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Designing and evaluating soundscapes in virtual reality exhibitions

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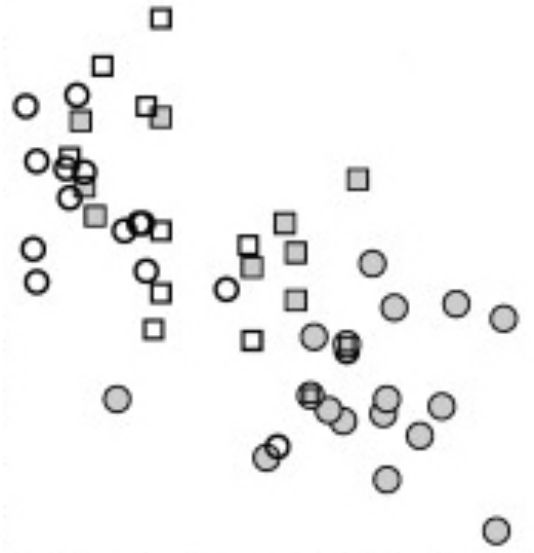
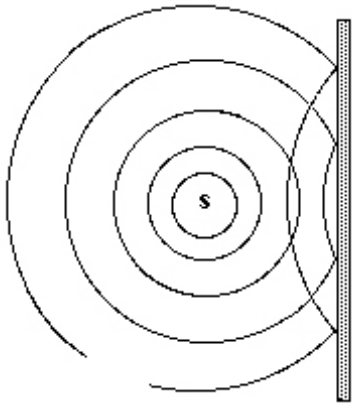
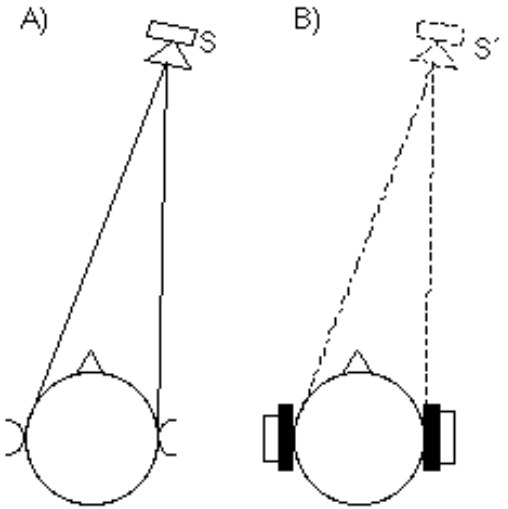
Construction of soundscapes







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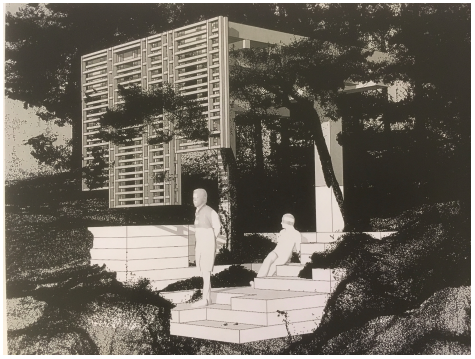

The forest in the house

(2018)

* UiO, Inst. of Education
* Norwegian National Museum of Art, Architecture and Design
- Atelier Oslo, architects
- Notam (Norwegian Center for Technology in Music and the Arts)

Recording of incidental sounds and acoustics (impulse response), pointcloud laser recording of physical shapes of terrain, derivation of physical model, modeling of indoor acoustics based on materials and dimensions.

Goals: Credibility, simplicity, correctness.

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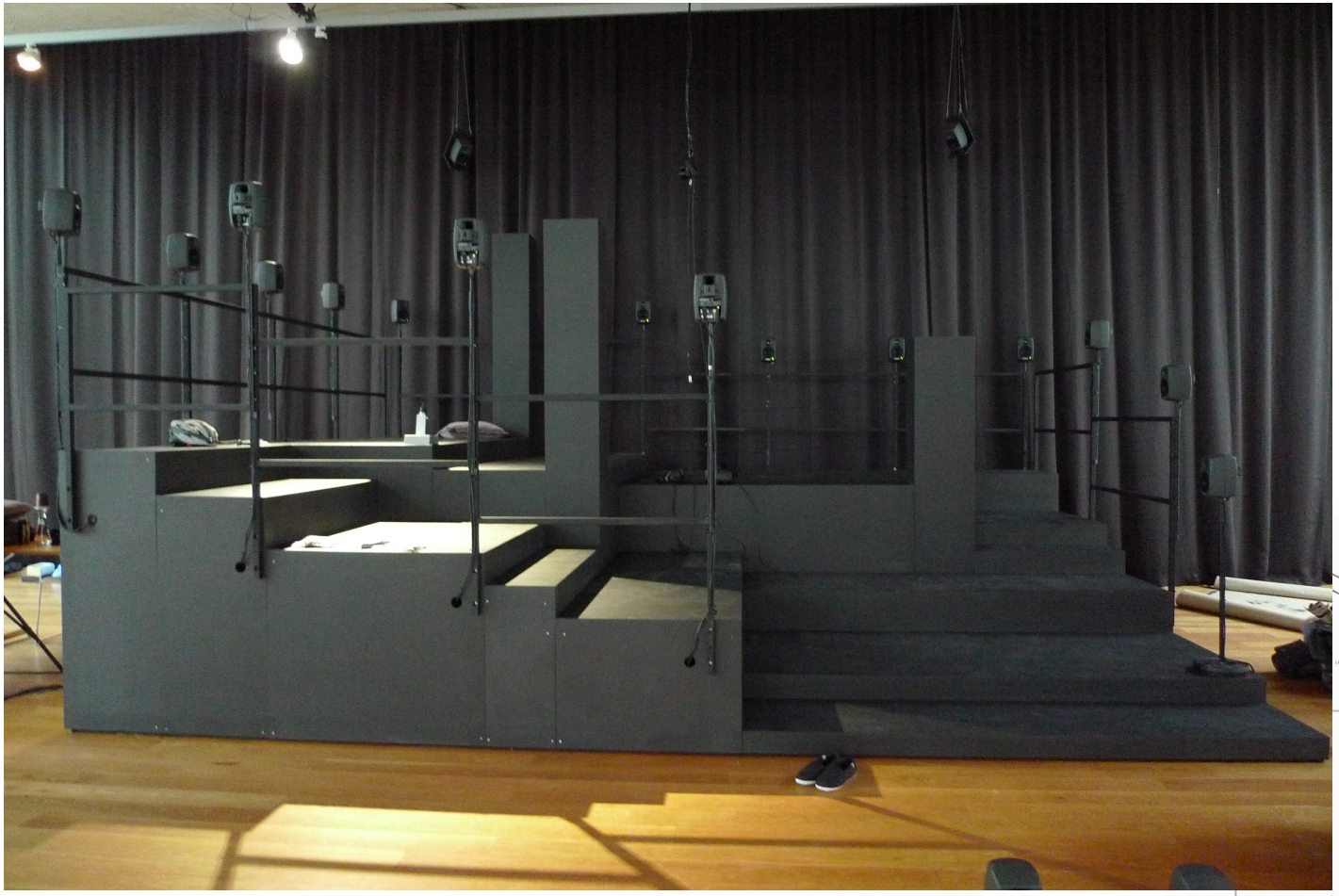
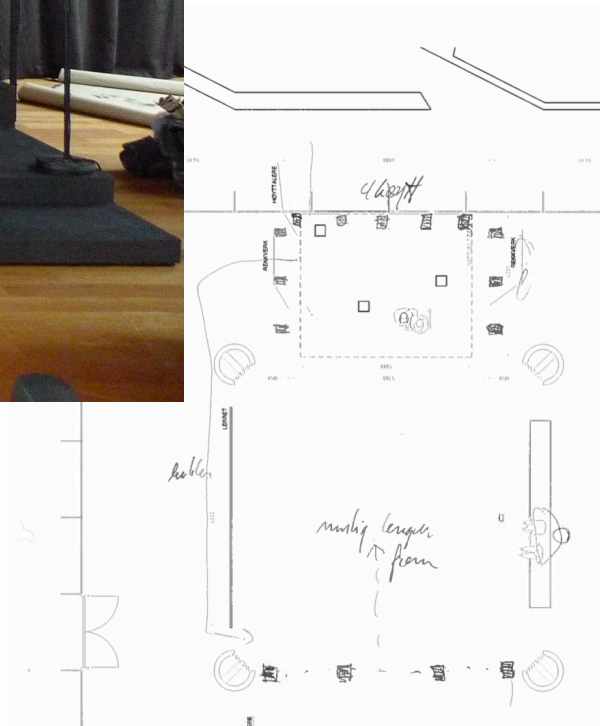
Delivery through loudspeakers





How to deliver these (3D) soundscapes in the exhibition context, for augmenting the visitor experience and evoking:
a sense of immersion, a sense of being there, and a sense of credibility

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Delivery through headset

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Nearfield rendering was impossible with use of speakeres only, due to exhibition space acoustics.

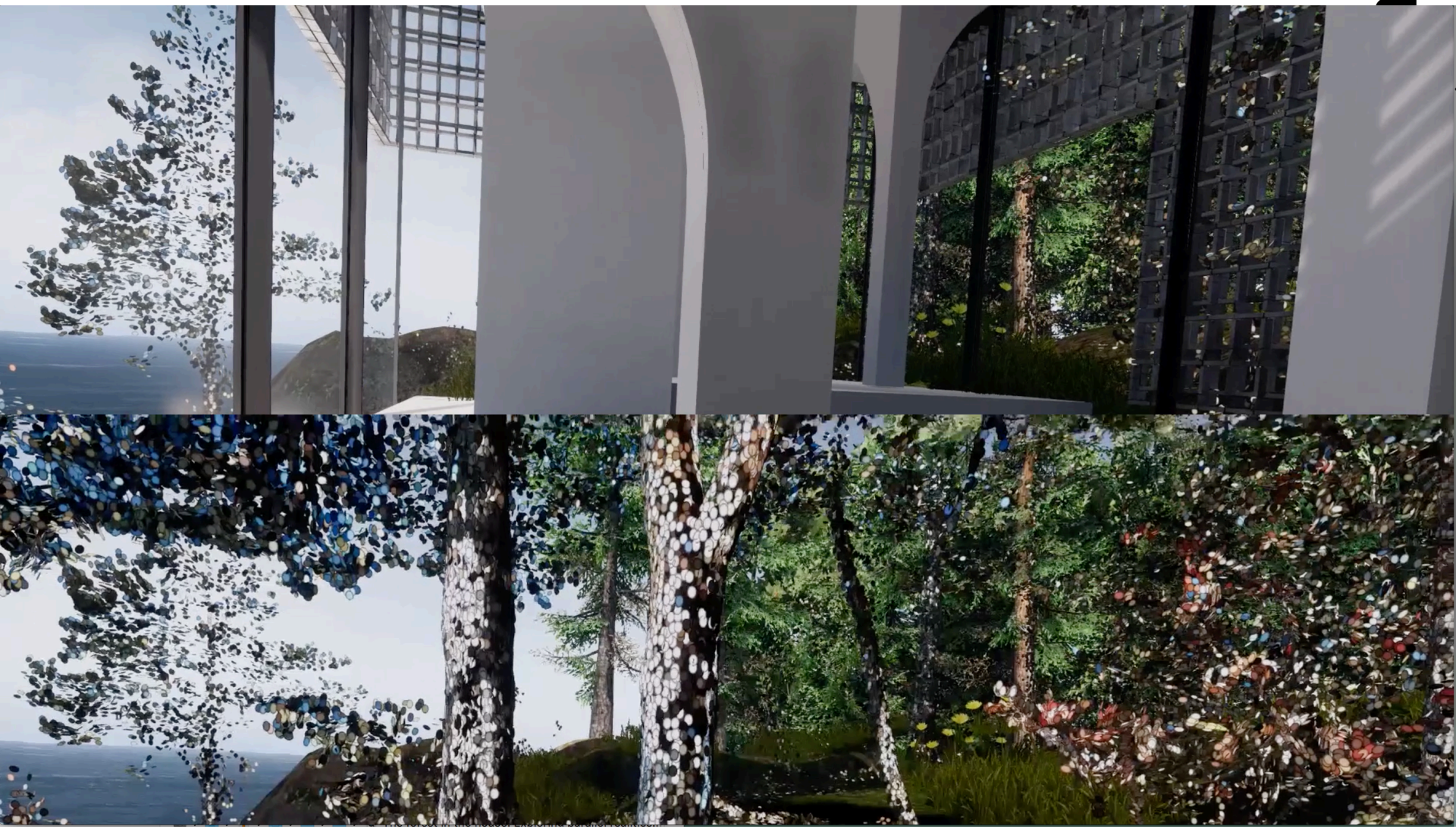
Open headset made communication possible in between visitors.

No significant differences between genders and age groups in perception and evaluation of the significance of sound.

In headset: Virtual acoustics inside and nearfield sounds outside.

Split-screen documentation

Split-screen documentation



Split-screen documentation

Gathering data

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Primary data:
82 exit interviews with 24 questions solely about sound, structured in three sections:

1) Relevance and meaning of soundscape for experience
2) Credibility of the soundscapes
3) Technical quality

When entering the exhibition, the visitors were NOT told that an exit interview on sound would happen.

Secondary data:
325 Visitracker questionnaires. Contained one question about sound about whether sound was important in the visitor's experience of “realness.”

16 video recordings and transcripts to capture interactions between pairs of visitors, some of which included comments and reflections on sound. 16 interviews.

Findings

96% visitors were positive to the inclusion of sound, and 68% thought that the soundscapes seemed authentic, **fulfilling expectations from the visuals**.

The soundscape was generally experienced as natural-sounding (68%), and **43% of the visitors wanted to hear sound that tied them closer to the installation by auralizing their interaction**.

A little more than 50% did not notice changes in the soundscapes. 70% noticed sounds coming from different distances, and 78 % noticed that sounds came from different directions, mentioning insect sounds, birds and indoor acoustics. A little more than half (44 of 82) noticed sounds that moved. A significant majority noticed surprising near-field sounds.

On average, visitors remembered 3.3 sounds of 12, sounds of wind and waves being remembered by nearly all. Close to no one remembered passing sounds of horses, bicycles or airplanes. **Nearly all visitors felt that sound was important for their experience, but almost no one remembered much of what they had heard**.

This correlates with hearing and listening in normal acoustic conditions, thus underpinning the perception of VR as a welcome technology in exhibition contexts.

Discussion

Inclusion of sound is wanted by visitors, in particular sounds from interaction.

Sounds and soundscape must appear to be realistic
- complexity, placement and spatiality, psychoacoustic
- correlate with expectations from VR visuals

Delivery methods for bypassing suboptimal conditions can be combined
- VBAP solution, cheap and adaptable
- Binaural for near-field sounds and acoustic modeling

Acoustically difficult spaces can be used for credible 3D sound presentations, as long as the more critical and attention-demanding sounds and their movements can be rendered (binaurally) close to the ear. This mix of sound sources has shown to be quite robust in creating a sense of presence.

This insight might encourage the incorporation of audio in museum mediation, particularly where budgetary constraints hinder construction of optimal building acoustics.

Literature

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Sound in museums

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Thank you for your attention!

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