Touching Sounds

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Perception of the curvature of Audio Virtual Surfaces

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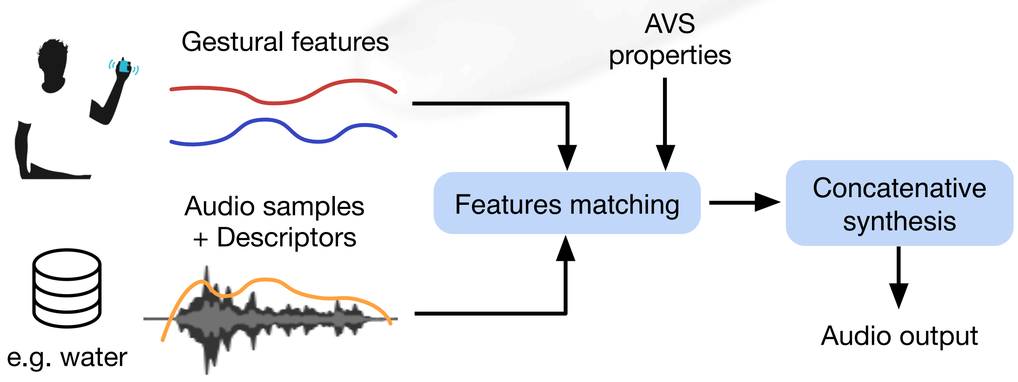
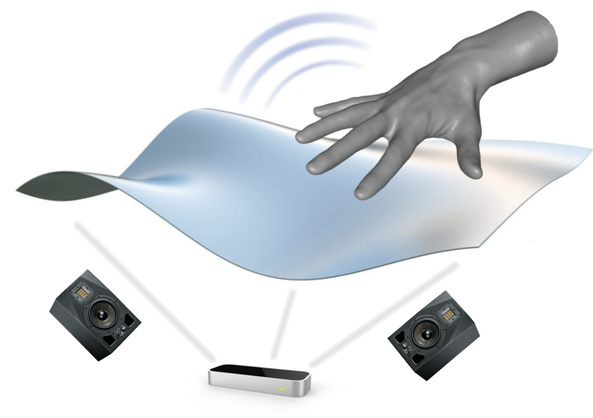
The concept of Audio Virtual Surfaces (AVS)

Interactive gesture-sound scenario



We define an Audio Virtual Surface as a responsive region in space the user can interact with, through interactive sonification.

The sound is produced in response to the presence of the user and/or physical properties.



Goals

- Explore sensory substitution of touch by sound for interaction with virtual objects
- Evaluate perceptual abilities in gestural interactions
- Develop interactive scenarios offering richer perceptual experience

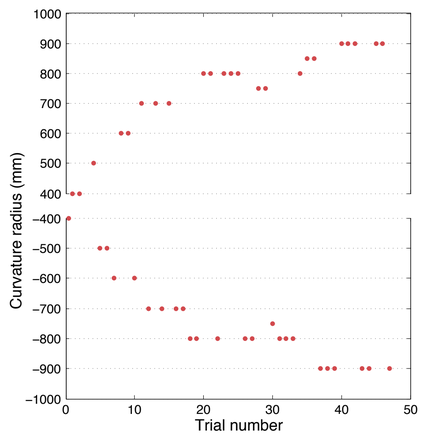
Experiment: determination of the curvature perception threshold of a 8 cm thick plate AVS

Randomized adaptive staircase procedure on curvature radius R

Q: is the plate **concave or convex** ?

-> correct 3 in a row: R increased

-> non correct in 10: threshold is reached



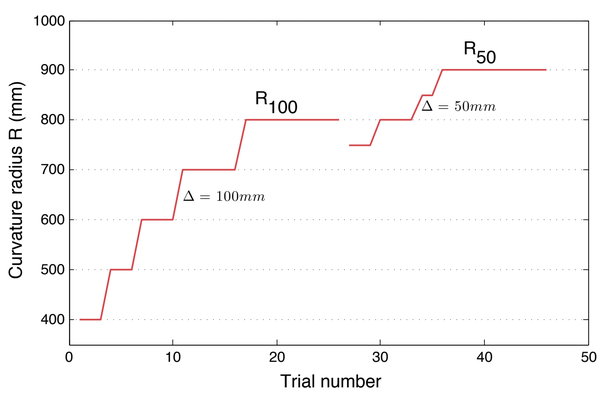
N=18

VAS
+ LeapMotion
+ Max.

2 groups

Speakers

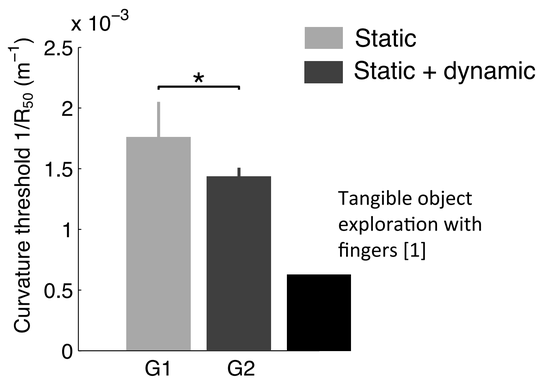
Data:
Hand position
+ response time
+ questionnaire.



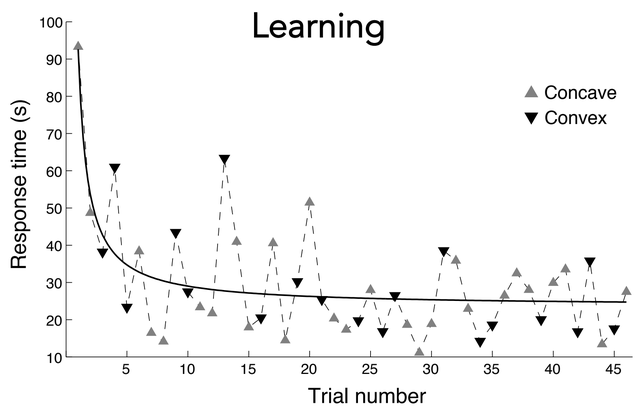
Auditory feedback

G1- Static: presence in/out of the plate

G2- Satic + dynamic feedback (Vt)



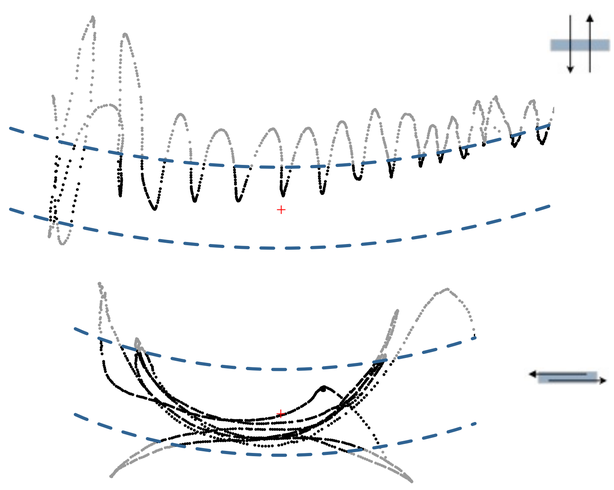
Learning



The G2 reached a higher level of perception, and the variance was reduced. 75% of them declared feeling tactile-like sensations.

% of participants	Static	Static+dynamic
Bothered by the blindness	87 %	25 %
Feeling tactile sensations	50 %	75 %

Gestural strategies



Conclusions

- Users are able to perceive properties of an object with **auditory feedback only**.
- **Auditory-motor representations** emerge from the interaction and shape exploratory gestures.
- The setup offers a tactile to auditory **sensory substitution** paradigm.
- Syneathesia and tactile sensations need to be further studied in interactive scenarios.

Check out our virtual bath tub demo !

Cited literature

[1] J. F. Norman, A. M. L. Kappers, J. R. Cheeseman, C. Ronning, K. E. Thomason, M. W. Baxter, A. B. Calloway, and D. N. Lamirande, “Aging and curvature discrimination from static and dynamic touch.,” *PLoS One*, vol. 8, no. 7, p. e68577, Jan. 2013.

Acknowledgements

This work was supported in part by the ANR (French National Research Agency) Legos project (11 BS02 012)