CÉSAR D. SALVADOR

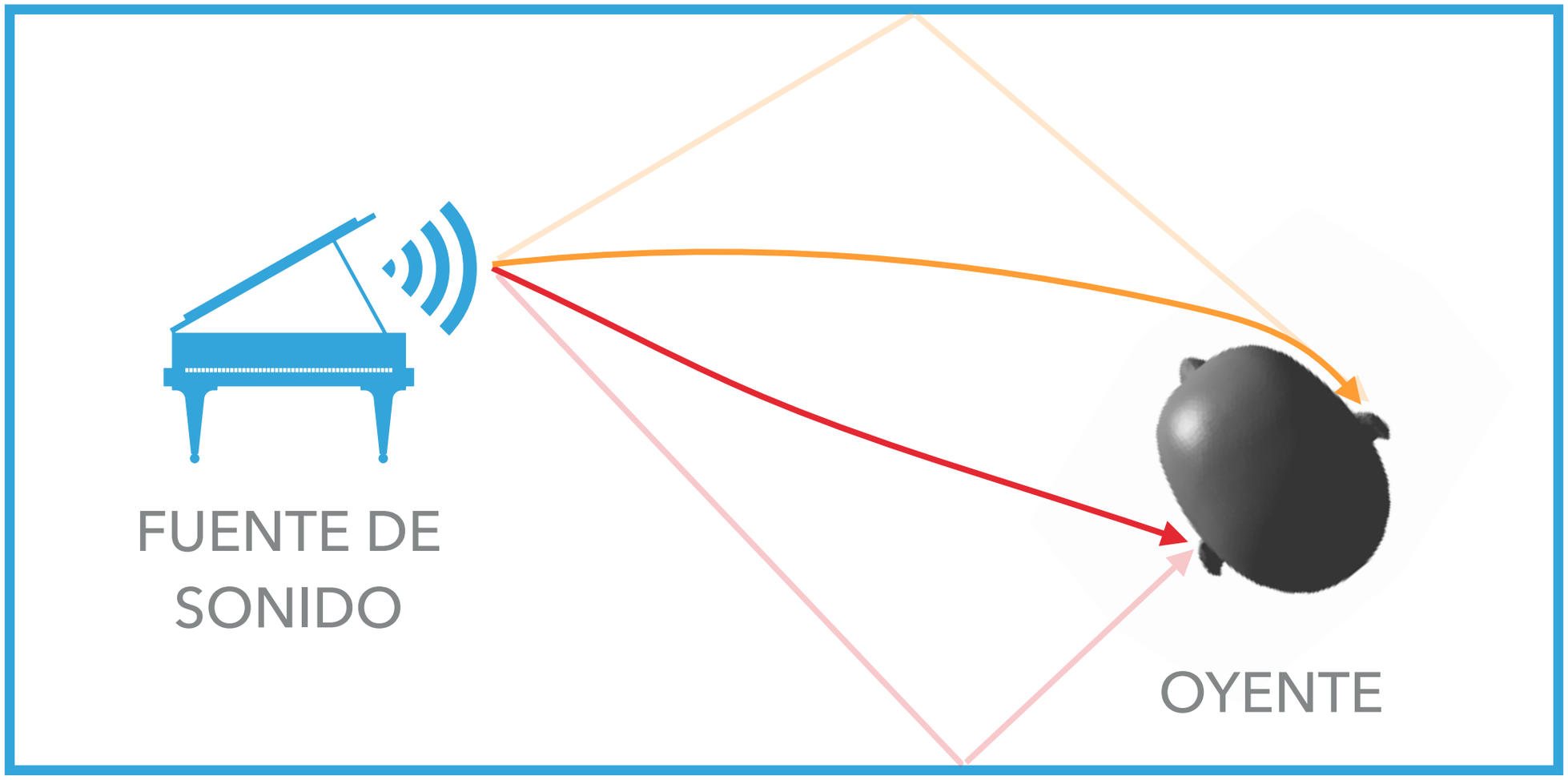
MODELOS DE PROPAGACIÓN ACÚSTICA Y AUDICIÓN BINAURAL

PERCEPCIÓN DEL ESPACIO ACÚSTICO

EVENTO EN EL ESPACIO

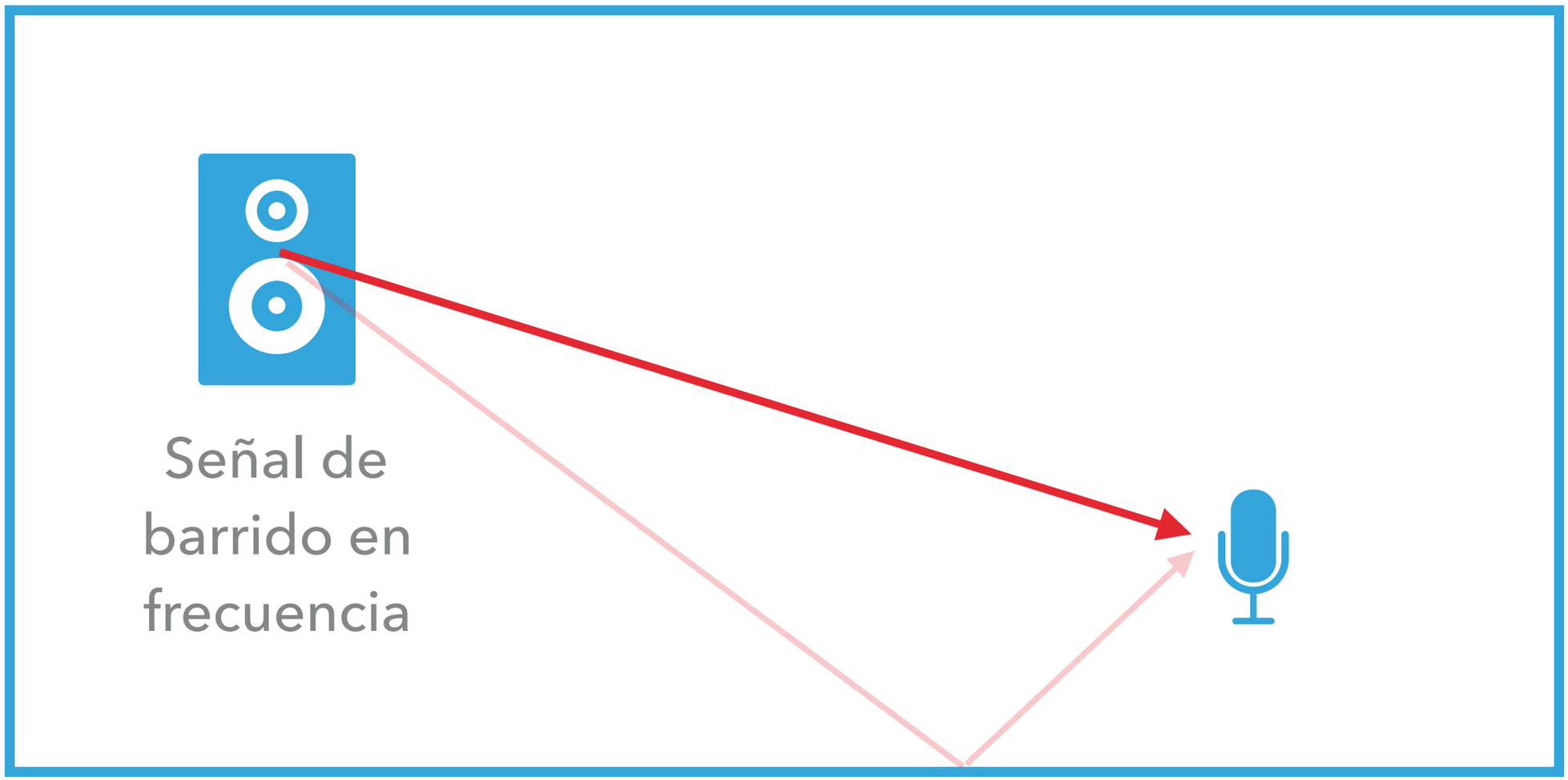
ESPACIALIDAD DEL EVENTO

INFORMACIÓN ACÚSTICA Y AUDICIÓN ESPACIAL



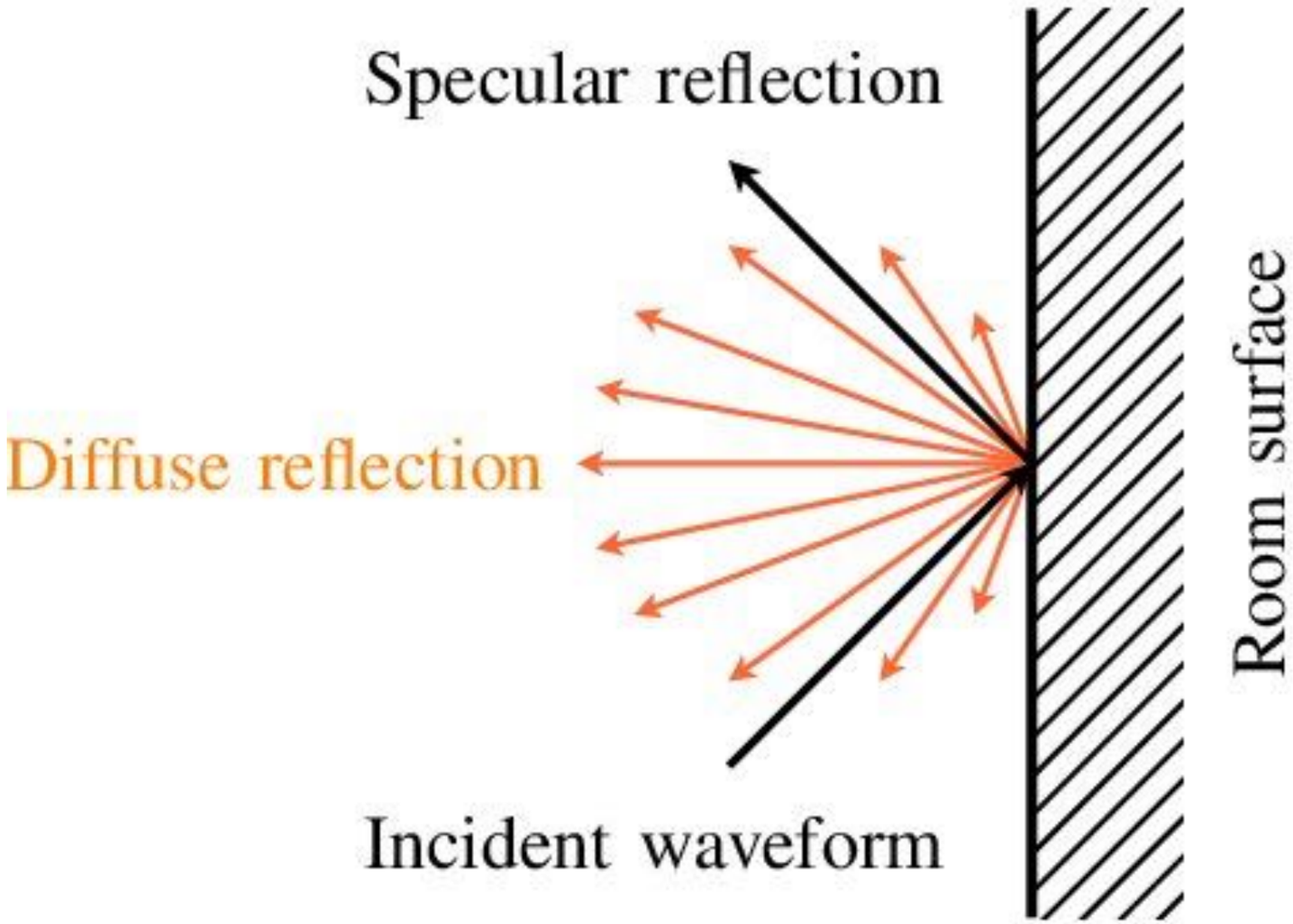
	Entorno	**Oyente**
Tiempo	Room impulse response (RIR)	Head-related impulse response (HRIR)
Frecuencia	Room transfer function (RTF)	Head-related transfer function (HRTF)

ENTORNO: ROOM IMPULSE RESPONSE (RIR)



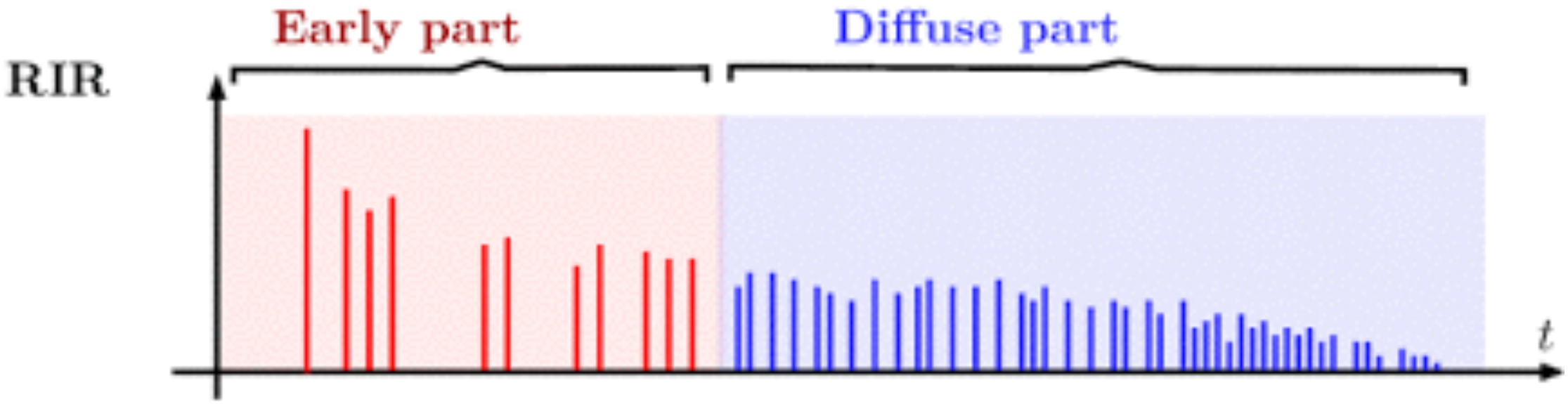
ENTORNO

ENTORNO: ROOM IMPULSE RESPONSE (RIR)

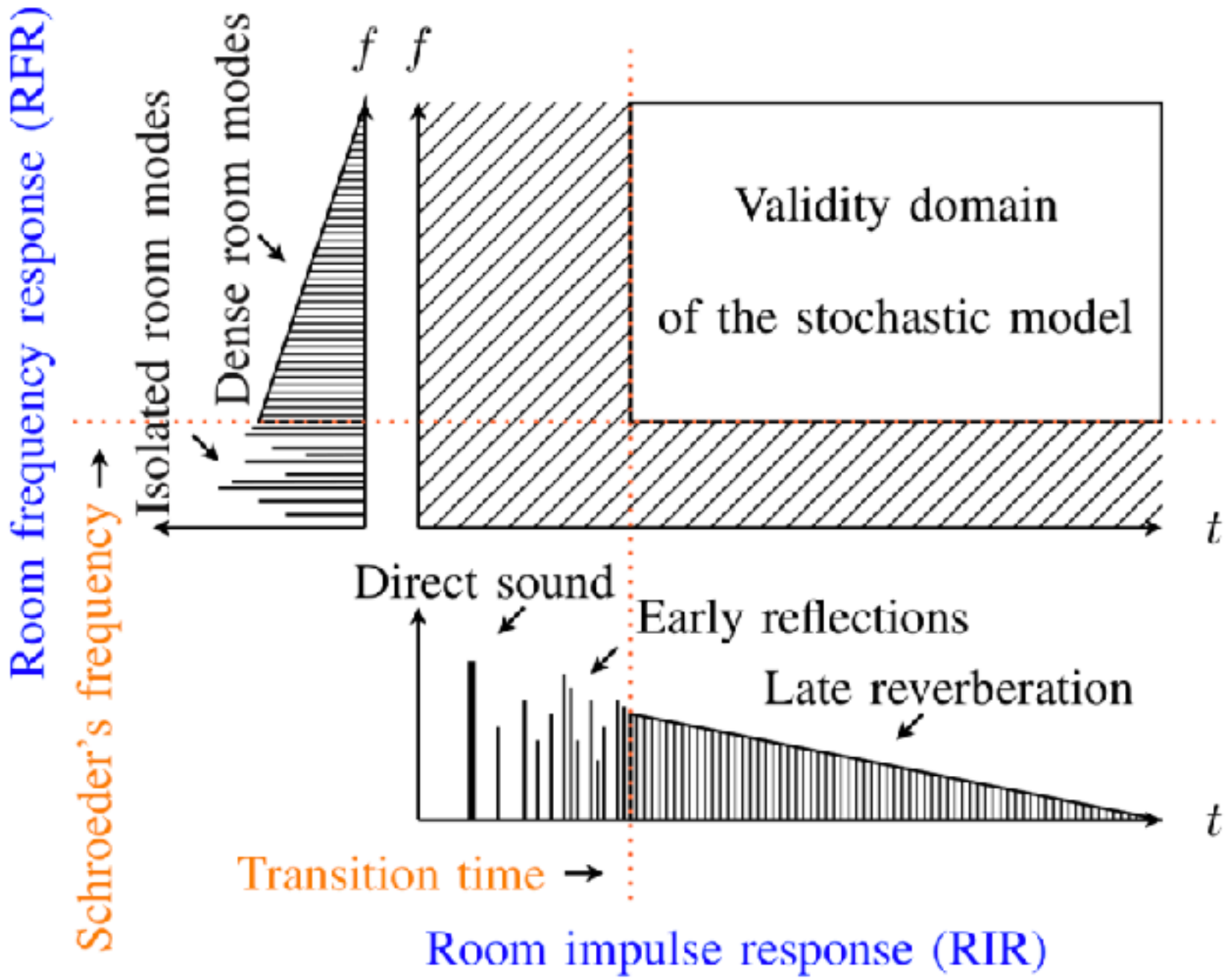


R. Badeau, “Unified stochastic reverberation model,” in Proc. 26th European Signal Process. Conf., Rome, Italy, 2018.

ENTORNO: ROOM IMPULSE RESPONSE (RIR)



ENTORNO: ROOM IMPULSE RESPONSE & ROOM TRANSFER FUNCTION



R. Badeau, "Unified stochastic reverberation model," in Proc. 26th European Signal Process. Conf., Rome, Italy, 2018.

ENTORNO: SPATIAL ROOM IMPULSE RESPONSE

SIMULADOR RÁPIDO DE PROPAGACIÓN ACÚSTICA

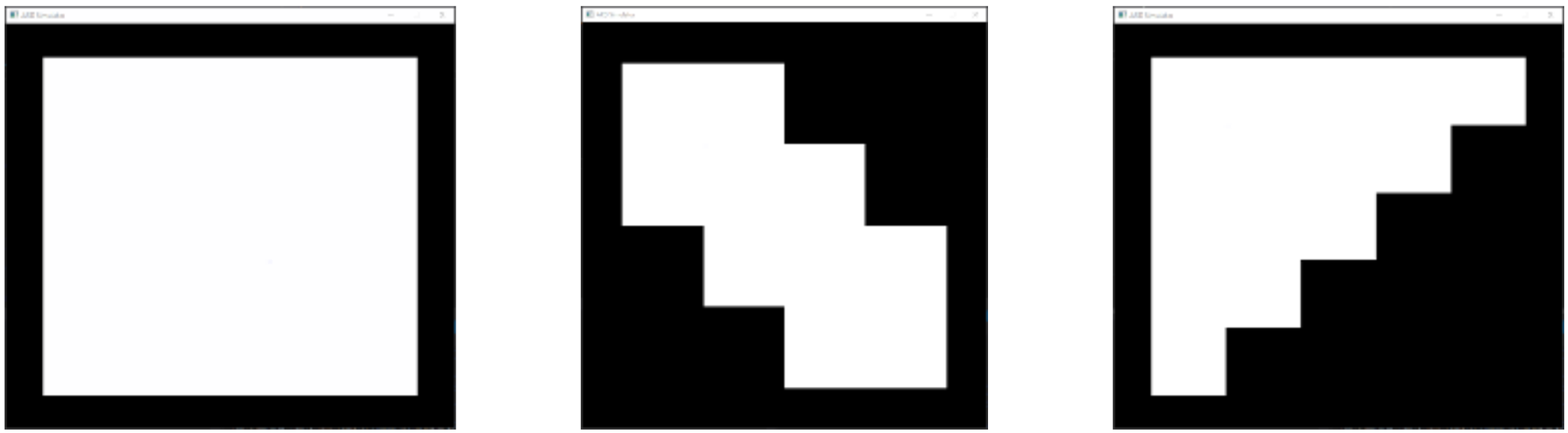
HTTPS://GITHUB.COM/JINNSJJ/ARD-SIMULATOR

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.

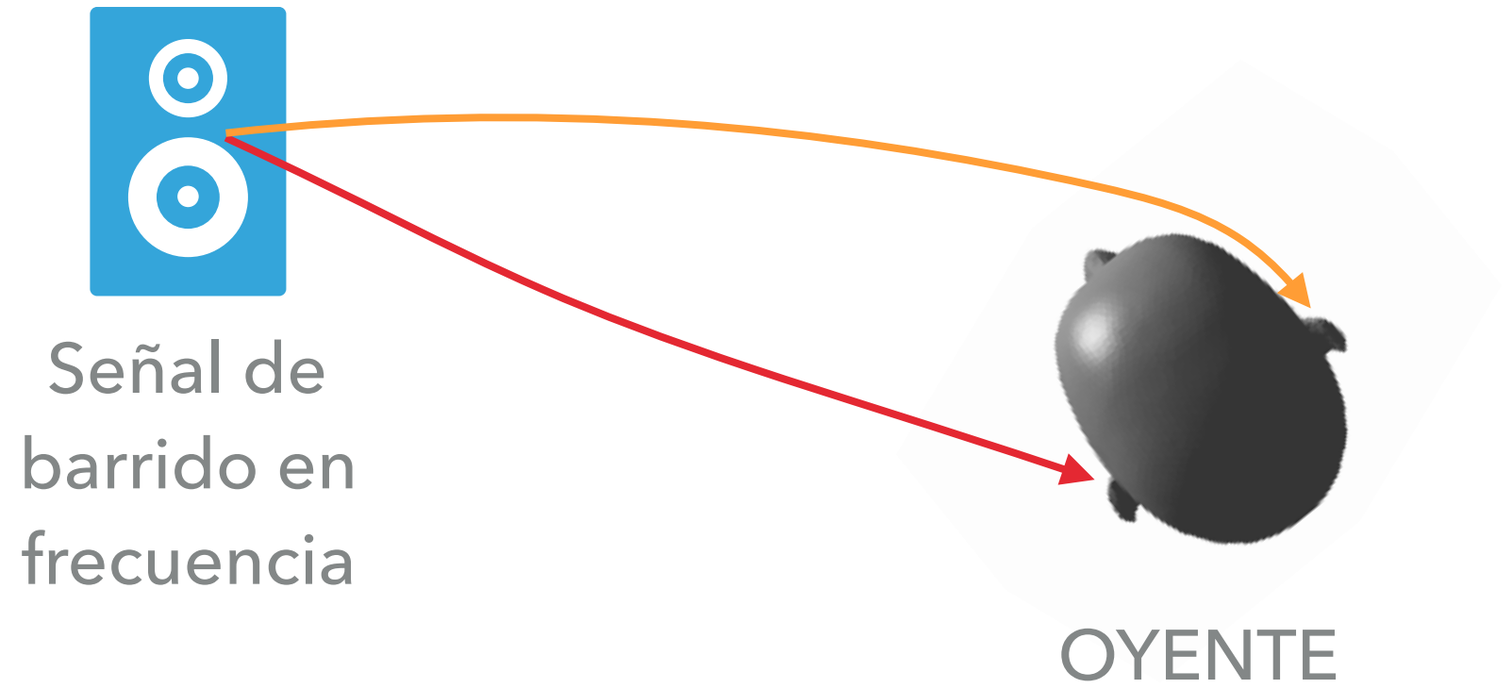
PROPAGACIÓN ACÚSTICA EN EL TIEMPO Y EL ESPACIO



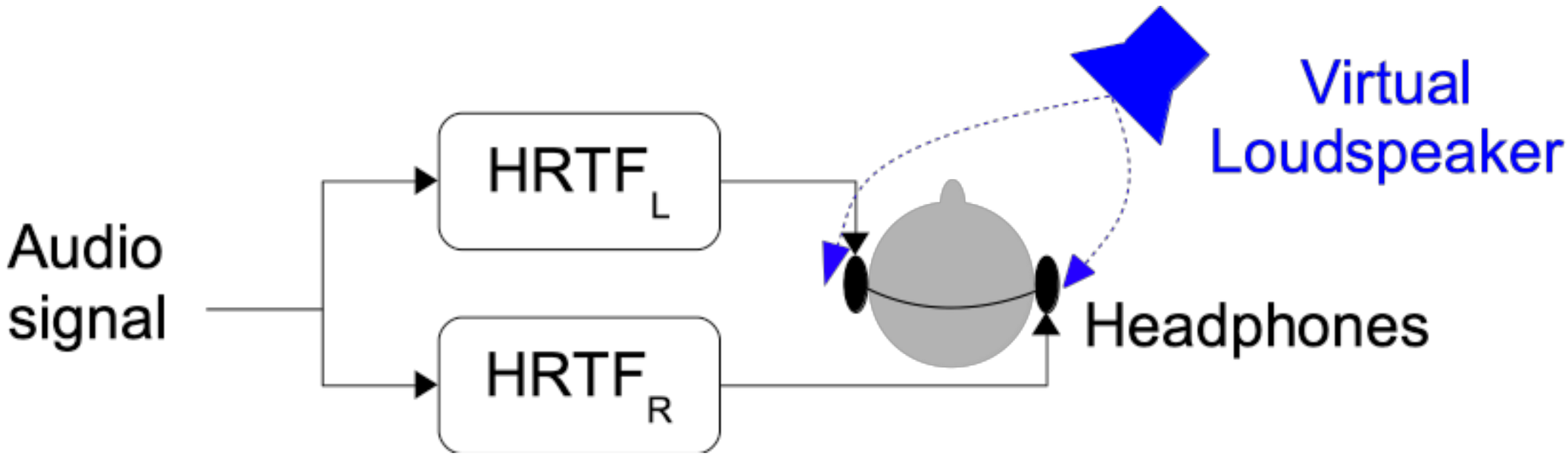
APLICACIONES PARA MODELAR EL ENTORNO

- Unity
- Google Resonance Audio

OYENTE: HEAD-RELATED IMPULSE RESPONSE (HRIR)



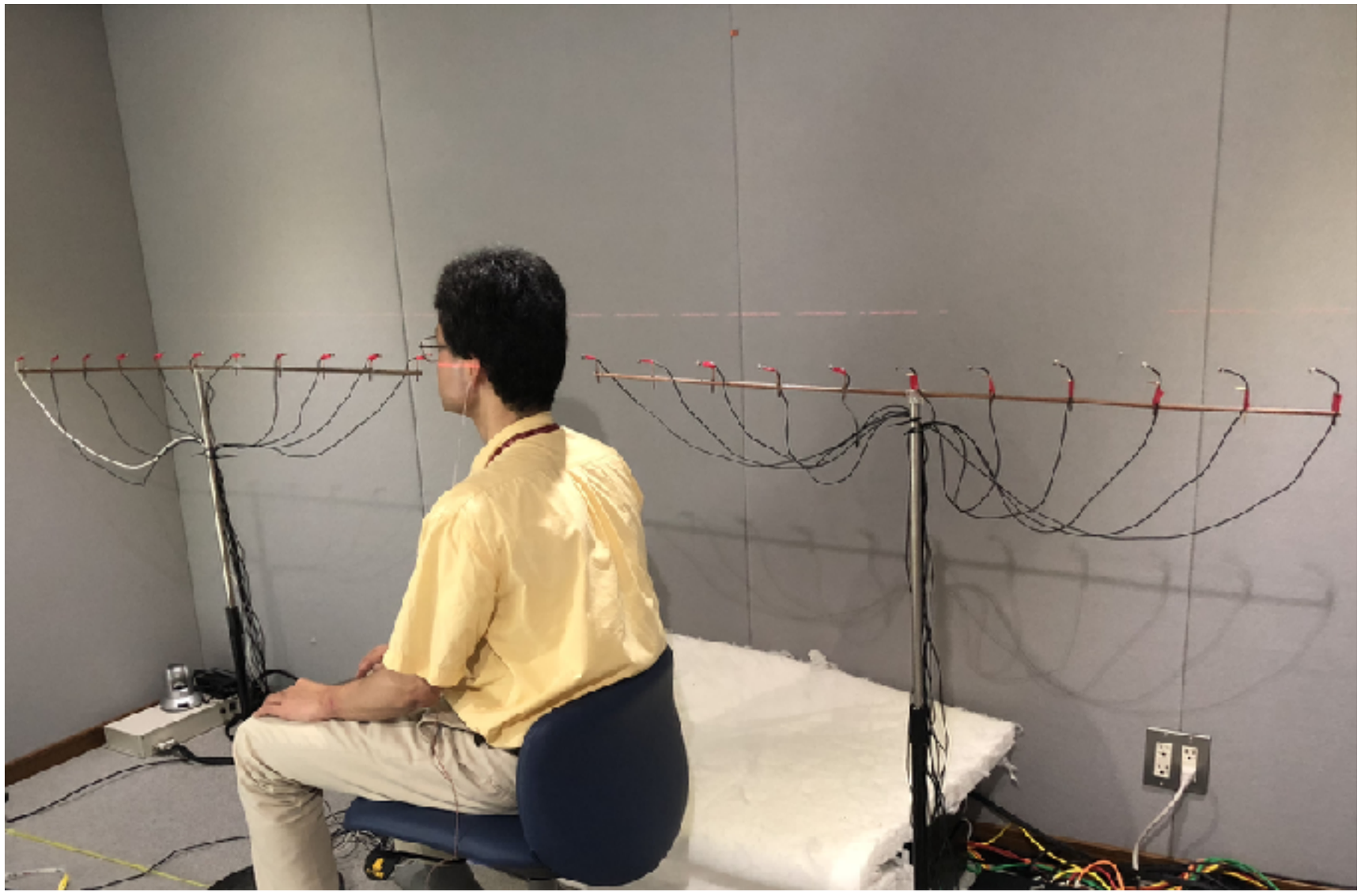
HEAD-RELATED TRANSFER FUCTION (HRTF)



MEDICIÓN DIRECTA

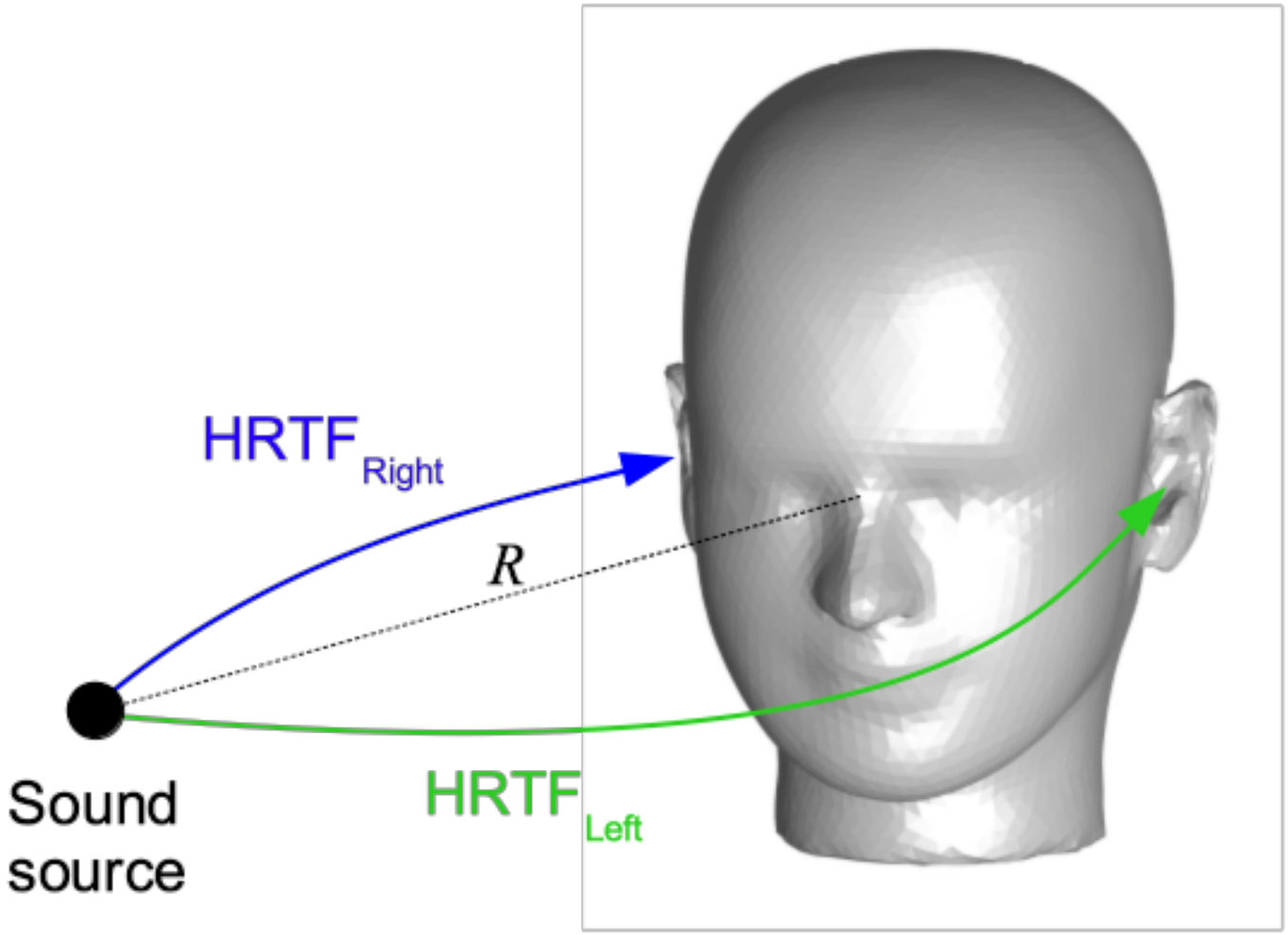
Laboratorio de Acústica de la Universidad de Tohoku

MEDICIÓN POR RECIPROCIDAD

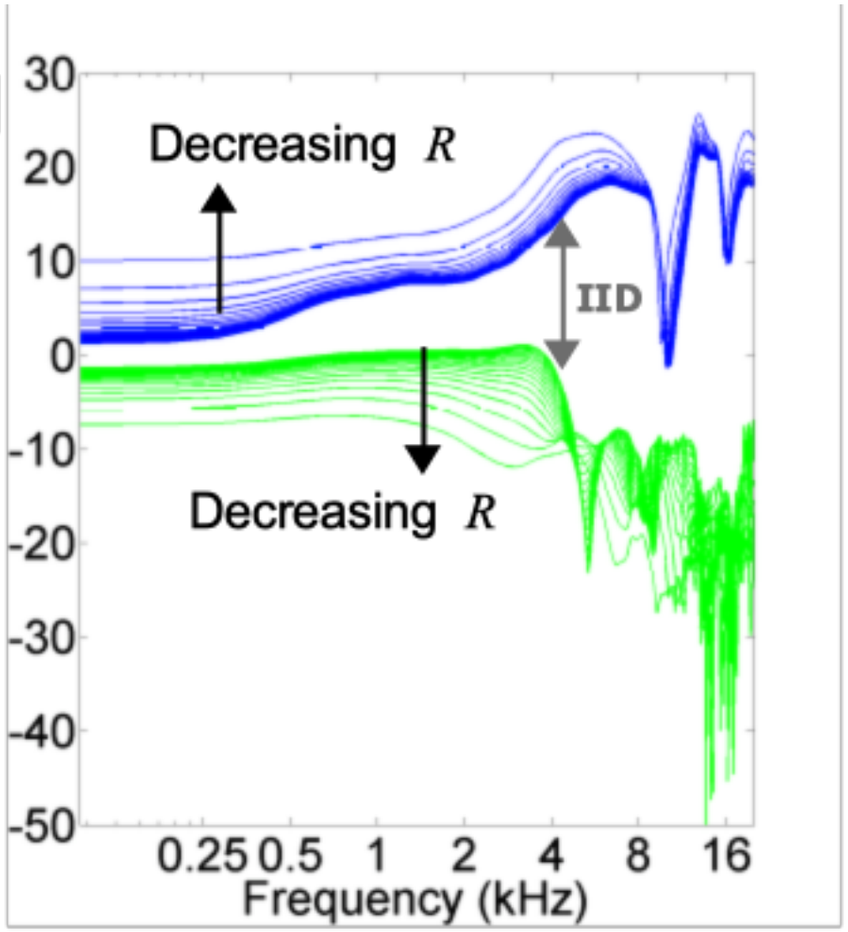


Laboratorio Hirahara-Morikawa de la Universidad Prefectural de Toyama

HEAD-RELATED TRANSFER FUNCTION (HRTF)



R: distance from the center of the head

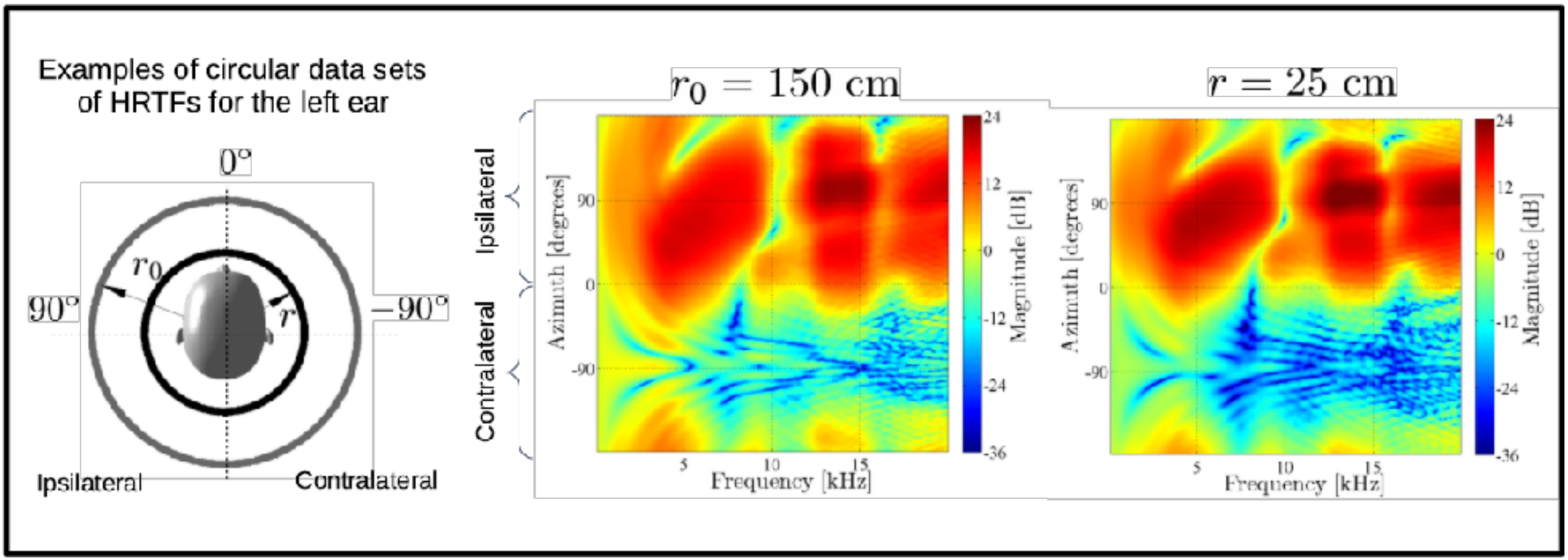


R = 15, 20, … , 100 cm.

IID: Interaural intensity difference

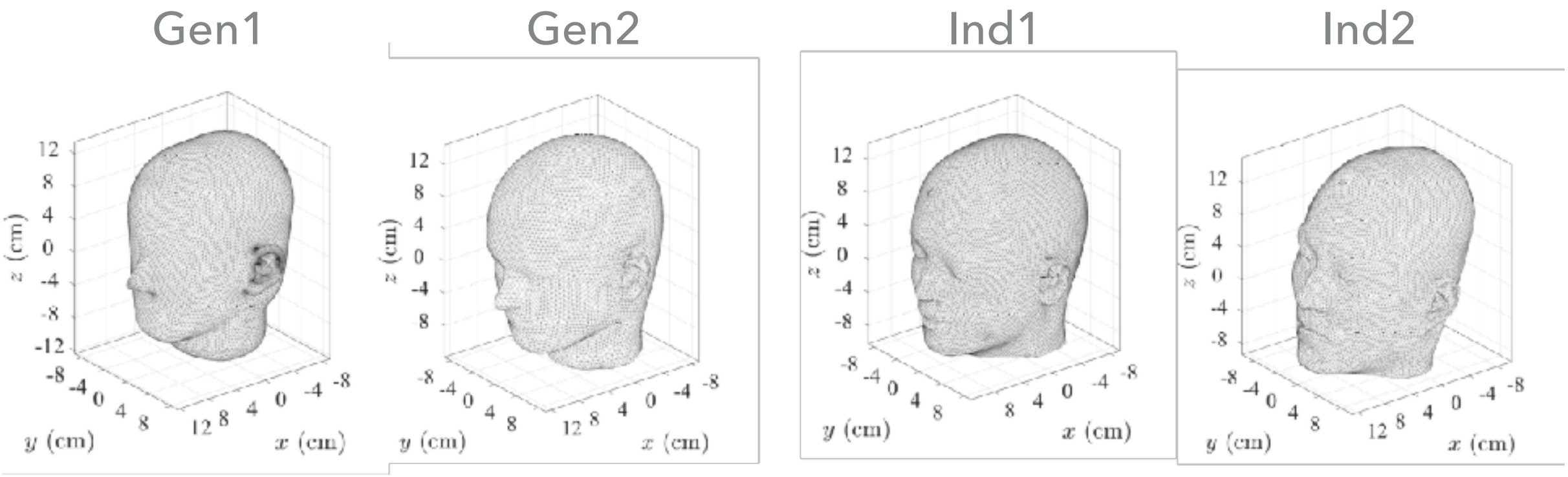
HRTFs calculated using the boundary element method (BEM) (Otani and Ise, 2006)

OYENTE: 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.

MODELOS GENÉRICOS E INDIVIDUALES



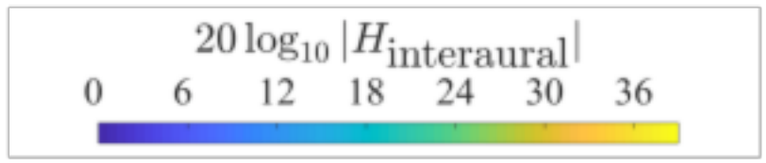
Genéricos

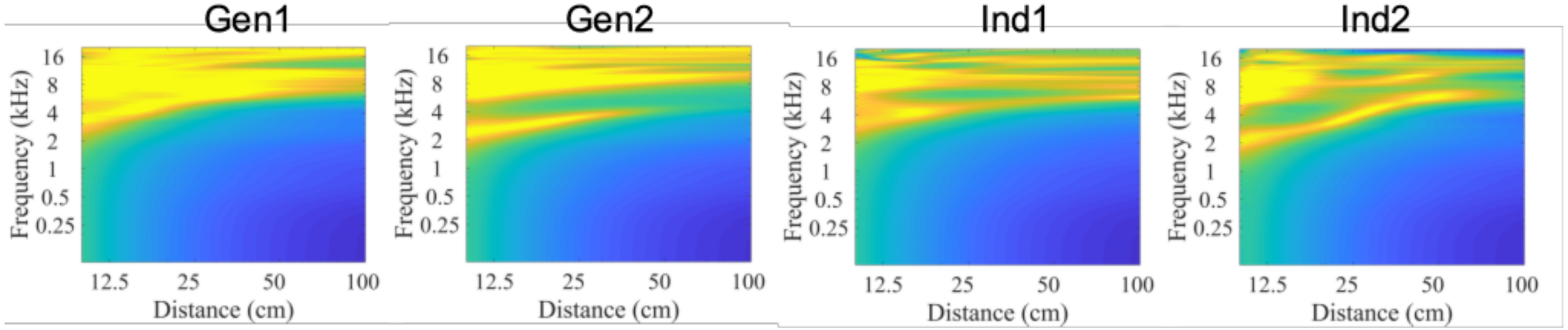
Individuales

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.

MODELOS GENÉRICOS E INDIVIDUALES

$$H_{\text{interaural}} = \frac{H_{\text{left}}}{H_{\text{right}}}$$



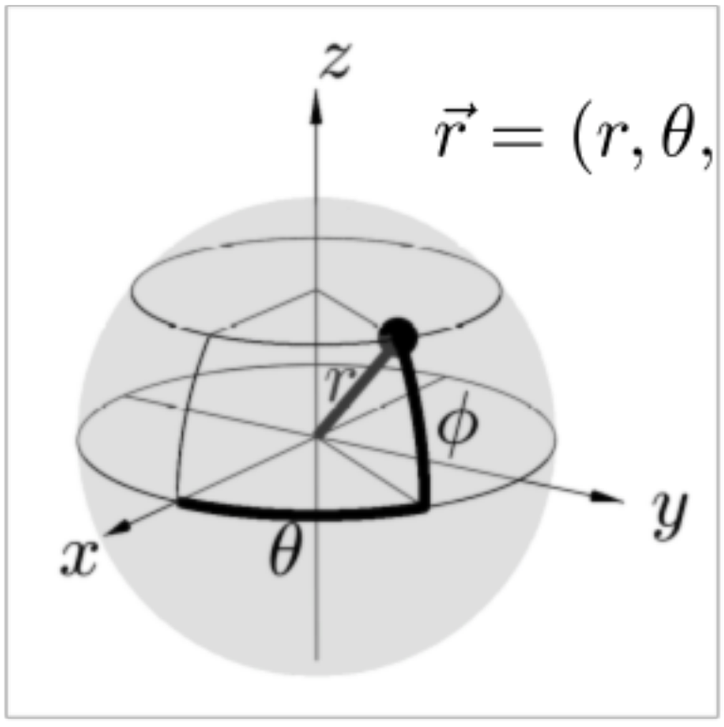


Interaural HRTFs for a distribution of sources along distances at $\theta = 100°$ and $\phi = 20°$.

Individual distance cues

SISTEMAS DE COORDENADAS PARA POSICIONES DE FUENTES

Vertical-polar, spherical coordinates

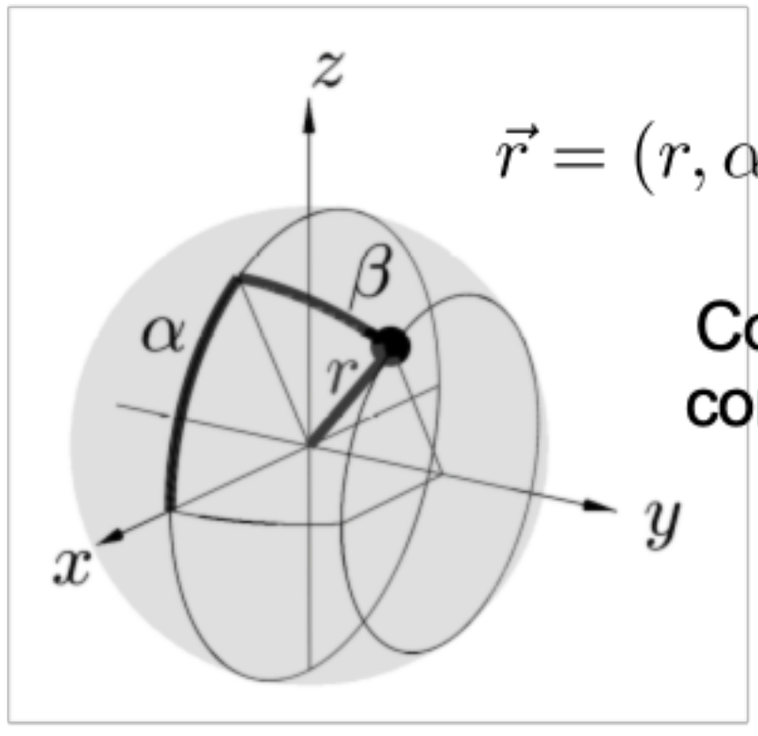


r: radial distance

θ: azimuthal angle $\in [-\pi, \pi]$

ϕ: elevation angle $\in [-\frac{\pi}{2}, \frac{\pi}{2}]$

Interaural-polar, spherical coordinates



r: radial distance

α: polar angle $\in [-\pi, \pi]$

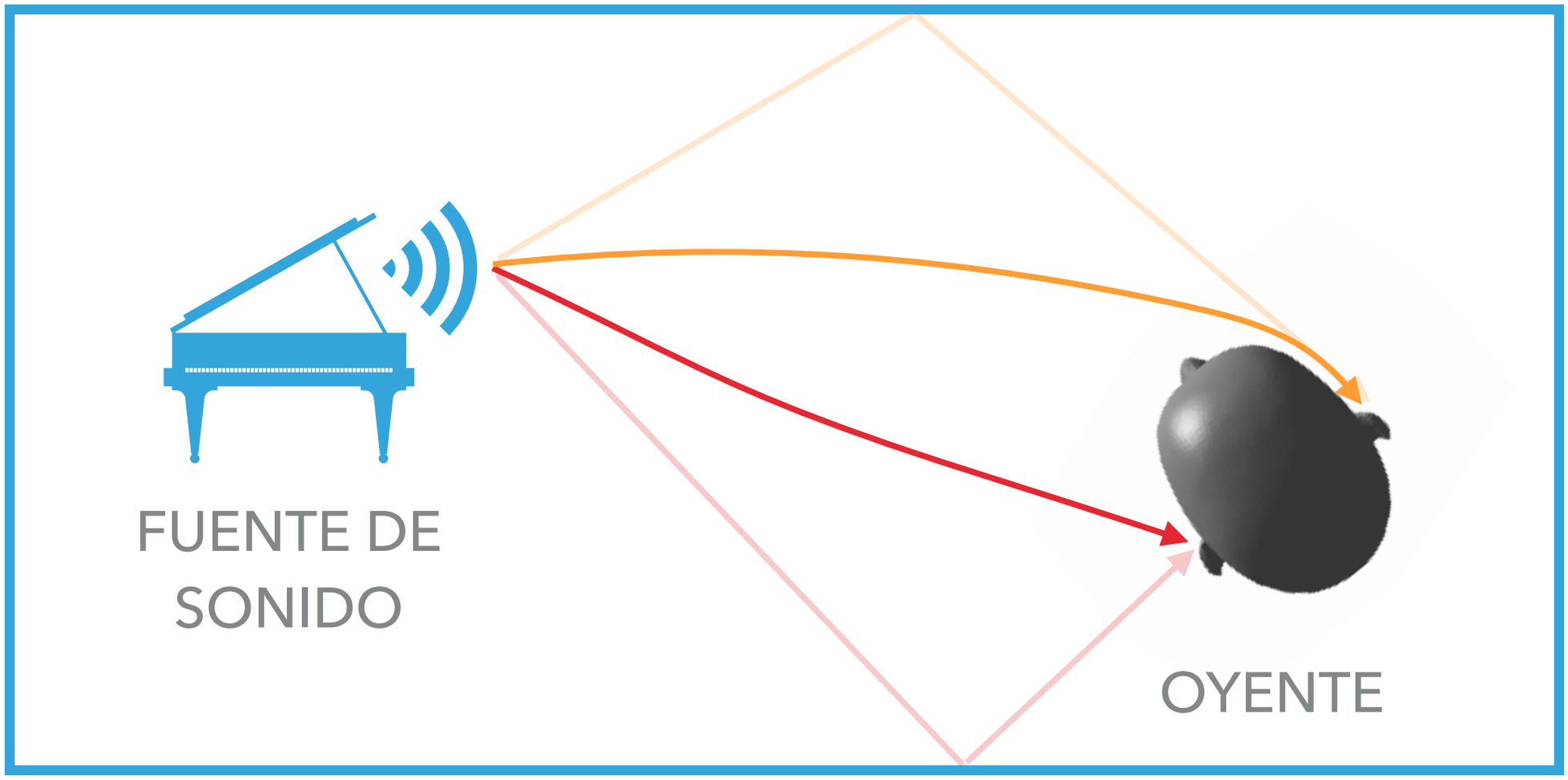
β: lateral angle $\in [-\frac{\pi}{2}, \frac{\pi}{2}]$

APLICACIONES PARA MODELAR LA ANATOMÍA EXTERNA DEL OYENTE

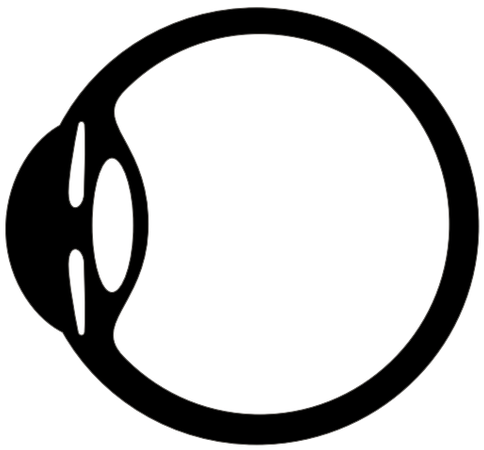
- Spatially-oriented format for acoustics (SOFA)
- MESH2HRTF

BINAURAL ROOM TRANSFER FUNCTION (BRTF)

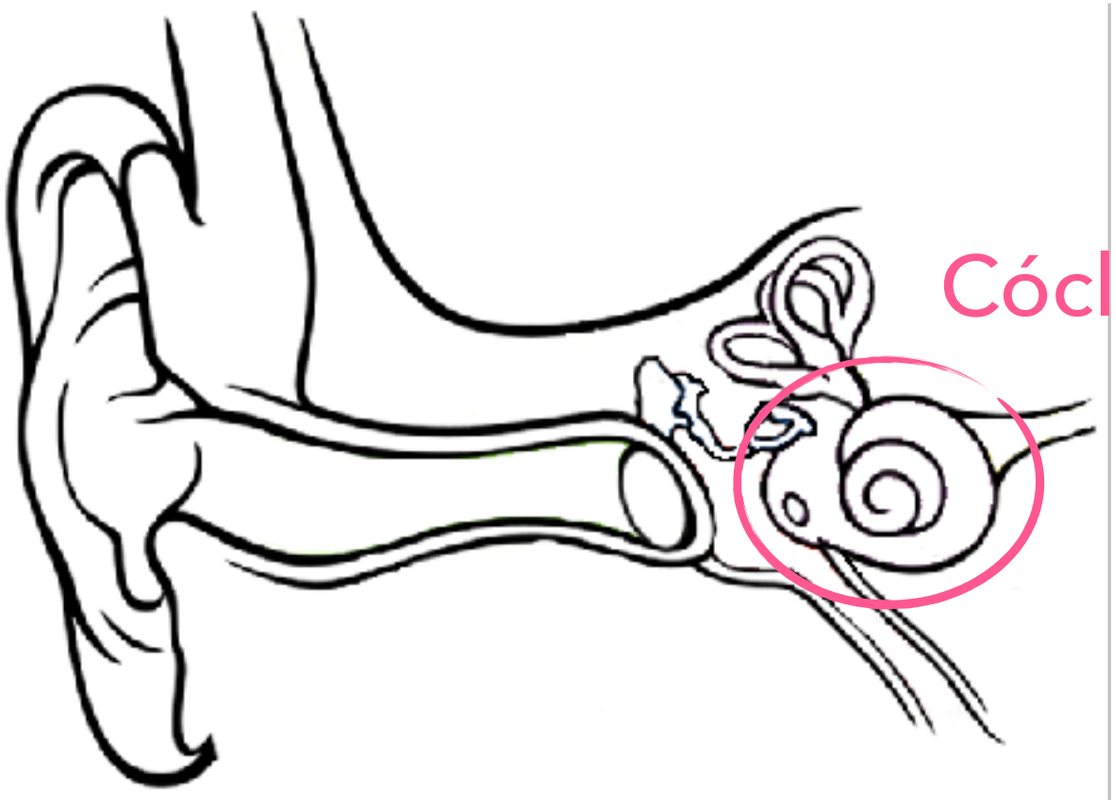
= HEAD-RELATED TRANSFER FUNCTION (HRTF) * ROOM TRANSFER FUNCTIONS (RTF)



REPRESENTACIÓN DEL ESPACIO A PARTIR DE LA PRESIÓN ACÚSTICA EN LOS TÍMPANOS

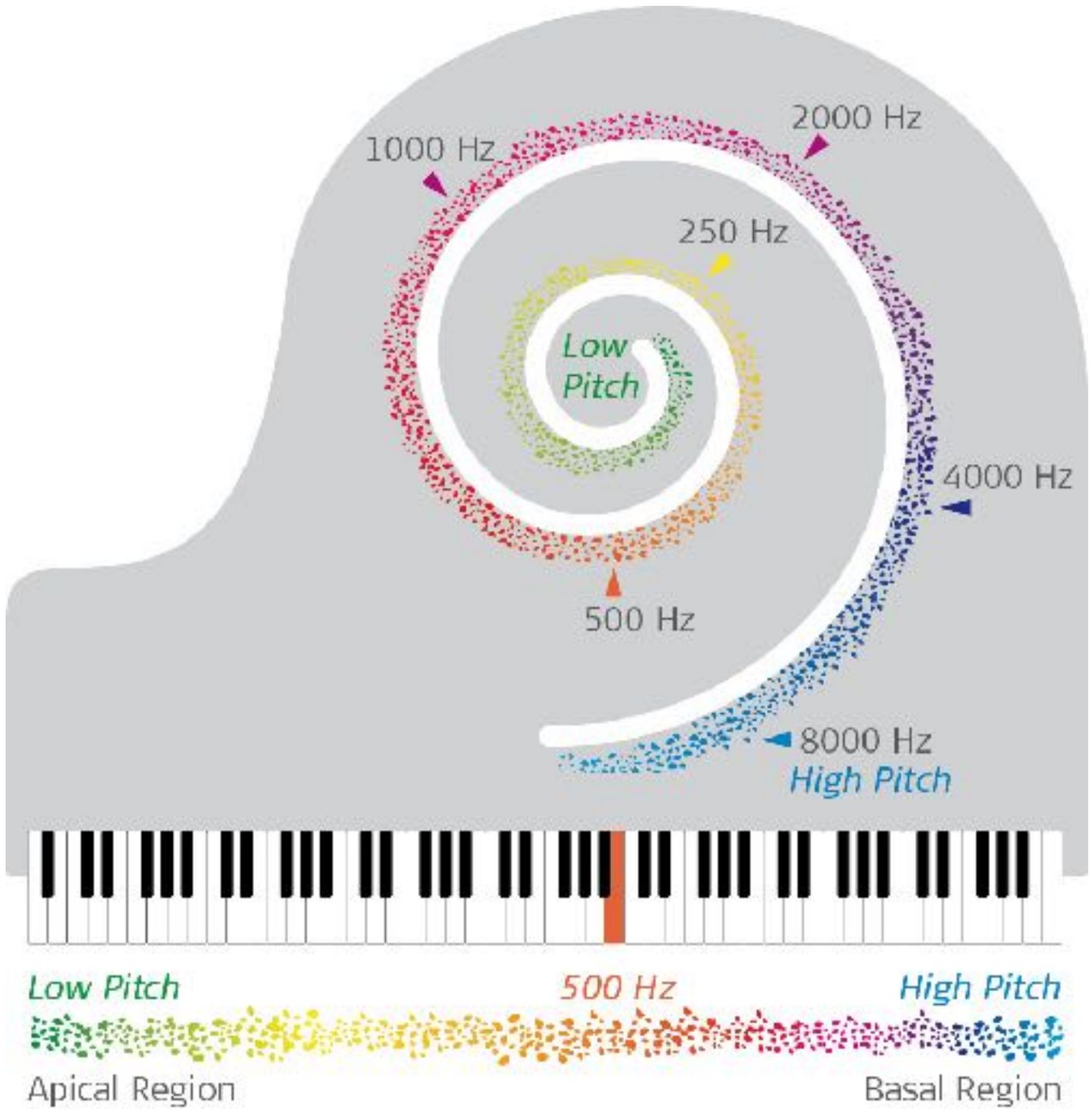


RETINOTOPÍA



TONOTOPÍA

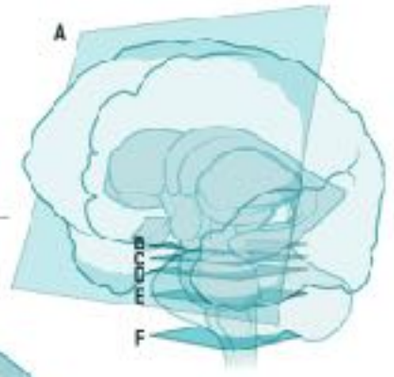
TONOTOPÍA

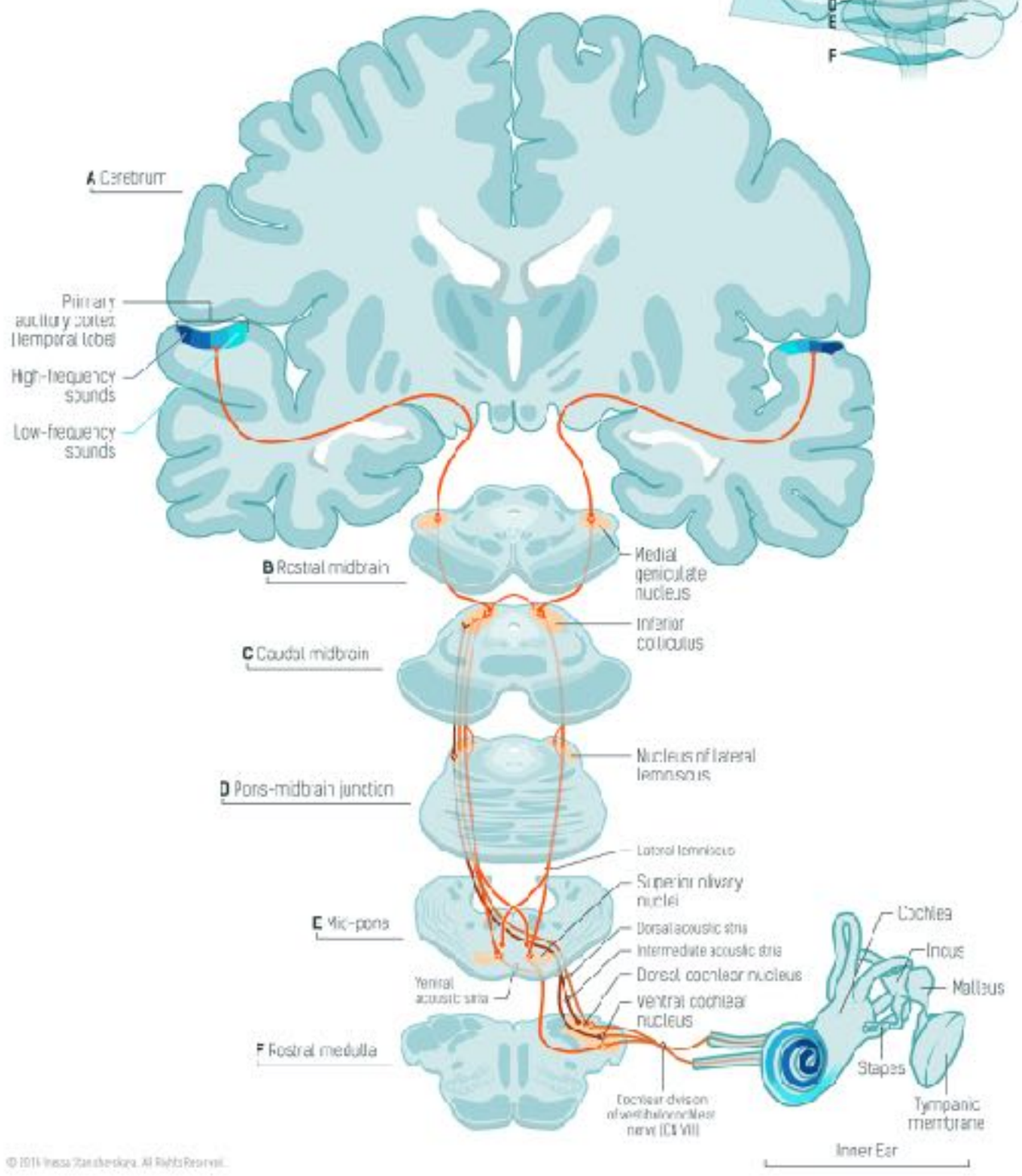


https://www.medel.com/

THE AUDITORY PATHWAY

of the human brain





THE AUDITORY MODELING TOOLBOX

http://
amtoolbox.sourceforge.net/

GRACIAS POR SU ATENCIÓN

César D. Salvador
cesardsalvador.github.io