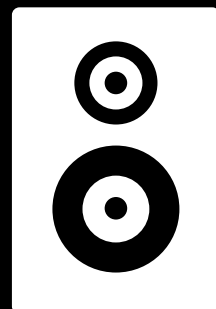


Test



Interactive Mapping for Sonic Interaction Design using Machine Learning

Federico Visi

Hamburg, 8 February 2020

www.federicovisi.com

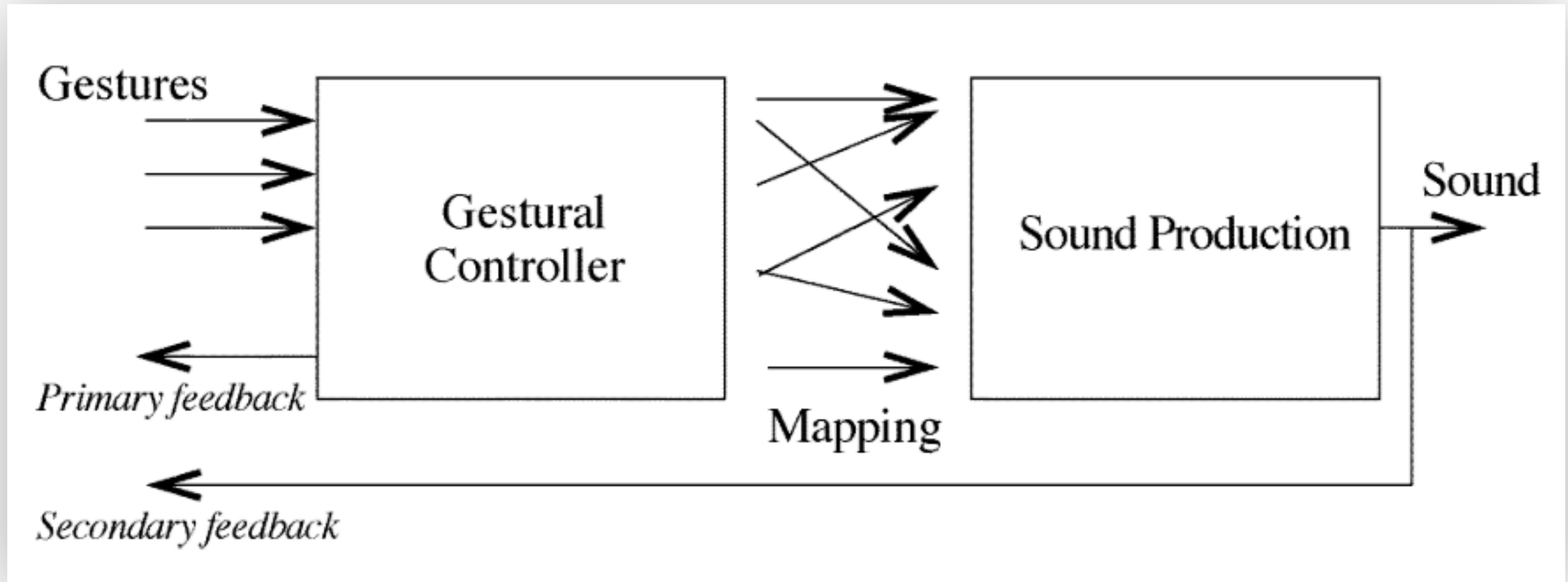


Gestural interfaces



See also: E. R. Miranda and M. Wanderley. *New Digital Musical Instruments: Control And Interaction Beyond the Keyboard* (Computer Music and Digital Audio Series). A-R Editions, Inc., Madison, WI, USA, 2006.
A. R. Jensenius and M. Lyons, Eds., *A NIME Reader: Fifteen years of New Interfaces for Musical Expression*. Berlin, Springer, 2017

The Importance of Mapping



Rovan, J. B., Wanderley, M. M., Dubnov, S., & Depalle, P. (1997). Instrumental Gestural Mapping Strategies as Expressivity Determinants in Computer Music Performance. Kansei-The Technology of Emotion Workshop. Proceedings of the AIMI International Workshop, 68–73.

Designing Mappings

"Clearly, electronic music systems allow much freedom for the performer, because the mappings [...] are not constrained by any biomechanical regularities. [...]"

However, [...] it is exactly this freedom of mapping that may disturb the sense of contact and of non-mediation".

Mapping as a Compositional Process

[...] a shift from creating wanted sounds via interactive means, towards creating wanted interactions having audible traces.

A. Di Scipio. 'Sound is the interface': from interactive to ecosystemic signal processing. Organised Sound, 8, 2003.

[...] the instrument itself becomes a part of the composition.

T. Murray-Browne, D. Mainstone, N. Bryan-Kinns, and M. D. Plumbley. *The Medium is the Message: Composing Instruments and Performing Mappings*. In Proceedings of the International Conference on New Interfaces for Musical Expression, 2011.

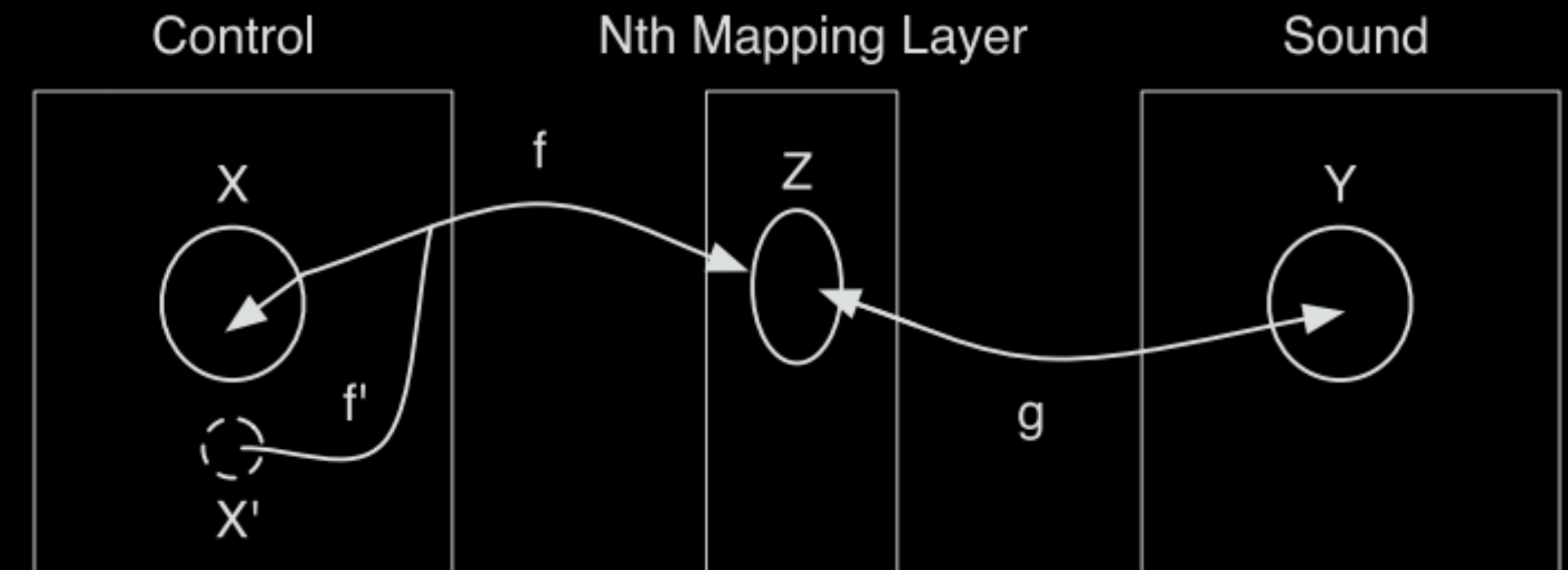
Different Kinds of Mapping

- One-to-one (a parameter is mapped explicitly)
- Many-to-many (many parameters are mapped implicitly, e.g. through interpolation of multidimensional parameter spaces)

Frequency

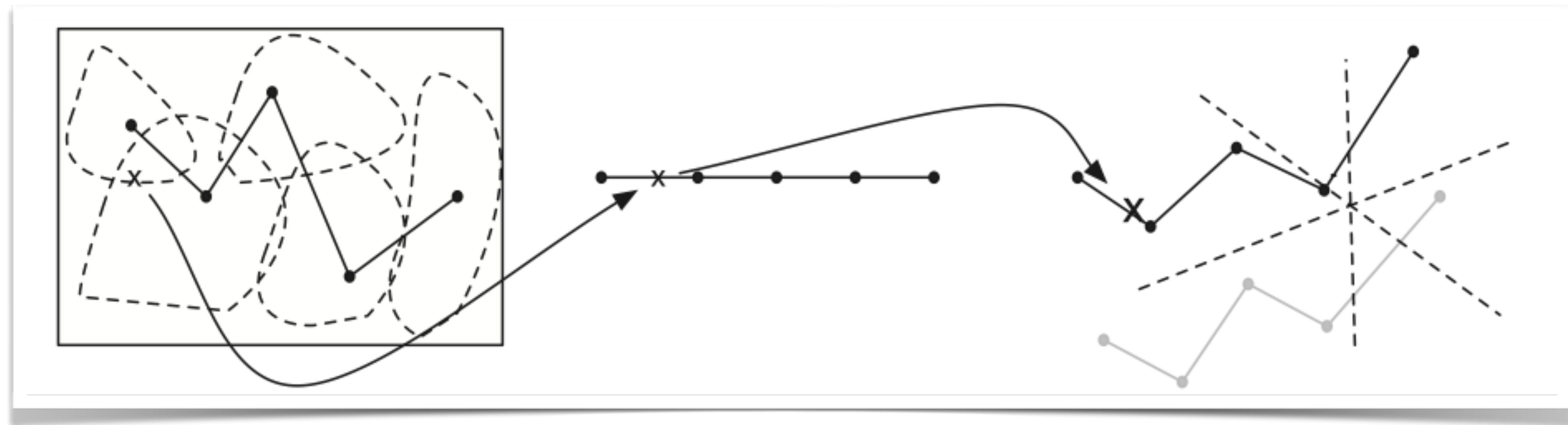


saw~



Functional Many-to-many Mapping

- Not a deterministic point-to-point mapping but a holistic approach that defines states in the control and sound domains (what) and the geometries that relate them (how).



Yes, but **how**?

Using Machine Learning

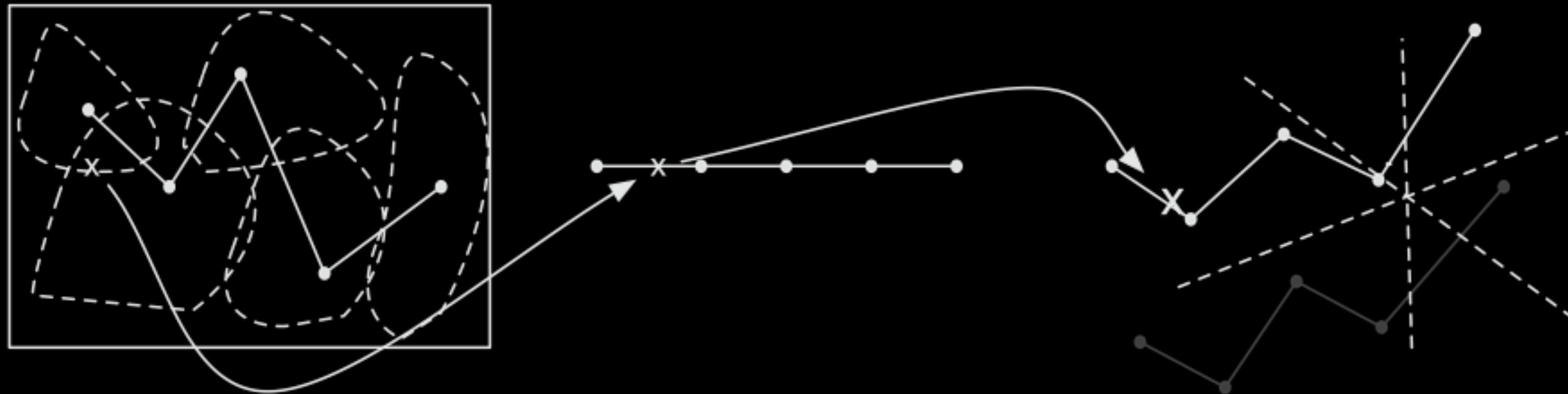
Machine Learning

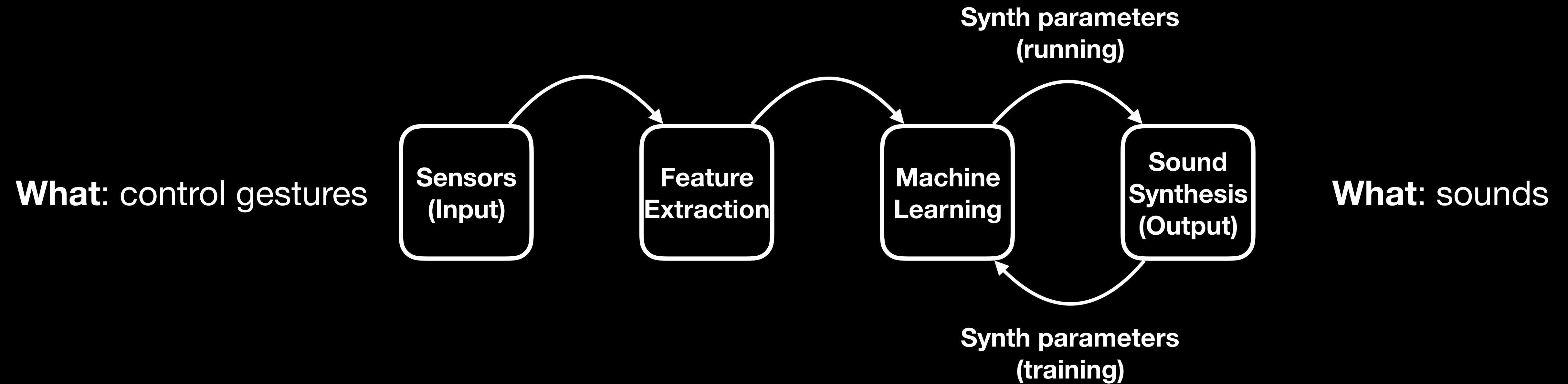


What: control gestures

How these are related

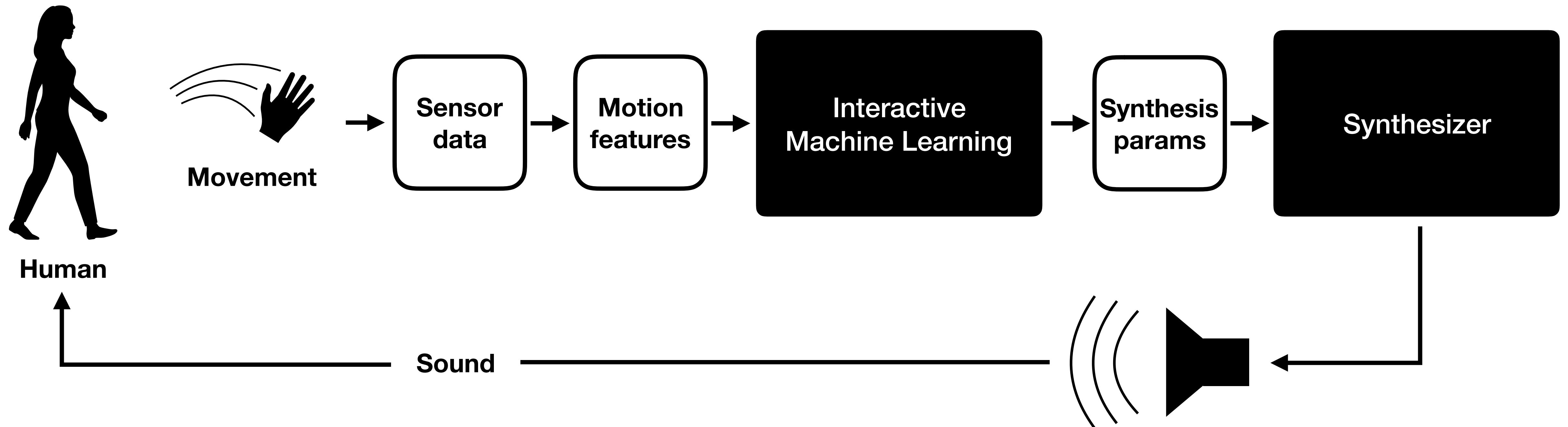
What: sounds

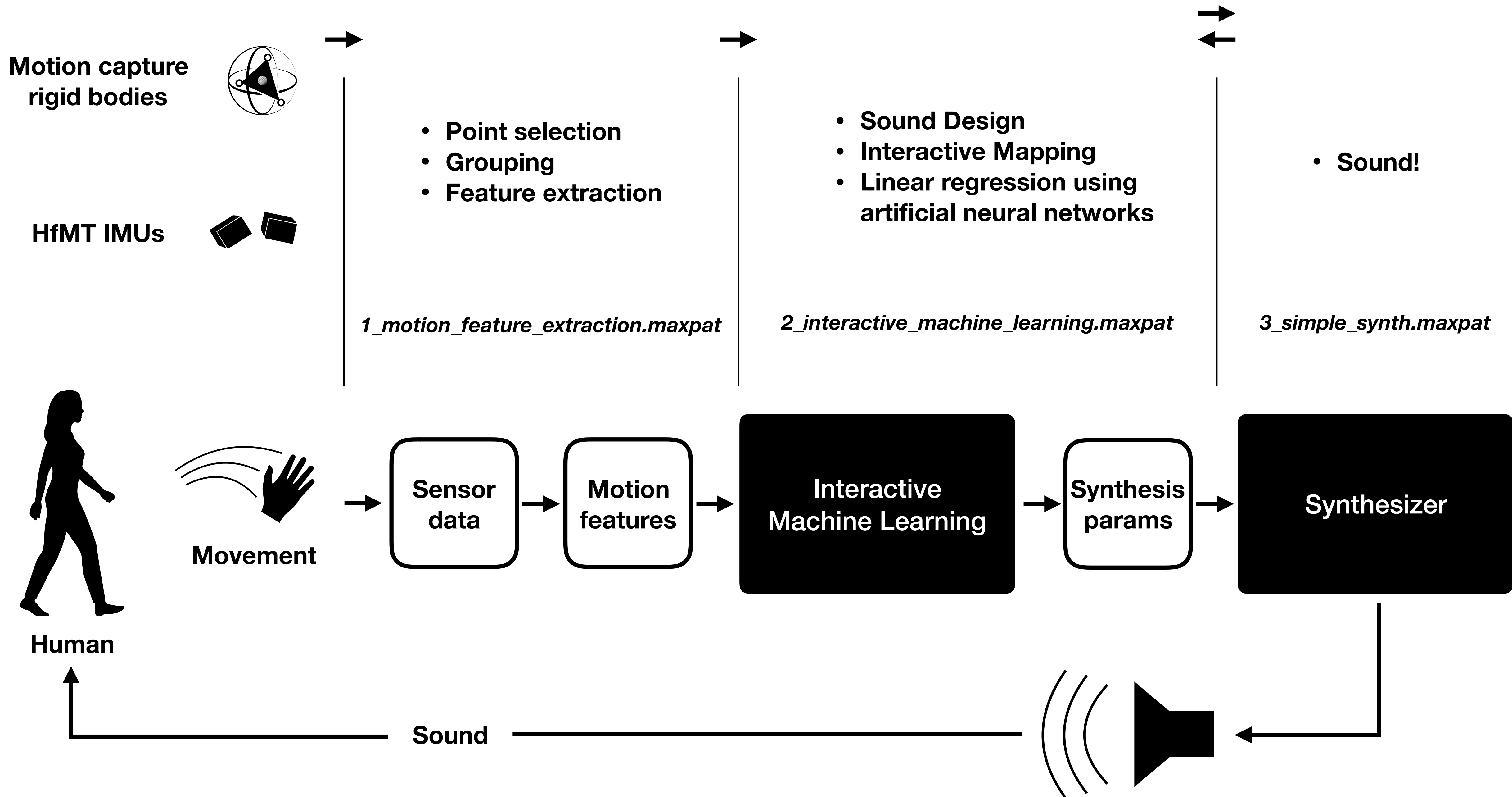




How these are related

Interactive Machine Learning Model





Supervised Learning

- Many algorithms, such as Artificial Neural Networks and Support Vector Machines (SVMs).
- Involves a training phase during which examples are recorded

Workshop Resources

- ***o.dot*** : OSC-centred multiparadigm dynamic programming in Max
<https://github.com/CNMAT/CNMAT-odot>
- ***modosc*** : real-time motion feature extraction
<https://github.com/motiondescriptors/modosc>
- ***rapidmax*** : Max external for interactive machine learning
<https://github.com/samparkewolfe/RapidMax> (Mac)
<https://github.com/MartinTownley/RapidMax> Windows
- ***GIMLeT*** : Gestural Interaction Machine Learning Toolkit
<https://github.com/federicoVisi/GIMLeT>

Learn More...

Visi, F., & Dahl, L. (2018). Real-Time Motion Capture Analysis and Music Interaction with the Modosc Descriptor Library. Proceedings of the International Conference on New Interfaces for Musical Expression, 144–147. <http://www.federicovisi.com/wp-content/papercite-data/pdf/visi-2018-nime.pdf>

Visi, F. (2017). Methods and Technologies for the Analysis and Interactive Use of Body Movements in Instrumental Music Performance. University of Plymouth. <https://pearl.plymouth.ac.uk/handle/10026.1/8805?show=full>

Larboulette, C., & Gibet, S. (2015). A review of computable expressive descriptors of human motion. In Proceedings of the 2nd International Workshop on Movement and Computing - MOCO '15 (pp. 21–28). New York, New York, USA: ACM Press. <https://doi.org/10.1145/2790994.2790998>

Dahl, L. (2015). Studying the Timing of Discrete Musical Air Gestures. Computer Music Journal, 39(2), 47–66. https://doi.org/10.1162/COMJ_a_00298

Fiebrink, R. A., & Caramiaux, B. (2018). The Machine Learning Algorithm as Creative Musical Tool. (R. T. Dean & A. McLean, Eds.), The Oxford Handbook of Algorithmic Music (Vol. 1). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780190226992.013.23>

Caramiaux, B., & Tanaka, A. (2013). Machine Learning of Musical Gestures. In W. Yeo, K. Lee, A. Sigman, J. H., & G. Wakefield (Eds.), Proceedings of the International Conference on New Interfaces for Musical Expression (pp. 513–518). Daejeon, Republic of Korea: Graduate School of Culture Technology, KAIST. Retrieved from <http://nime2013.kaist.ac.kr/>

Thank you!

mail@federicovisi.com