



# Sonic Interactions in Multimodal Virtual Environments

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## Abstract

In this paper we present the research and teaching activities performed in the Multisensory Experience Lab at Aalborg University Copenhagen. We also briefly describe the Sound and Music Computing Education started at Aalborg University in September 2014.

**Keywords:** sonic interaction design, multisensory interaction, sound and music computing

## 1. Introduction

Sonic interaction design is an emerging field recently defined as the study and exploitation of sound as one of the principal channels conveying information, meaning, and aesthetic/emotional qualities in interactive contexts. This field lies at the intersection of interaction design and sound and music computing (Fratinovic and Serafin, 2013). At Aalborg University Copenhagen we examine sonic interaction from different angles.

Since we live in a multi sensorial world, sonic interactions become more meaningful when combined with simulations of other modalities. It is well known that sound can indeed complement, enhance or even substitute other senses.

Our research explores sonic interactions when combined with other senses such as haptic and visual feedback. This includes the physics based simulation of multimodal interactions together with evaluation of the user experience.

Recent applications have been focused on the field of virtual reality, where the focus on auditory feedback has been rather limited when compared, for example, to the focus placed on visual feedback or even on haptic

feedback. Other applications have been in the field of cultural heritage, in order to use sonic interaction technologies to reconstruct and preserve musical instruments. In particular, thanks to a project supported by the Culture 2000 EU framework, we reconstructed and exhibited the devices and the music of the Rai Studio di Fonologia Musicale in Milan (see Novati and Dack, 2012).

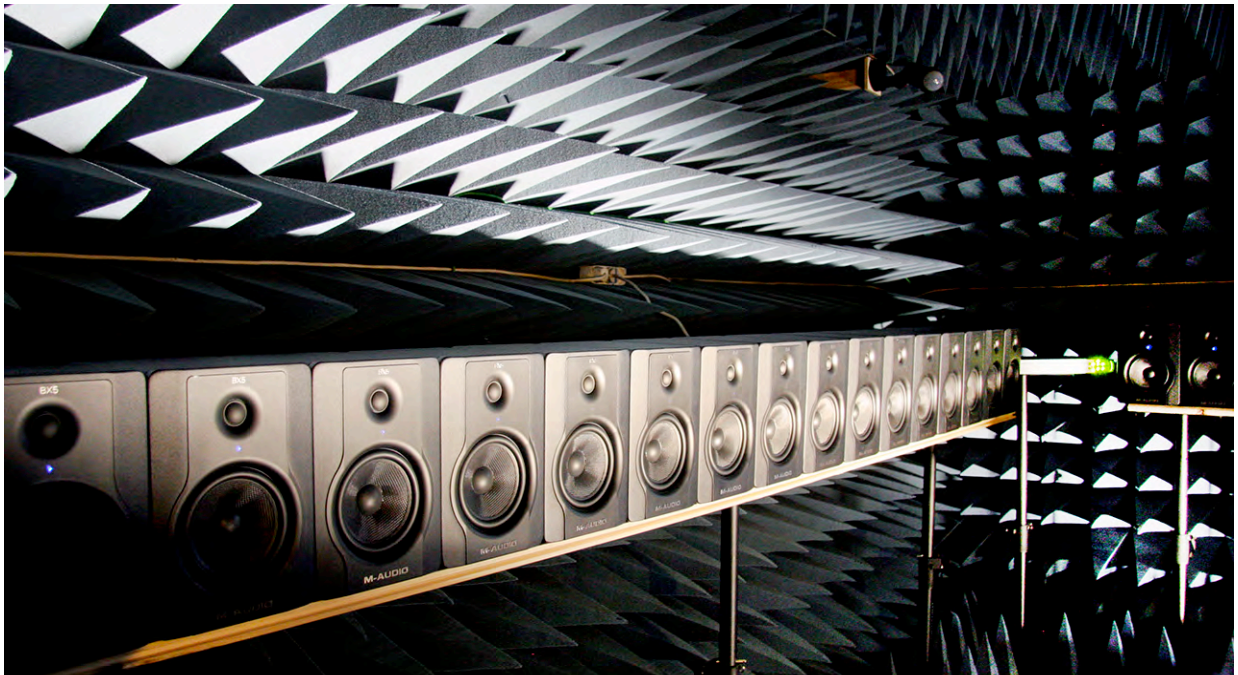
## 2. MultiSensory Experience Lab

In the MultiSensory Experience Lab (see **Figure 1**) we research the integration of different senses by combining technology, computer simulations and user experience evaluation. The lab consists of three main spaces.

The larger space is used for multimodal (audio-visual-haptic) simulations, and contains a motion capture system (16 cameras motion Optitrack system by NaturalPoint), a nVisor SX head mounted display and Oculus head mounted display, a 24 channels surround sound system (Dynaudio BM5A), and several devices for haptic feedback. In addition, the lab contains an anechoic chamber and a 64 speaker wavefield synthesis system (see **Figure 2**).



**Figure 1.** The Multisensory experience lab.



**Figure 2.** The wavefield synthesis lab.

### 3. The Sound and Music Computing education

From September 1st, 2014, Aalborg University in Copenhagen will offer a Master of Science in Sound and Music Computing. The Master of Science is a 2-year, research-based, full-time study programme, set to 120 ECTS credits. Its mission is to train the next generation of professionals to push forward the sound and music technologies of the new information society. By combining practical and theoretical approaches in topics such as computational modeling, audio engineering, perception, cognition, and interactive systems, the program gives the scientific and technological background needed to start a research or professional career. This program trains students on

the technologies for the analysis, description, synthesis, transformation and production of sound and music, and on the technologies and processes that support sound and music creation.

More information can be found at URL <http://media.aau.dk/smc>

#### References

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