

Codificação binaural em cinema virtual

Binaural coding in virtual cinema

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Sound in cinema *O som em cinema* (1)

- The soundtrack (o conteúdo sonoro):

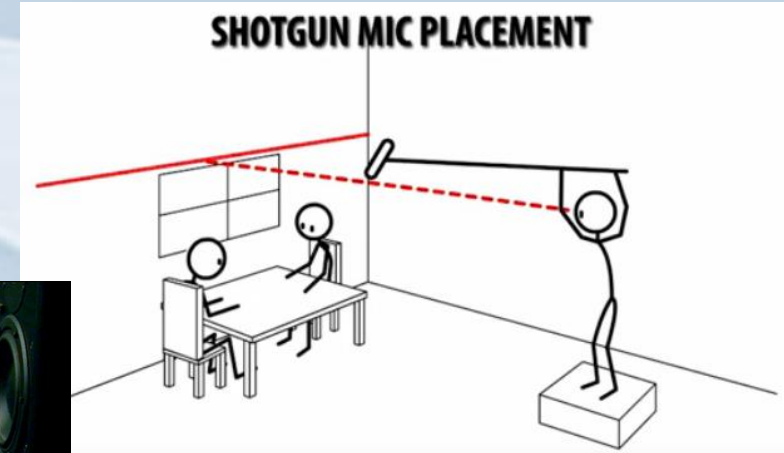
- Sound collection and recording
- Mixing, panning and sound design (digital)
- Soundtrack format selection and reproduction in cinema room

<http://www.mixedlogic.com/>



(example of screen speaker)

<https://www.studiobinder.com/blog/sound-recording/#Recording-Distance>



Sound in cinema *O som em cinema* (2)

- Spatial sound perception by the spectators is demanded:

- Co-incidence of image and sound objects,
- Objects localizations in the scenes,
- Sound field production with an **Immersive**

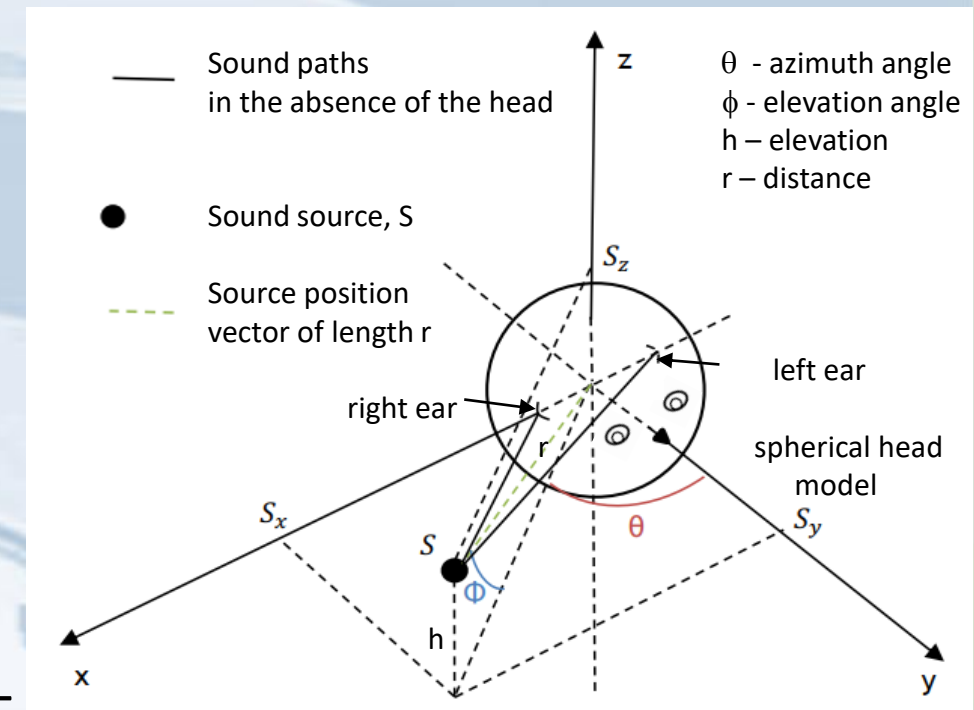
approach requires more than:

- Stereo (reduced azimuth range)
- Surround (reduced elevation range)

- Requires 3D controlled sound field

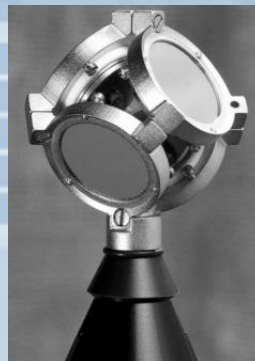
- The main technical problem:

- To produce the required sound field **at ears level** in a cinema room environment for **all** spectators (large sweet-spot)



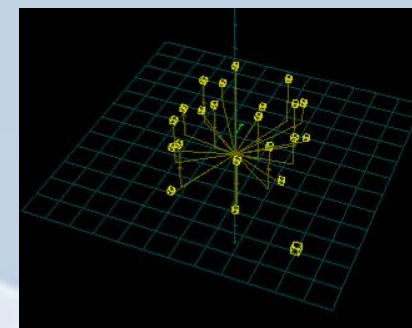
Sound in cinema *O som em cinema* (3)

- Some 3D approaches:
 - Ambisonics – high order



microfone array

reproduction with, for ex: stacked-rings or custom layout)



<http://www.blueripplesound.com/custom-layouts>

- Dolby Atmos
- DTS:X



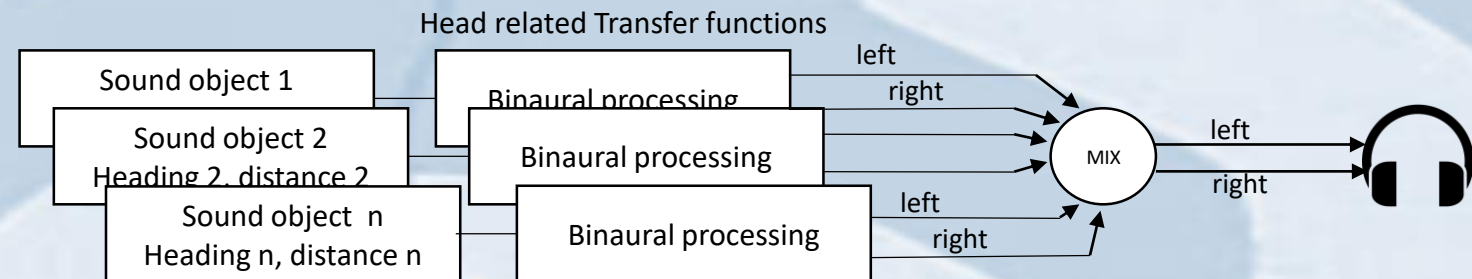
- Sound object concept: dynamic
- PROBLEMS?



Binaural coding *Codificação binaural* (1)

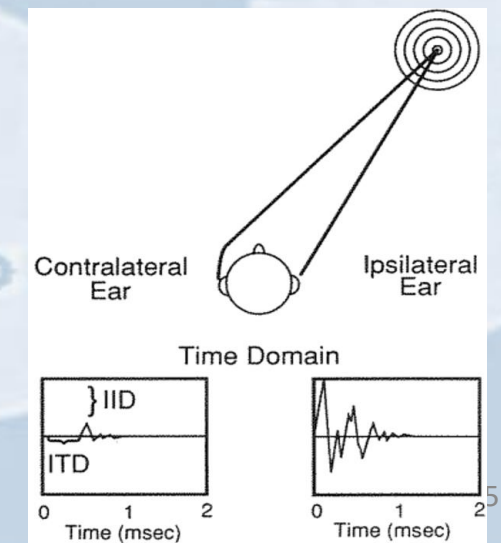
- What is binaural coding?
 - Many - to - 2 channels processing, for emulation of the human hearing at the ear channels entrance

- How does it work?



- Binaural fusion, ITD, ILD

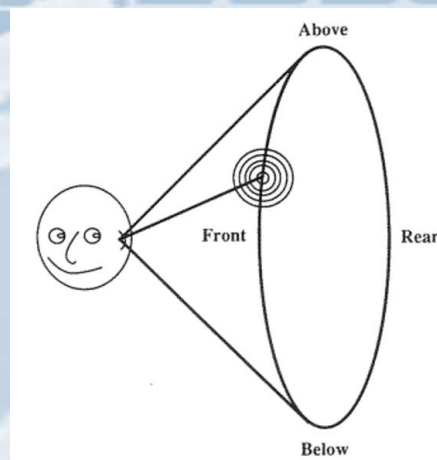
- Human source localization capacities and incapacities
 $3 \pm 4,7$ degrees azimuthal at 0 degrees, worse in other directions



Binaural coding *Codificação binaural* (2)

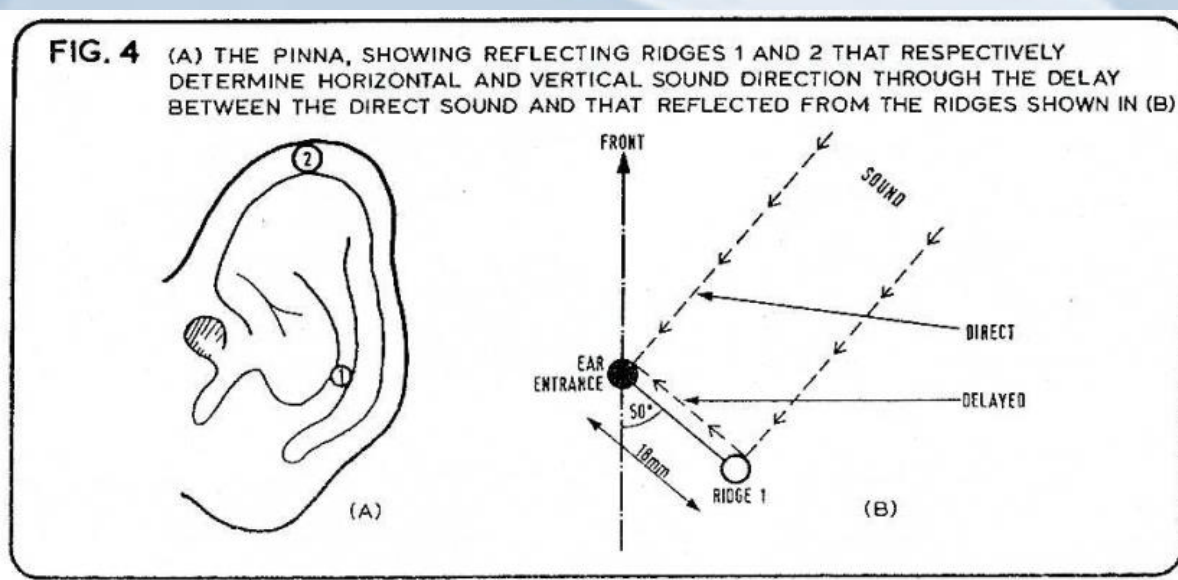
- Human source localization capacities and incapacities (continued)

Cone of confusion



Front-back confusion – pinna effects

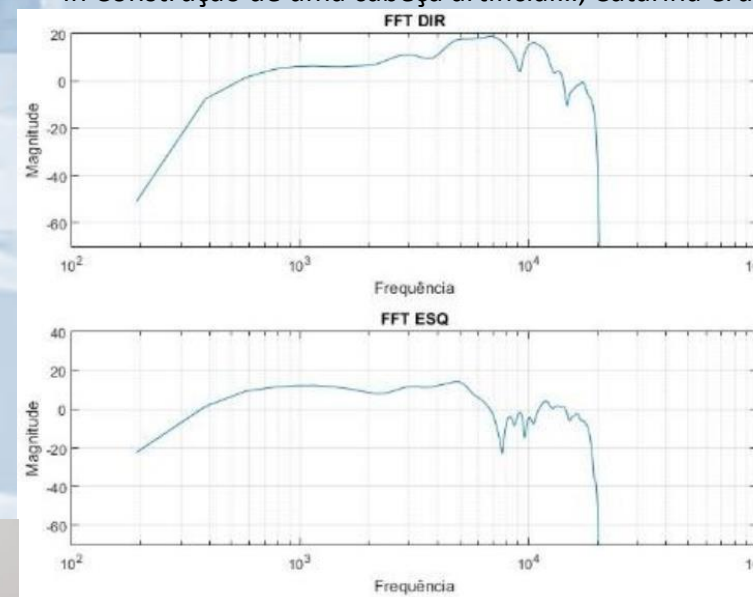
In Dummy head recording, Michael Gerzon



Binaural coding *Codificação binaural* (3)

In Construção de uma cabeça artificial..., Catarina Cruz

- Head related transfer functions
- (existing databases: CIPIC, IRCAM; ARI, ATK, Google, LPF-ESI, etc)
- Pick-up or Synthesize source object left and right ear Signals



With manequim



B&K HTS

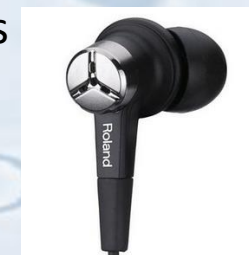


Neumann



LPF-ESI

or use a real head with in-ear microphones



Roland

in-ear mic + earphone

- Play with in-ear headphones

Binaural coding in cinema *Codificação binaural em cinema* (1)

- Documentary or news – binaural pick-up and reproduce

- Original movie - pick-up, mix and design (3D)
(Works with virtual reality)

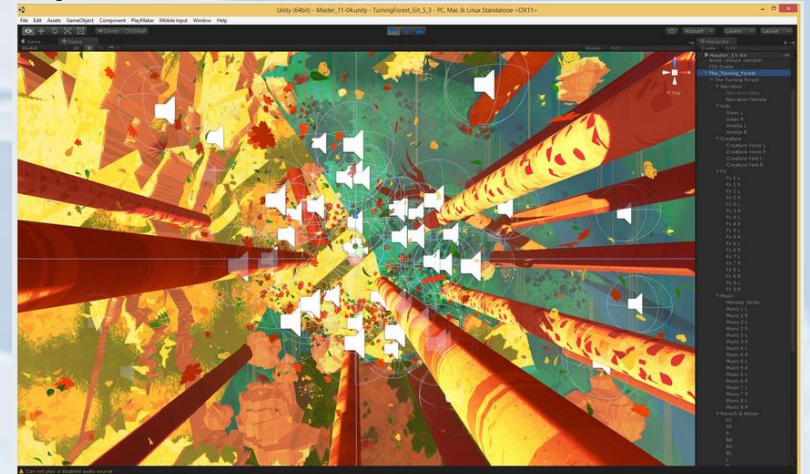
- 360 degrees video

- HOAmbisonics pick-up, head orientation processing, binaural rendering and reproducing

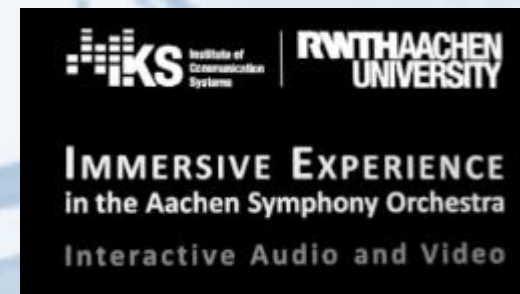
Example interactive video (Aachen University)

WEARING HEADPHONES is required

<https://youtu.be/XZY3nPnDCQw>



<https://www.bbc.co.uk/rd/blog/2016-05-virtual-reality-sound-in-the-turning-forest>





That's it for now. Thanks!

I'm glad to take questions...