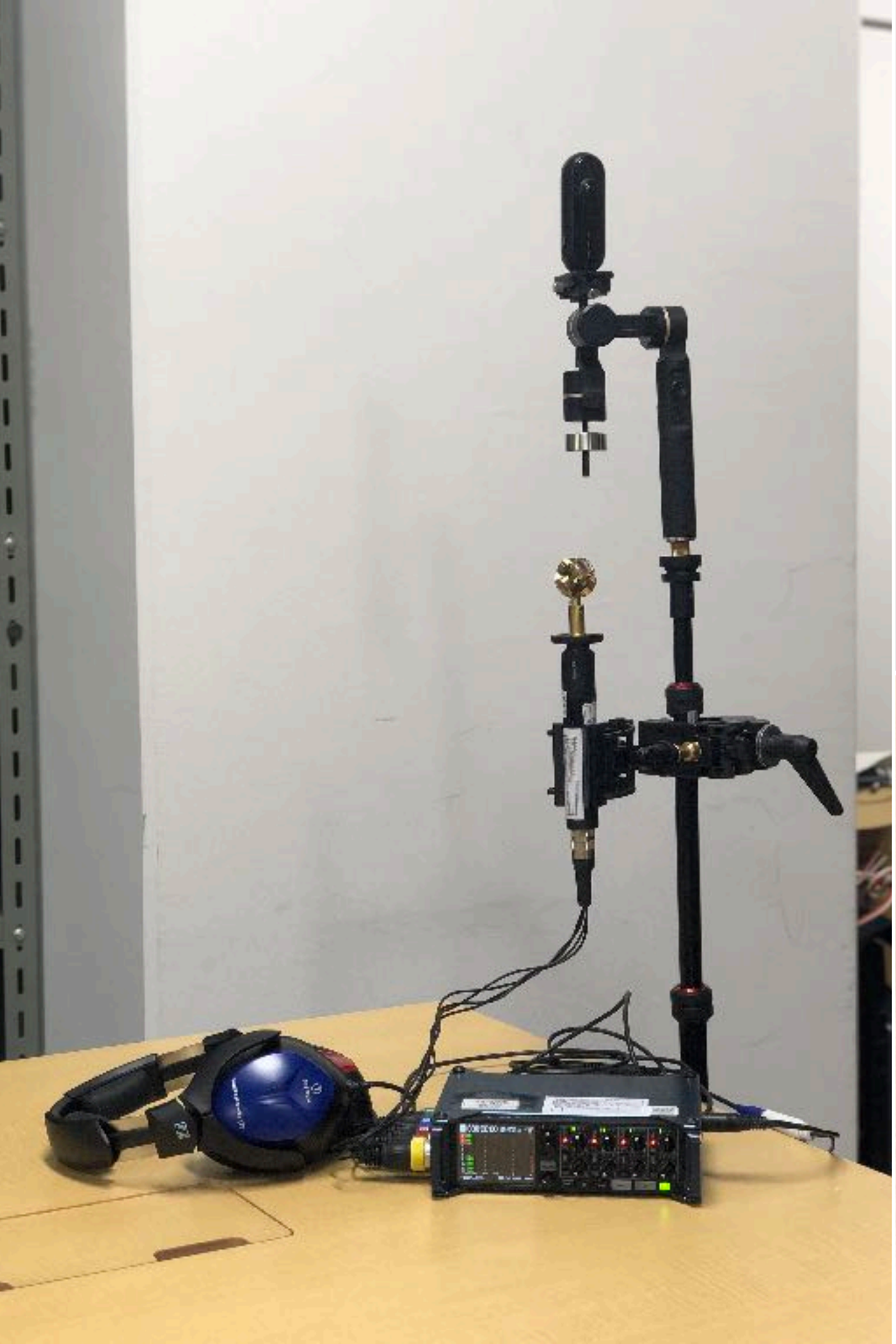
CÉSAR D. SALVADOR

TALLER



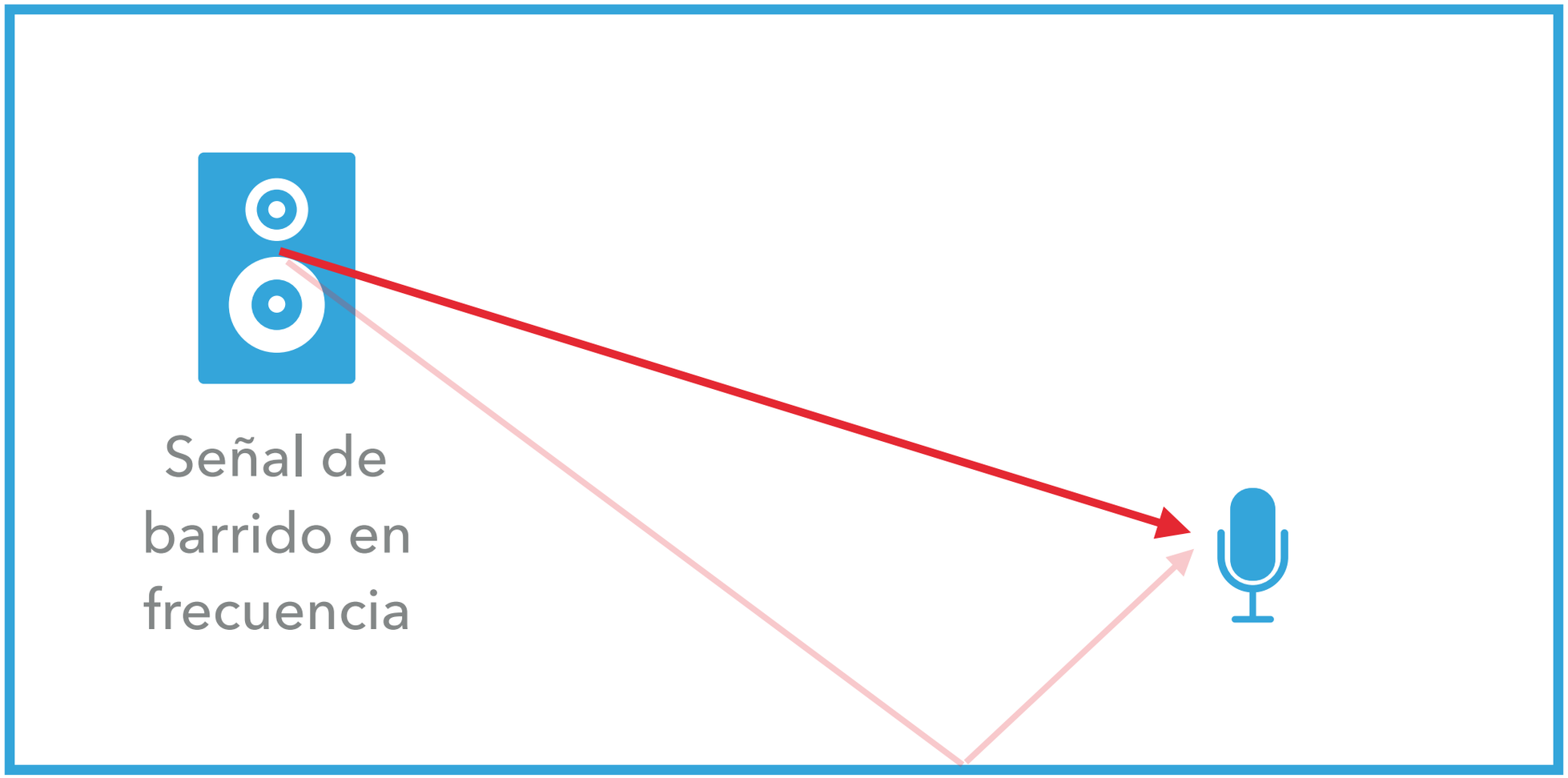
LISTA DE APLICACIONES A INSTALAR

- Reaper (free evaluation version)
- Facebook Spatial workstation VST (en windows se require instalar Mp4Box y Python 2.7)
- Insta360 STUDIO (360 editing software)
- Unity (free personal version)
- Resonance Audio – Google Developers

HTTPS://CESARDSALVADOR.GITHUB.IO/A3D/

	Entorno	**Oyente**
Tiempo	Room impulse response (RIR)	Head-related impulse response (HRIR)
Frecuencia	Room transfer function (RTF)	Head-related transfer function (HRTF)

ROOM IMPULSE RESPONSE (RIR)



SPATIAL ROOM IMPULSE RESPONSE

SIMULADOR RÁPIDO DE PROPAGACIÓN ACÚSTICA

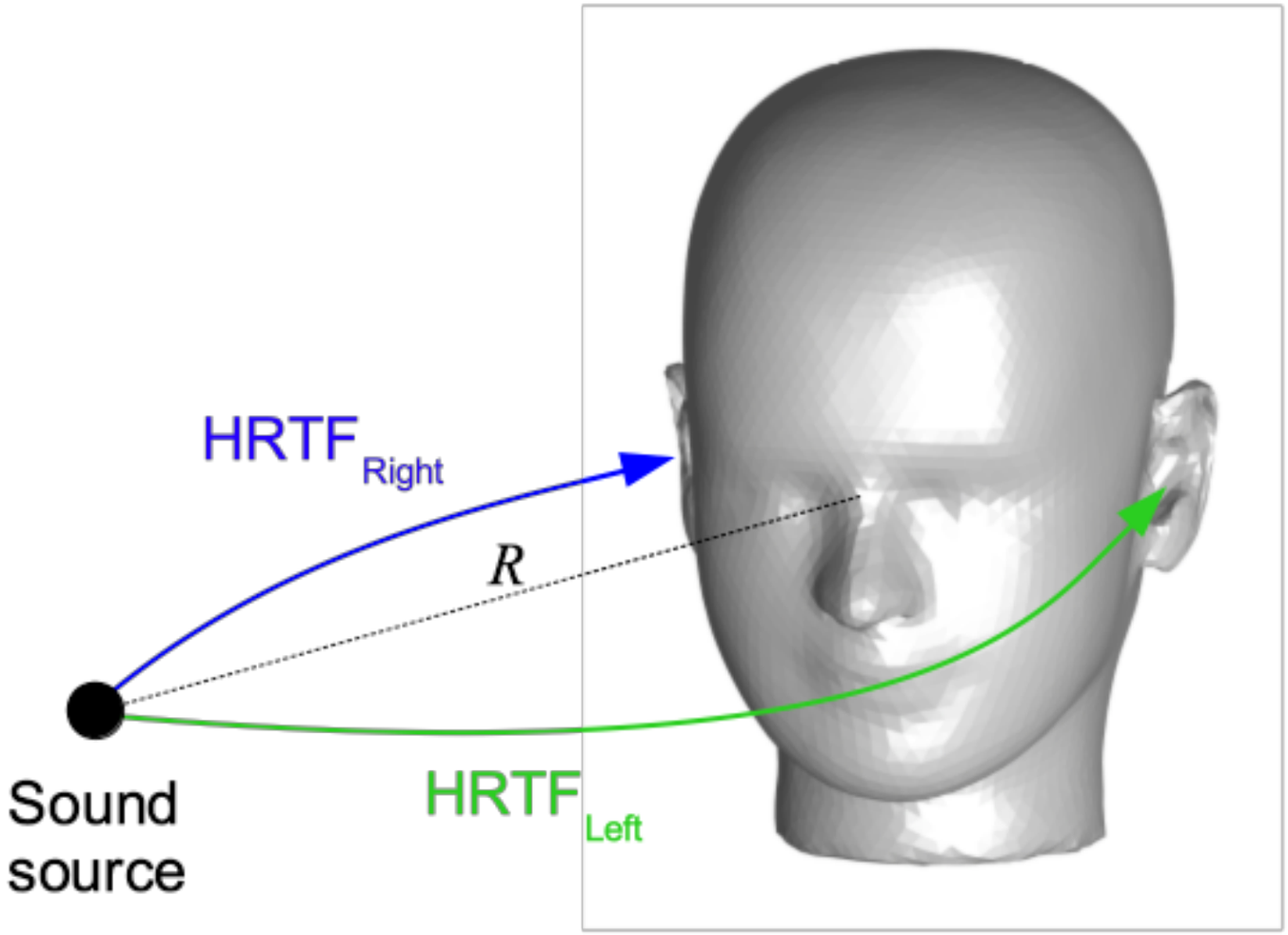
HTTPS://GITHUB.COM/JINNSJJ/ARD-SIMULATOR

J. Shi, Universidad de Tohoku

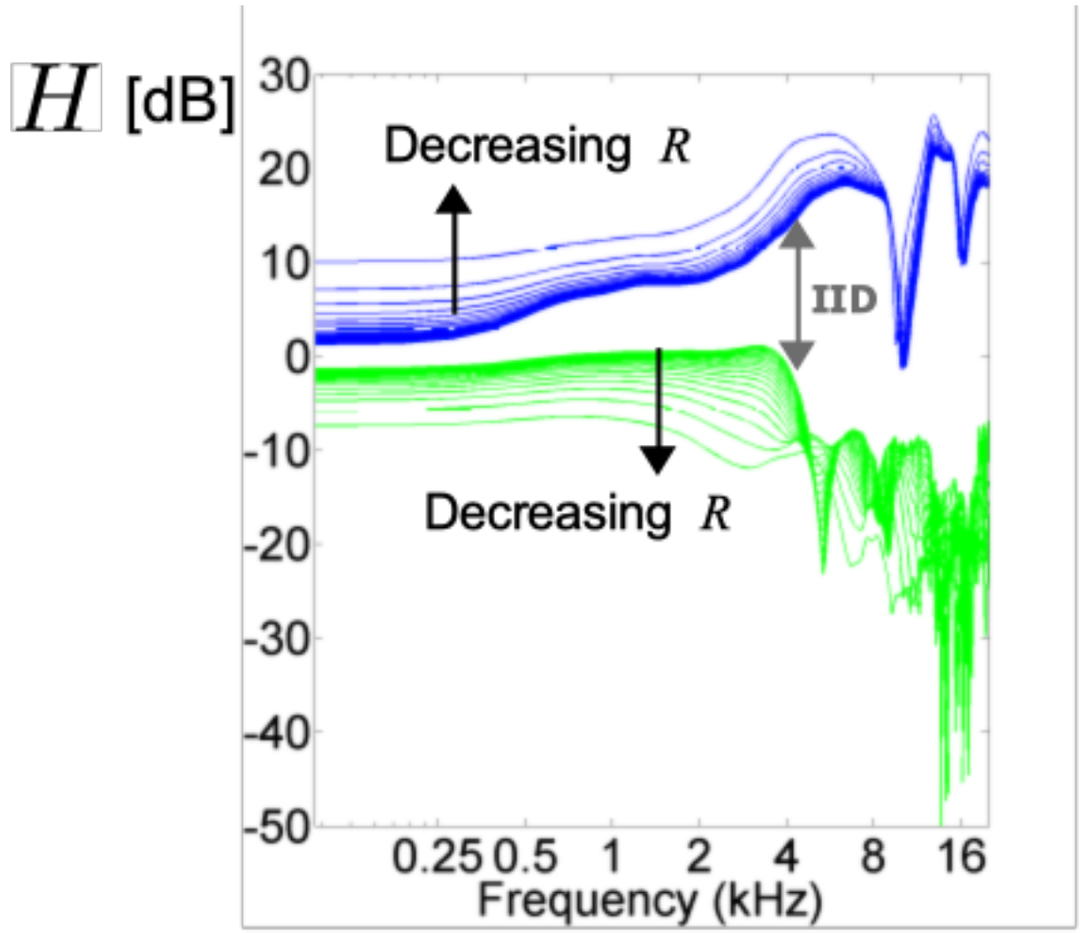
BASADO EN DESCOMPOSICIÓN ADAPTATIVA RECTANGULAR

[1] J. Shi, C. D. Salvador, J. Treviño, S. Sakamoto, and Y. Suzuki, “Spherical harmonic representation of rectangular domain sound fields,” in *Int. Symp. Universal Acoustical Communication*, Sendai, Japan, Oct. 2018. [http://www.tfc.tohoku.ac.jp/event/4212.html]
[2] N. Raghuvanshi, R. Narain, and M. C. Lin, “Efficient and Accurate Sound Propagation Using Adaptive Rectangular Decomposition,” IEEE Trans. Vis. Comput. Graphics, vol. 15, no. 5, pp. 789–801, Sep. 2009.

HEAD-RELATED TRANSFER FUNCTION (HRTF)



R: distance from the center of the head

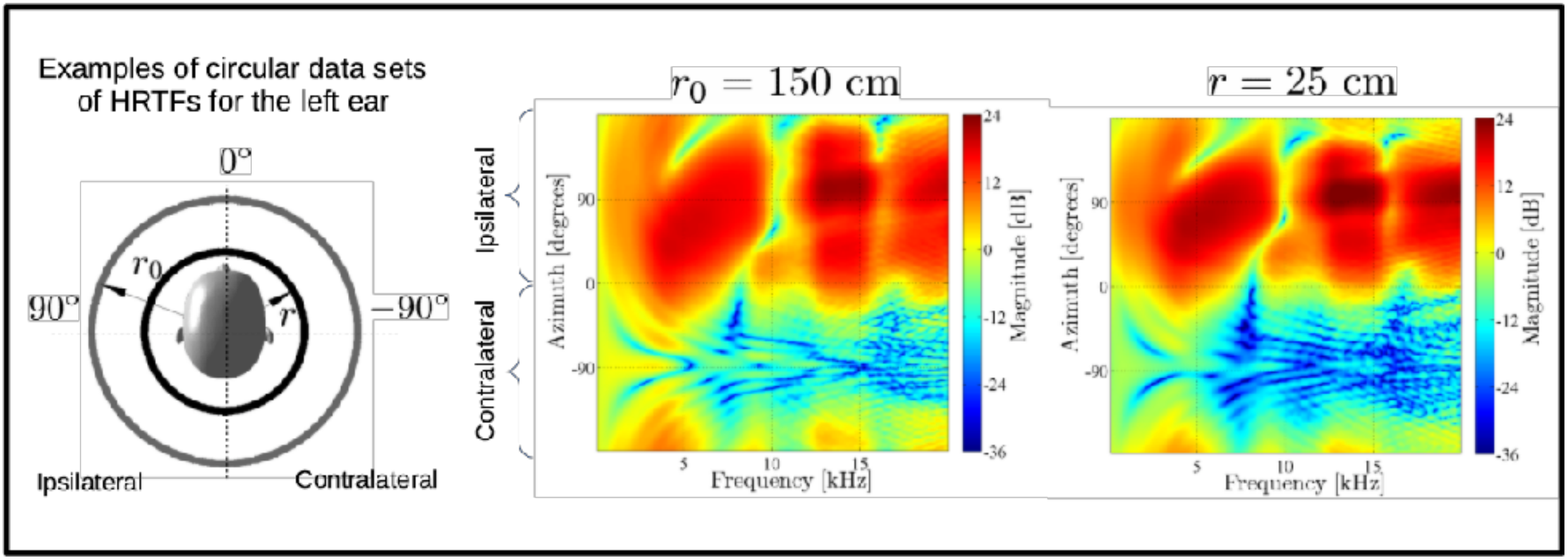


R = 15, 20, … , 100 cm.

IID: Interaural intensity difference

HRTFs calculated using the boundary element method (BEM) (Otani and Ise, 2006)

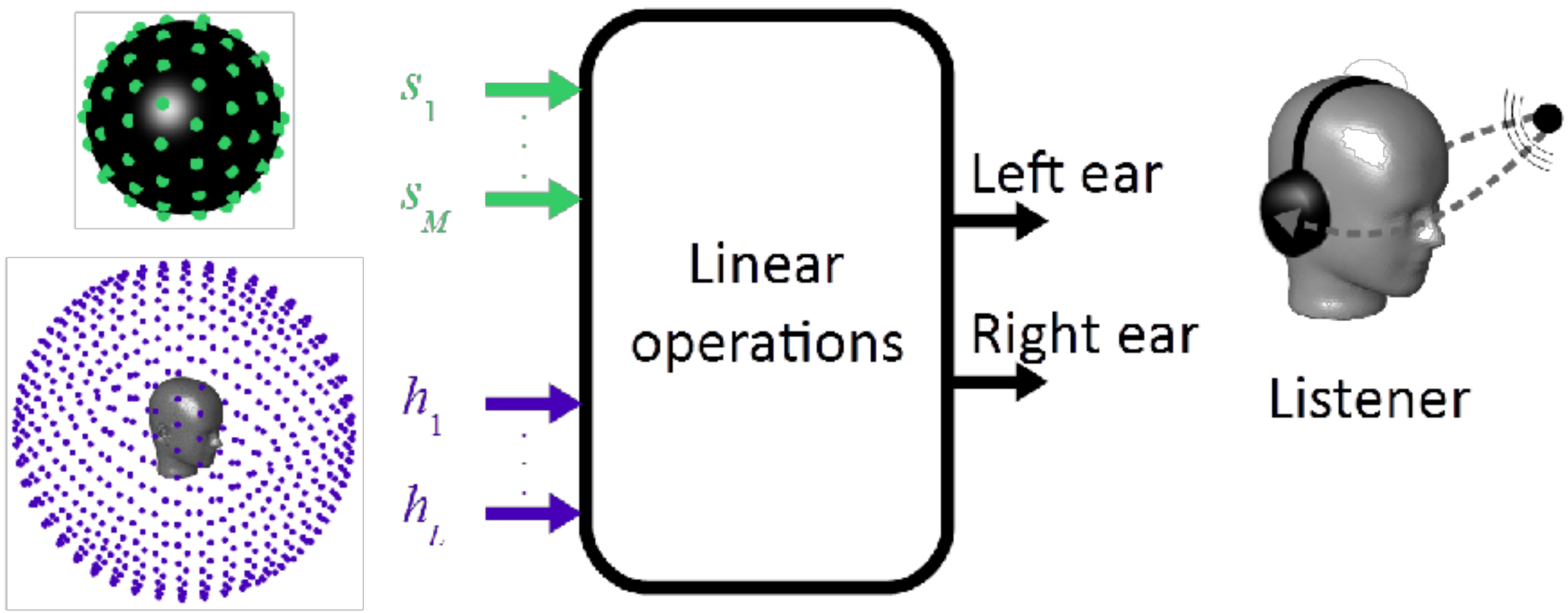
HEAD-RELATED TRANSFER FUNCTION (HRTF)



C. D. Salvador, S. Sakamoto, J. Treviño, and Y. Suzuki, “Distance-varying filters to synthesize head-related transfer functions in the horizontal plane from circular boundary values,” Acoust. Sci. Technol., vol. 38, no. 1, pp. 1–13, Jan. 2017.
C. D. Salvador, S. Sakamoto, J. Treviño, and Y. Suzuki, “Dataset of near-distance head-related transfer functions calculated using the boundary element method,” in Proc. Audio Eng. Soc. Int. Conf. Spatial Reproduction —Aesthetics and Science—, Tokyo, Japan, 2018.

SISTEMA DE REGISTRO Y REPRODUCCIÓN BINAURAL

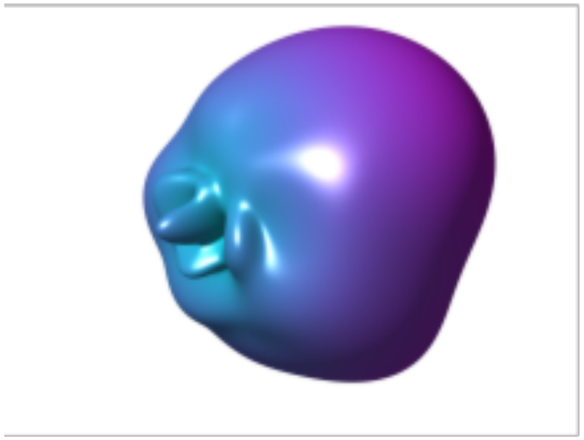
Compact spherical microphone
array of ***M*** elements.

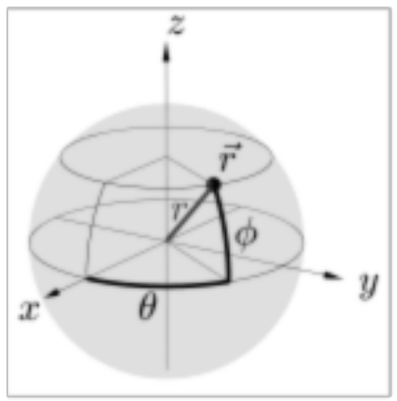


Data set of HRTFs characterized
for a set of ***L*** sound sources.

SPHERICAL HARMONICS AND SPHERICAL FOURIER TRANSFORM

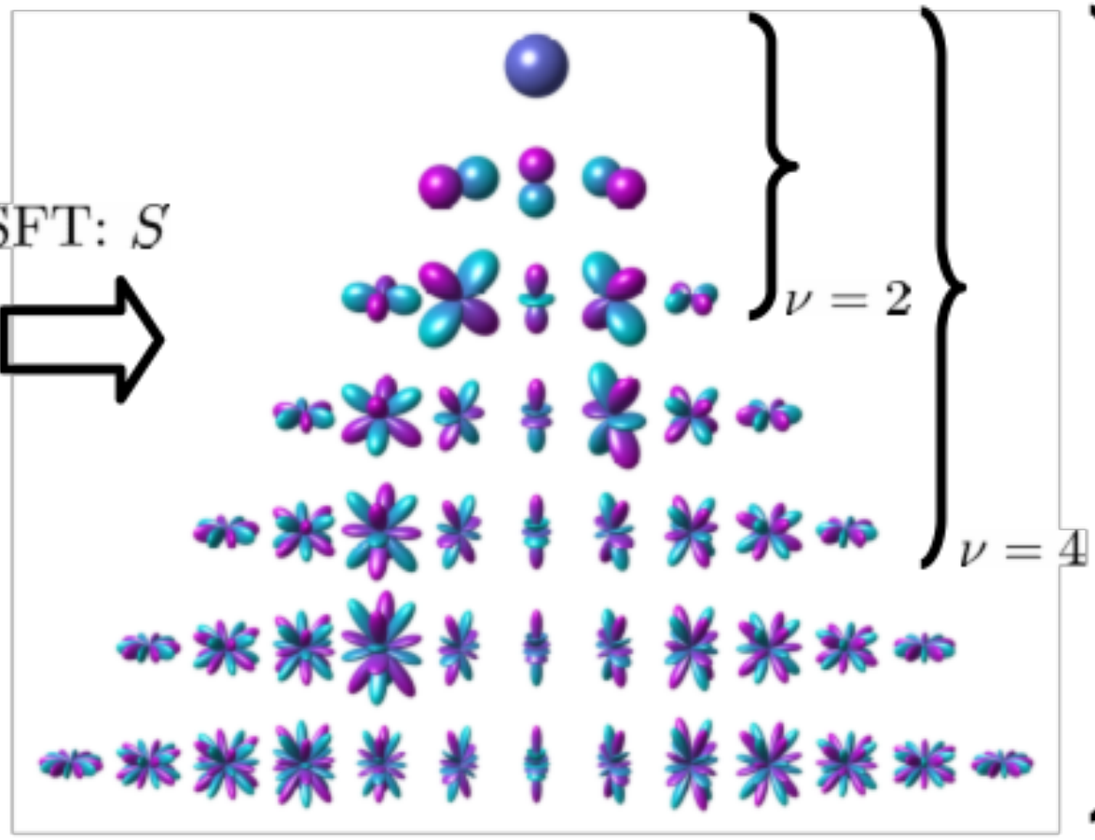
$p(\theta, \phi)$





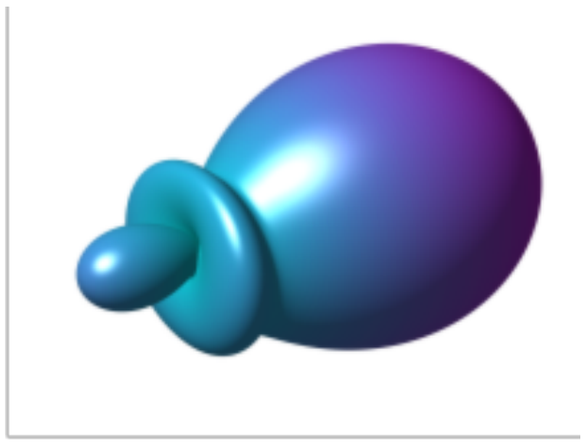
$p_{\nu\mu}$

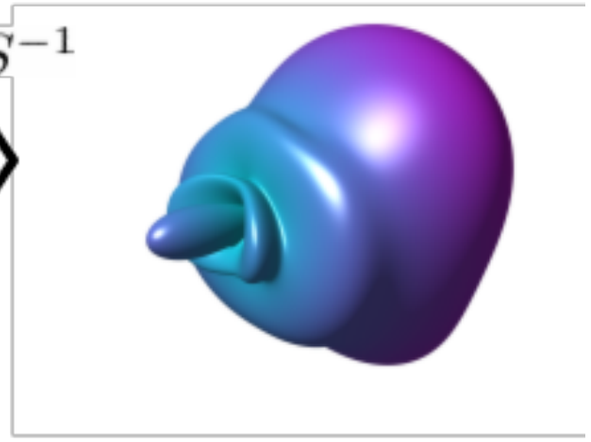
SFT: S

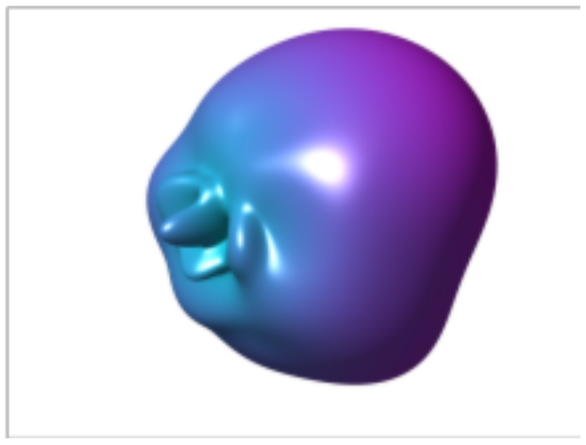


Orthonormal functions along directions

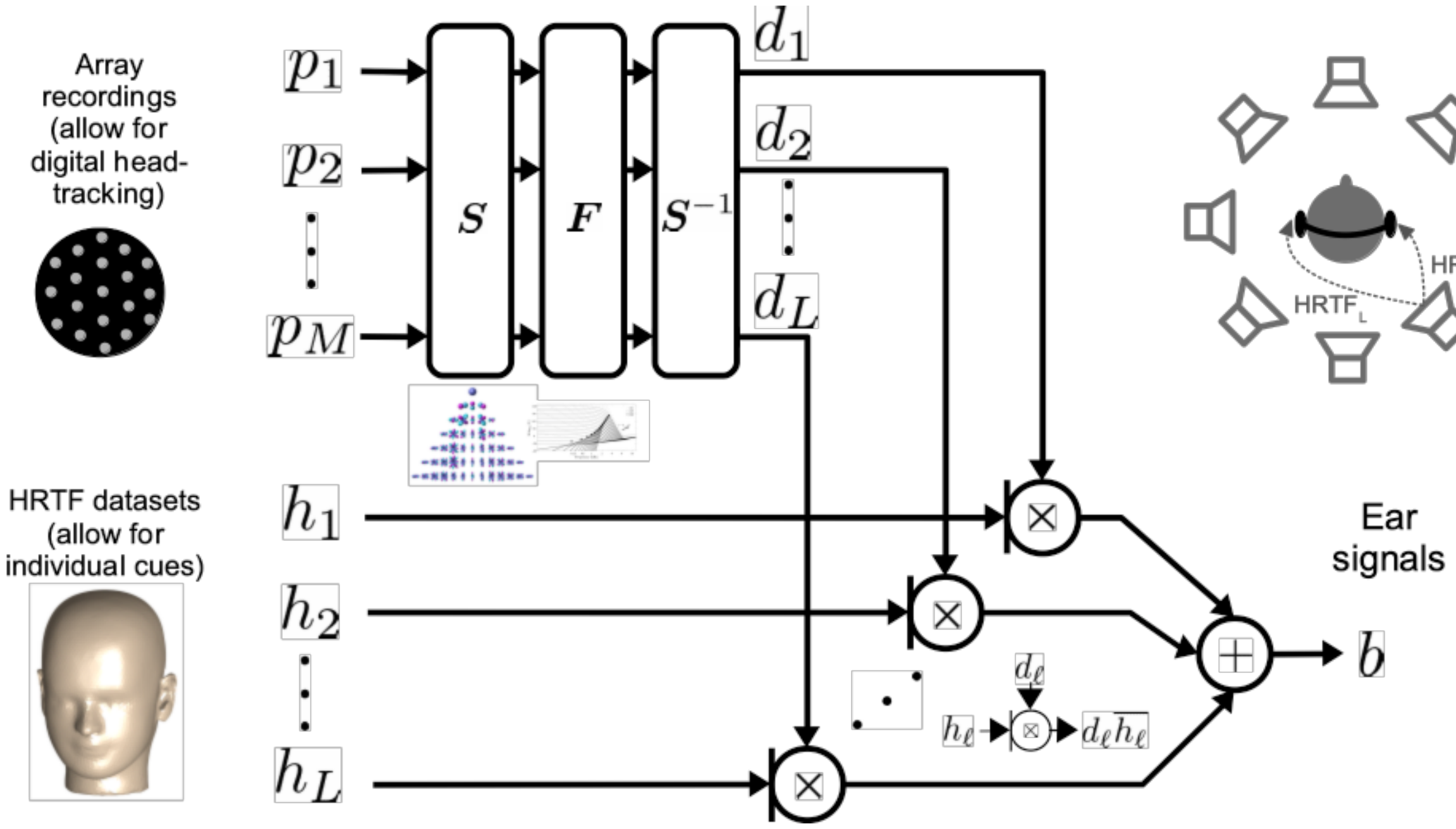
ISFT: S^{-1}







BINAURAL SYSTEM



RESUMEN DE TECNOLOGÍA DE SONIDO 3D

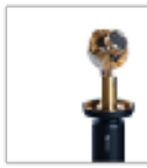
RECORDING

Stereo recordings

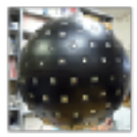
Dummy head

5.1 microphone array

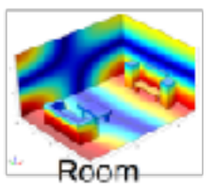
Tetrahedral microphone (First order ambisonics)



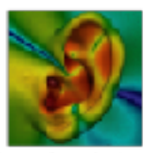
Spherical microphone array (High order ambisonics)



VIRTUAL ACOUSTICS



Room impulse responses



Head-related transfer functions

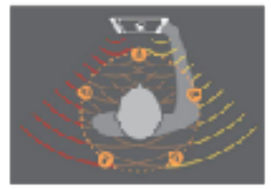
PROCESSING

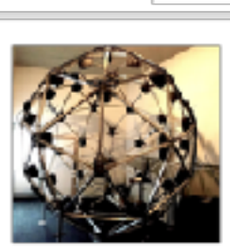
ENCODING

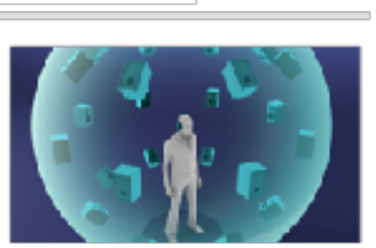
EDITION

DECODING

REPRODUCTION





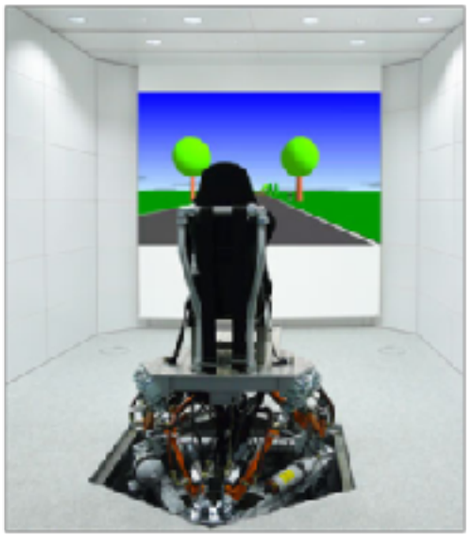


Centered on the listener (spherical geometries)

Large audiences (rectangular geometries, WFS)

MULTISENSORY INTEGRATION

Real



Virtual

Mixed

APLICACIONES ADICIONALES

- Personal sound zones
- Shared sound zones

T. Betlehem, W. Zhang, M. Poletti, and T. Abhayapala, “Personal sound zones: Delivering interface-free audio to multiple listeners,” IEEE Signal Process. Mag., vol. 32, no. 2, pp. 81–91, Mar. 2015.

T. Shimizu, J. Trevino, S. Sakamoto, and Y. Suzuki, “A multi-zone approach to sound field reproduction based on spherical harmonic analysis,” Acoust. Sci. Technol., vol. 36, no. 5, pp. 441–444, 2015.

http://www.individualsoundzones.com/

GRACIAS POR SU ATENCIÓN

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