Agile seed funding 2020 recipient report

Project title: Evaluation of three acoustic manikins for binaural recording and research/popularization purposes

Project participants: Alain Berry, Olivier Robin, Pierre Grandjean (Université de Sherbrooke), Philippe-Aubert Gauthier (Université du Québec à Montréal)

Abstract: Acoustic manikins can be used for outreach (hearing health prevention) or for research purposes (psychoacoustics). The cost of these manikins can range from few hundred to several tens of thousand dollars, but it is not clear whether this price difference is translated into measurement quality. This project aims at evaluating three acoustic manikins especially in a binaural recording context (a very low-cost full-body manikin, a low-cost acoustic head and a high-end torso). Recordings will be held under controlled conditions at Groupe d'acoustique (UdeS) as well as with musicians at École de musique (UdeS), and streamed online in science popularization videos.

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It is first precised that the COVID-19 pandemic complicated the handling of this project, but to a limited extent. The funds were used to (1) pay salary for the setup of laboratory tests, and participation to support binaural recordings for another agile seed project (A concrete explanation to sound directivity of musical instruments and musicians/instruments interaction with rooms, involving Lévy Leblanc), and (2) buy a low-cost acoustics head (Binaural Enthusiast B1-E Dummy Head https://binauralenthusiast.com/product/etiam-ullamcorper-dollor-3/).

The tests were finally limited to the low-cost acoustic head and the high-end torso, since the very low-cost full-body manikin could not support the setup of different microphones. Head Related Transfer Functions (HRTF) were measured in anechoic conditions, with a combination of acoustics heads (see Figure 1) and corresponding microphones (one head with its own microphones and the microphones from the other head, and vice-versa). Corresponding data are still to be processed. It is anticipated that the results obtained, if satisfactory, will be presented in a conference (Acoustics Week in Canada 2021) or even a journal paper if justified (Canadian Acoustics, typically).

The concrete outcomes of this project include:

- Training of two CIRMMT members (Pierre Grandjean, and Lévy Leblanc),
- An improved knowledge of acoustic manikins performance (using indicators like HRTF),
- Several videos including binaural recordings made with skilled musicians in anechoic and reverberant rooms (already recorded and planned to be streamed this session), that will support research outreach,
- Two presentations at the CIRMMT RA1 Workshop: Spatial Audio Processing for Sound and Music Applications (February 26 2021), given by Olivier Robin (Explaining sound directivity: from backup alarms to musical instruments) and Pierre Grandjean (A concrete explanation to sound directivity by using binaural rendering),
- The development of interdisciplinary research with the participation of a student from École de musique, Université de Sherbrooke.

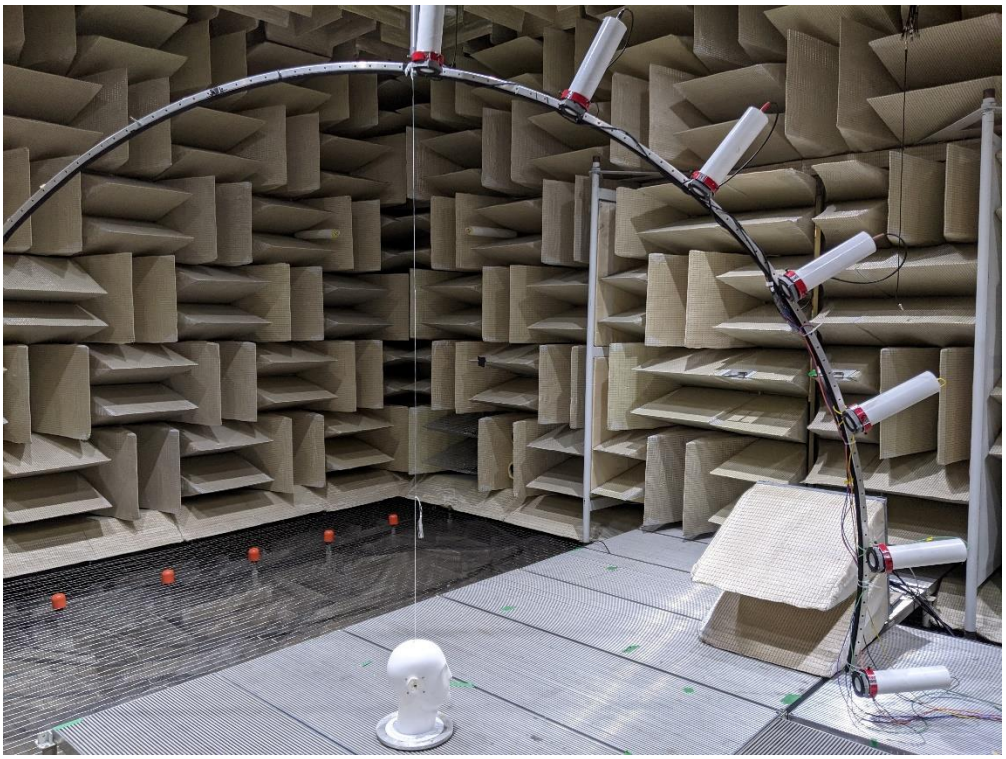

Figure 1: HRTF measurements in anechoic room using 7 speakers in the elevation plane (angular spacing = 15 degrees). The acoustic head was rotated by 10 degrees increments.

Figure 2: Pierre Grandjean holds the binaural enthusiast head while preparing a classical guitar audio/video recording in an anechoic room