

Human-Sound Interaction (HSI)

current and future directions

Dr Balandino Di Donato

balandino.didonato@leicester.ac.uk



Foundation of this work



- Sonic Interaction Design
- Music affordances
- Aural Diversity

Sonic Interaction Design



Sound at the centre of the design [27] and reflects on several aspects of sonic interaction: perceptual, cognitive, emotional, product sound design, auditory display and sonification.

SID aims to explore “ways in which sound can be used to convey information, meaning, and aesthetics and emotional qualities in an interactive context” [10] that can vary from critical functionalities of a product that relies on auditory feedback to communicate to its users, to artistic musical works such as performances or installations.

[10] Franinović, K., and Serafin, S. 2013. Sonic interaction design. Mit Press.

[27] Rocchesso, D., Serafin, S., Behrendt, F., Bernardini, N., Bresin, R., Eckel, G., Franinovic, K., Hermann, T., Pauletto, S., Susini, P., and Visell. 2008. Sonic Interaction Design: Sound, Information and Experience. In CHI '08 Extended Abstracts on Human Factors in Computing Systems (CHI EA '08). Association for Computing Machinery, New York, NY, USA, 3969–3972. <https://doi.org/10.1145/1358628.1358969>

Music Affordances



Music can invite gestures that are often evoked by:

- Timbral and dynamic qualities of the sound [15]
- Musical aspects [15]
- Causality of the sound [3]
- Affordances of the instrument or interface [33]

[3] Caramiaux, B., Susini, P., Bianco, T. et al. 2011. Gestural Embodiment of Environmental Sounds: an Experimental Study. In Proc. of the International Conference on New Interfaces for Musical Expression (NIME '11). Oslo, Norway, 144–148.

[15] Godøy, R. I., 2010. Gestural affordances of musical sound. In *Musical Gestures: Sound, Movement, and Meaning*, Rolf Inge Godøy and Marc Leman (Eds.). Routledge, New York, New York, 115–137.

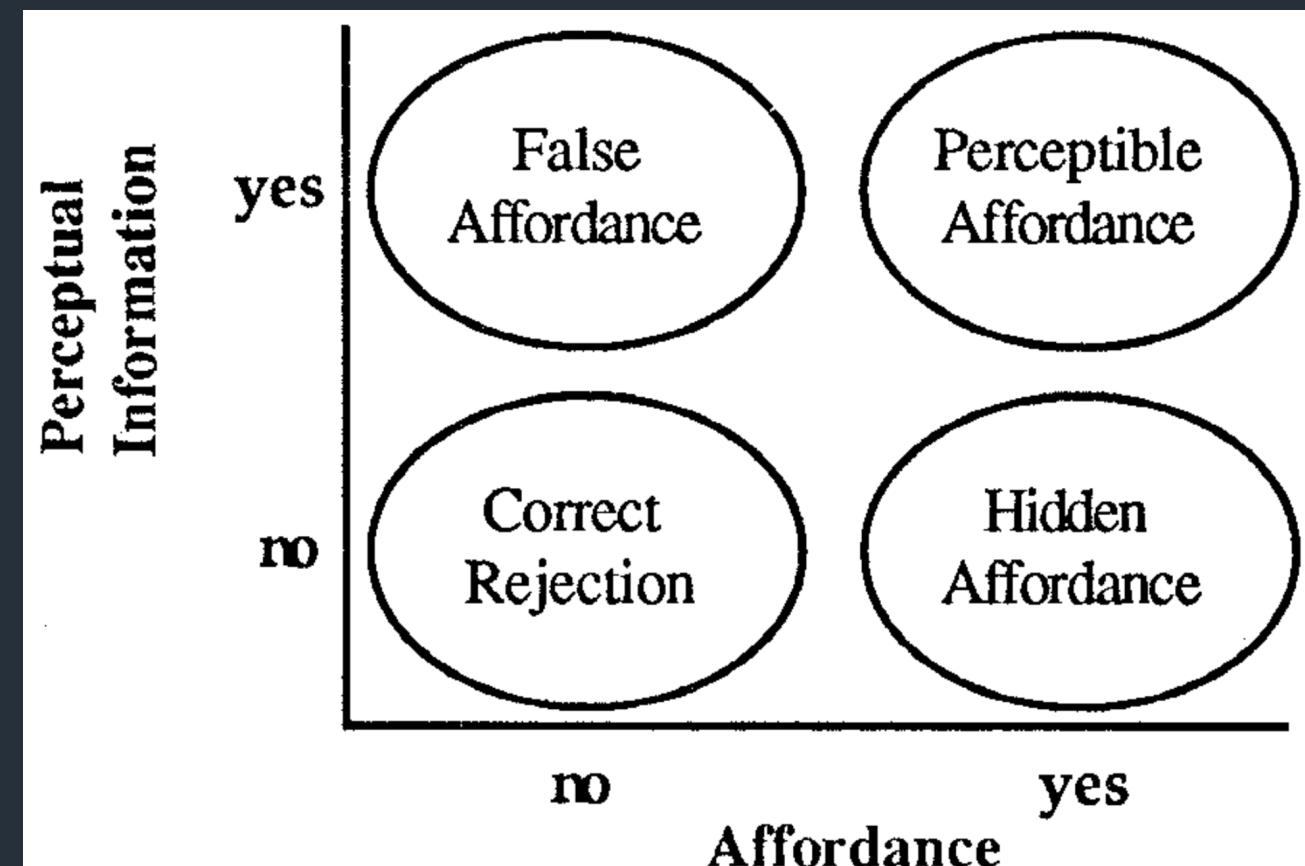
[33] Tanaka, A., Altavilla, A., and Spowage, N. 2012. Gestural Musical Affordances. In Proceedings of the 9th International Conference on Sound and Music Computing. Copenhagen, Denmark.

Perception of affordances



Gaver [12] categorised affordances upon their perceptibly:

- correct rejections, when there is no affordance and it is not perceived;
- perceived, the affordance is present and perceived;
- hidden, the affordance is present but it is not perceived
- false affordances an affordance is perceived but it does not exist



[12] William W. Gaver Technology Affordances. In Proc. of the SIGCHI Conference on Human Factors in Computing Systems (CHI '91). ACM, New York, NY, USA, 79–84. <https://doi.org/10.1145/108844.108856> ver. 1991

Perception of affordances



Diversity of human-factors that can affect the perception of affordances

- Auditory
- Vision
- Haptic feedback
- Cultural Background



Human-Sound Interaction



Direct, engaging, natural and embodied interaction with sound that takes into account one's abilities to perceive the world.

- ***direct*** as the impression or a feeling about an interface capable of being described in terms of concrete actions [22]
- ***engaging*** as fostering the “feeling of directly manipulating the objects of interest”, where “the world of interest is explicitly represented and there is no intermediary between user and world” [22]
- ***natural*** “as being marked by spontaneity” [17]
- ***embodied*** as an extension and incorporation of human skills and abilities within the interaction design of a system [8]

[8] Dourish P.. 2001. Where The Action Is: The Foundations of Embodied Interaction. MIT Press.

[17] GinaJoue, SAG., and Mittelberg, I., 2011. Understanding naturalness and intuitiveness in gesture production. In Proc. of the SIGCHI Conference on Human Factors in Computing Systems (CHI). Vancouver, BC, Canada, 821–824.

[22] Norman D.A. and Draper, S.W., 1986. User Centered System Design: New Perspectives on Human-computer Interaction. Lawrence Erlbaum Associates, Hillsdale, New Jersey.

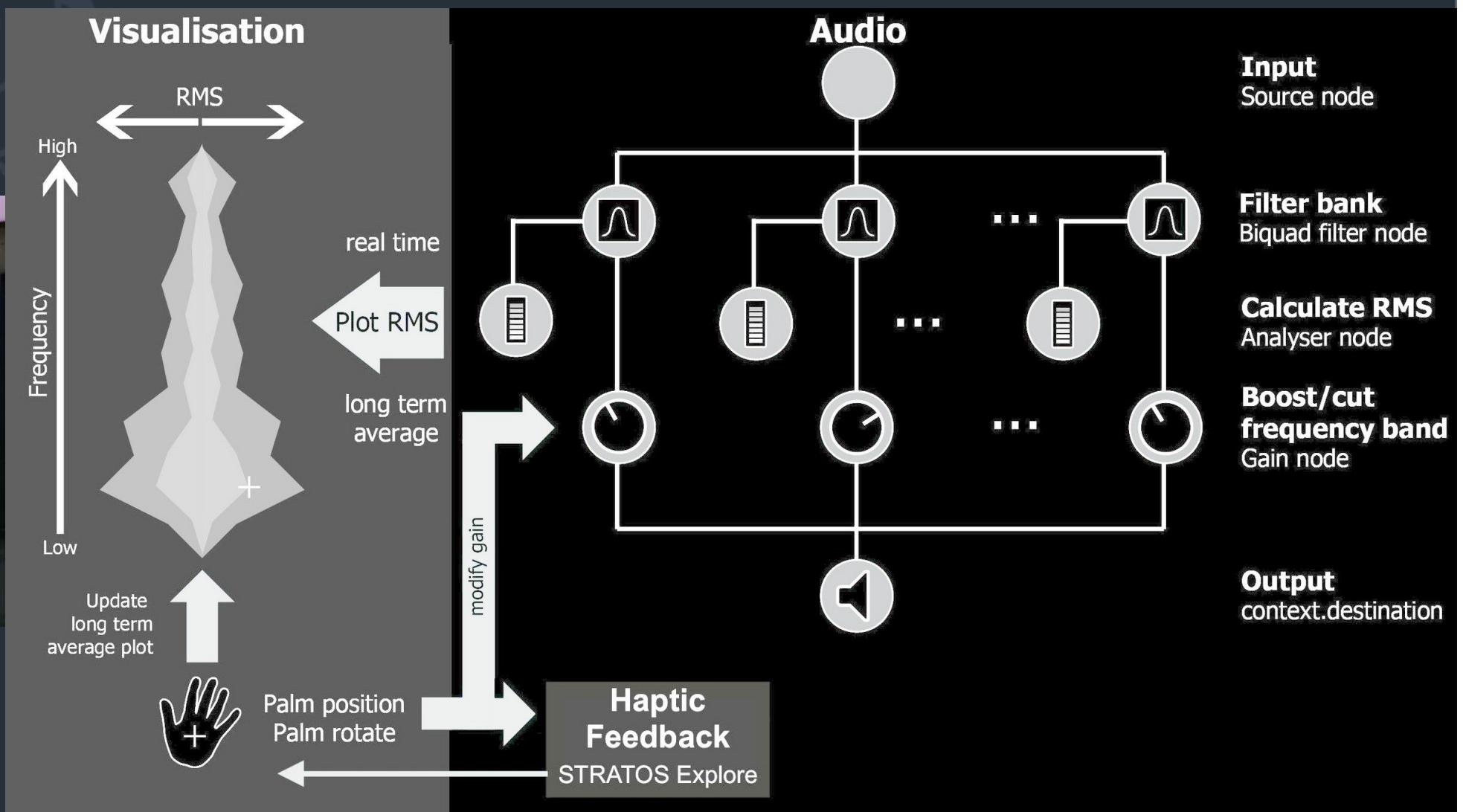
SoundSculpt



Watch on YouTube

Di Donato, B., Dewey, C., and Michailidis, T. (2020) Human-Sound Interaction: Towards a Human-Centred Sonic Interaction Design approach. In 7th International Conference on Movement and Computing (MOCO '20), July 15–17, 2020, Jersey City/ Virtual, NJ, USA. ACM, New York, NY, USA, 4 pages. DOI: [10.1145/3401956.3404233](https://doi.org/10.1145/3401956.3404233).

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SoundSculpt



Image source: <https://www.ultraleap.com/haptics/>

HSI & Aural Diversity

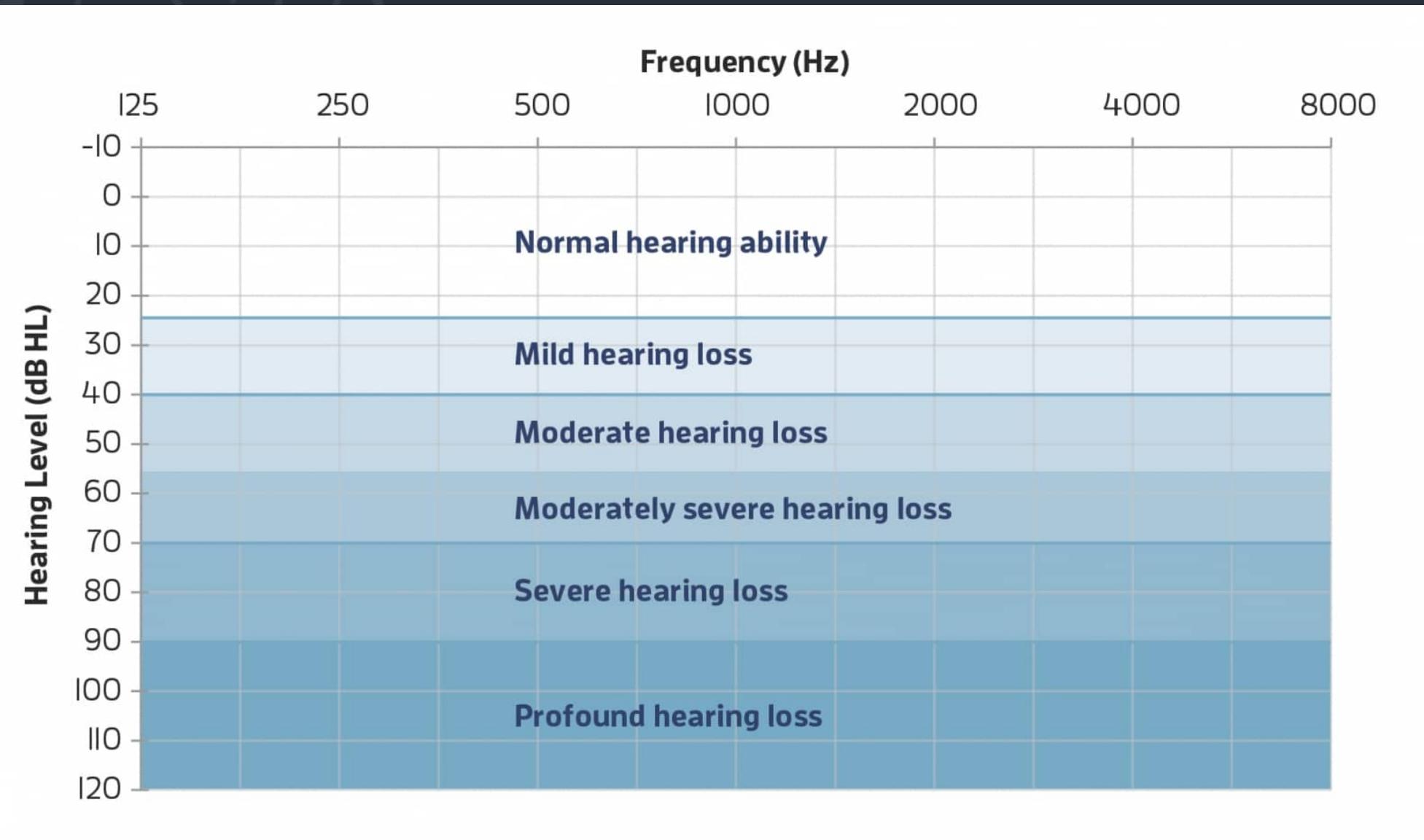


Image source: <https://www.healthyhearing.com/report/41775-Degrees-of-hearing-loss>

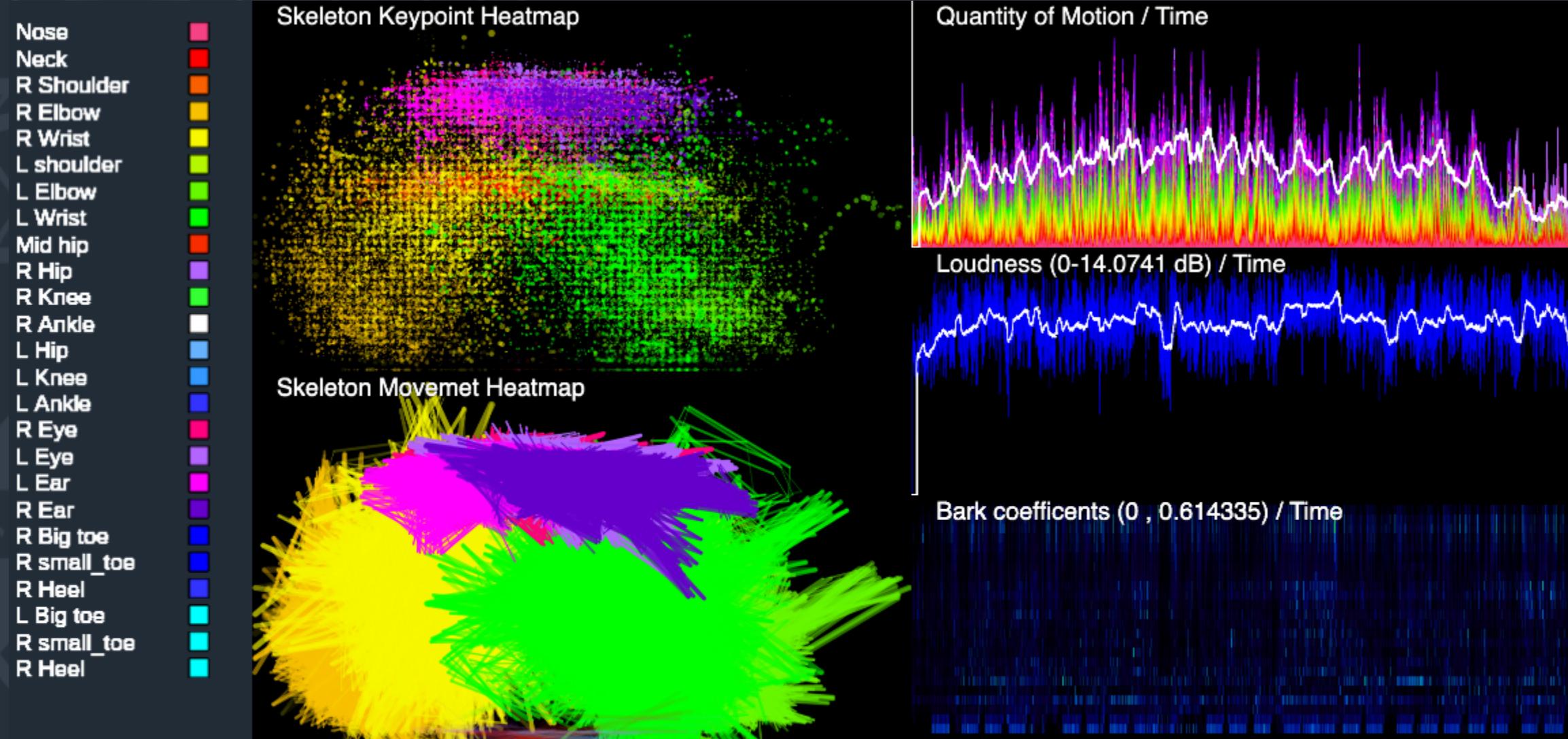
HSI & Aural Diversity



Video source: <https://youtu.be/MGRWeKeh9NE?t=150>



the HSI-data repository



Repository link: <https://github.com/balandinodidonato/HSI-data>

what's next



HSI at TFTI & UoY



- *Immersive digital storytelling.* The HSI project will realise crossmodal systems to deliver digital storytelling experiences to anyone regardless of their abilities to perceive the world.
- *Health, wellbeing and accessibility.* Diversity and accessibility are at the core of the HSI project. The HSI project looks at designing experiences considering others abilities to perceive sound.
- *Digital Cultures.* The HSI project will look at how cultural background does affect sound perception and how this knowledge can be embedded in the design of digital artefacts.
- *Performance and Production Practices and Context.* HSI analyses and design technologies for performance and production.

Thank you for listening

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