Historical Context – Ambisonics

- Stereo (1D) & 5.1 (2D): channel-based

- Ambisonics (3D): object-based



- 1st– 3rd order: increase in directionality detail
- Extension of mid-side recording: creates a ‘virtual microphone’
- A-format (recording) and B-format (listening)

Historical Context – 3D Formats



- Dolby Atmos (3D) combines advantages of object-based and channel-based (Wagner 2022)
- Apple uses its own format (Rothermich 2021)



Examples

Examples

- Music experience: Kid Amnesia Exhibition (Epic Games 2022): [Link](#)
- Music Composition: Assembly 2020: [Link](#)

KID AMNESIA EXHIBITION



- Virtual musical instruments: Korg Gadget Studio(Kirn 2021): [Link](#)
- Music performance: Envelop SF / Envelop Stream: [Link](#)
- Storytelling: [Link](#)

Examples

SNØMASKN (chimera) - Aurélie Ferrière

3

8

3

4

13

Roman Theatre of Regina Tiberina

Raga Radialti

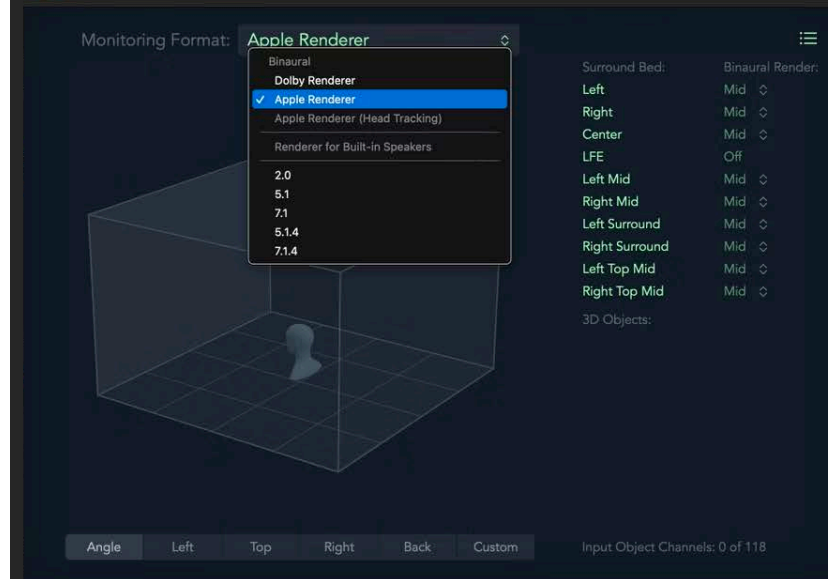
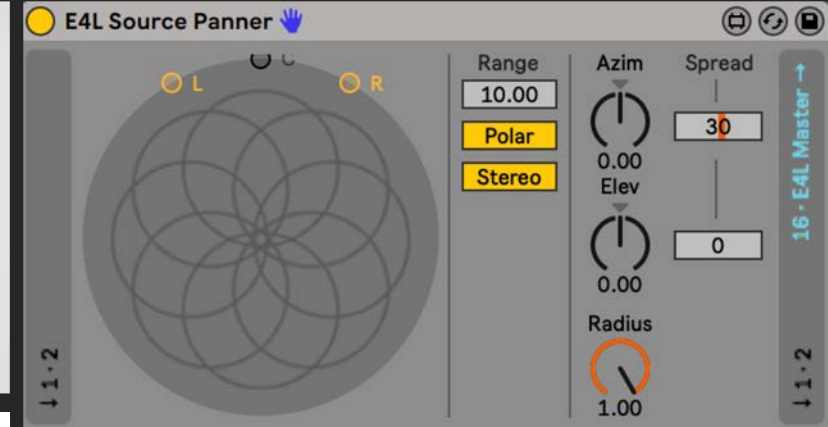
- Online installation: Acoustic Atlas (van Toder & Lopez 2020): [Link](#)
- Heritage: Sonosynthesiser (BBC Arts 2021): [Link](#)
- Well-being: Mindflow (Brady 2021): [Link](#) / Sleepscapes (BBC Radio 1 2021): [Link](#)
- Content creation (Zoom 2018): [Link](#)



Tools

Tools

- Zoom H3 recorder
 - Available in Stores
 - Binaural monitoring
- Binaural microphones & dummy head
 - Mimic HRTF
 - Available in Stores
- Envelop for Live
 - Max for Live devices
 - Free download with account
 - Envelop (2021)
- Logic Pro Spatial Audio Tools
 - Logic 10.7 / Monterey or later
 - Wu (2022)



Dolby Atmos



Conclusion

Conclusion

- Immersive audio promotes involvement through interactivity and/or enveloping the audience
- There are loads of industry opportunities for immersive content creators across many disciplines
- Please see Learning Space for details of the module structure and assessment
- The field has evolved through various music and visual media recording and playback technologies.
- A range of examples included music and sound design applications
- Tools for recording and creating spatial audio content were reviewed



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