
ACRONYMS

VSS	Virtual Singing Studio.....	2
RIR	Room Impulse Response.....	2

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IMPLEMENTATION

This section describes the steps taken from setting the project objectives to reaching the final implementation of the desired system.

2.1 - REAL RIR RECORDINGS

In order to test the perceptual differences when using synthetic RIRs, real RIRs of the same space had to be taken.

Previous test in the VSS have required ‘Plausibility’ test, where the user must evaluate the response of the VSS without reference to the real venue. This is usually because testing a virtual environment against a real one (authenticity tests) requires travel which can be expensive and difficult. Therefore, by running test based on ‘plausibility’ a sense of how convincing the virtual room is can be obtained. In the case of other virtual reality systems where the virtual environment does not exist in the real world, only these types of test can be run.

Though plausibility test are acceptable, an authenticity test gives more objective results. Therefore impulse responses of Hendrix Hall were taken, in the same format as the synthesised RIR’s.

B-Format ambisonic RIRs were taken using a B-format soundfield microphone, a Genelec 8040B all at a height of [Enter height] in a number of positions around the room in 4 directions for each.

2.1.1) RIR Measurement Setup

For the Virtual Singing Studio (VSS) it is desirable to obtain Room Impulse Response (RIR)’s that can be used to represent the topology of a singer, i.e mouth (sound source) below the ears (receiver). For this application it is more appropriate to use a Head and Torso simulator, however due to the unavailability of such equipment, a Genelec 8040B [1] loudspeaker was used as a directional sound source and a Soundfield St450 MKII microphone [2] was used as the receiver to record the three dimensional sound field in Ambisonic B-format.

Figure 1 shows an image of the human head topology sound source and receiver set up. The Genelec is placed 1m above the ground and the Soundfield microphone places 0.6m above the sound source. Ideally the receiver would be placed closer to the sound source to more accurately represent the distance between the ears and the mouth, however due to the physical dimensions of the equipment being used this was not possible. The sound source was placed 1m off the ground simply due to the limitations set by the maximum height of the microphone stand.

Figure 2 shows the overall set up used for recording the RIR's as follows: (1) the Genelec and Soundfield set up in the above mentioned source and receiver set up with a special soundfield cable running into (2), the soundfield unit used to output either a 4 channel B-format signal or a stereo signal to (3) a Fireface UXS audio interface plugged into (4) a Mac running Reaper. Reaper was used to output a 15 second long sinusoidal sweep to the Genelec.



Figure 1: Human head topology RIR measurement set up with a Genelec 8040B sound source placed 1m off the floor 0.6m below a Soundfield microphone used as a receiver

2.1.2) Positions

Four positions within the room were chosen and marked with tape for the RIR positions shown in figure 4 where:

Position	(1)	(2)	(3)	(4)
Coordinates [x(m),y(m)]	[9,9]	[4.5,9]	[2,9]	[10.13,1.46]

For each position an RIR was taken in four different directions starting at 0° and rotation anti-clockwise 90° (anti-clockwise rotation is a standard in Ambisonics) by rotation the sound source and keeping the receiver facing the same direction. This ensures that when the user turns their head in the VSS the sound field does not rotate as they do. Once the four directional RIR were recorded, the source and receiver were moved to the next marked location with care being taken to make sure the receiver is placed the same distance away from the sound source each time.

There a link like: [Audio!](#)

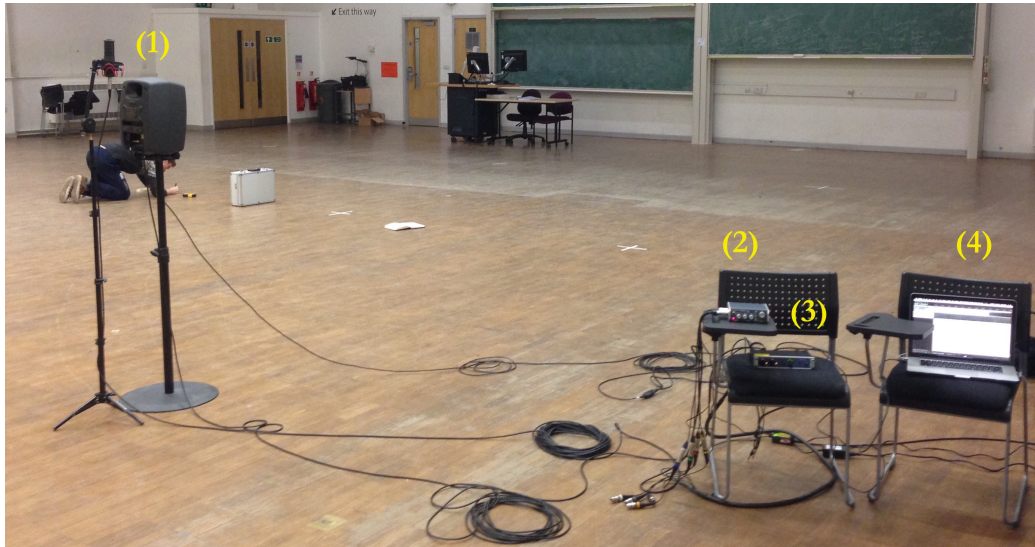


Figure 2: Real **RIR** measurement set up. (1): Sound source and receiver set up (2): Soundfield interface (3): Fireface UXC audio interface (4): Mac running Reaper to output sinusoidal sweep and record B-format input

2.1.3) RIR Analysis

2.1.4) Issues: False Start

Simple wiring error

REFERENCES

- [1] *Genelec 8040B Active Monitoring System*, Datasheet, Genelec, 2016.
- [2] (2016) Website. TSL Products. [Online]. Available: <http://www.tslproducts.com/soundfield/st450-soundfield-portable/#spec-tab>

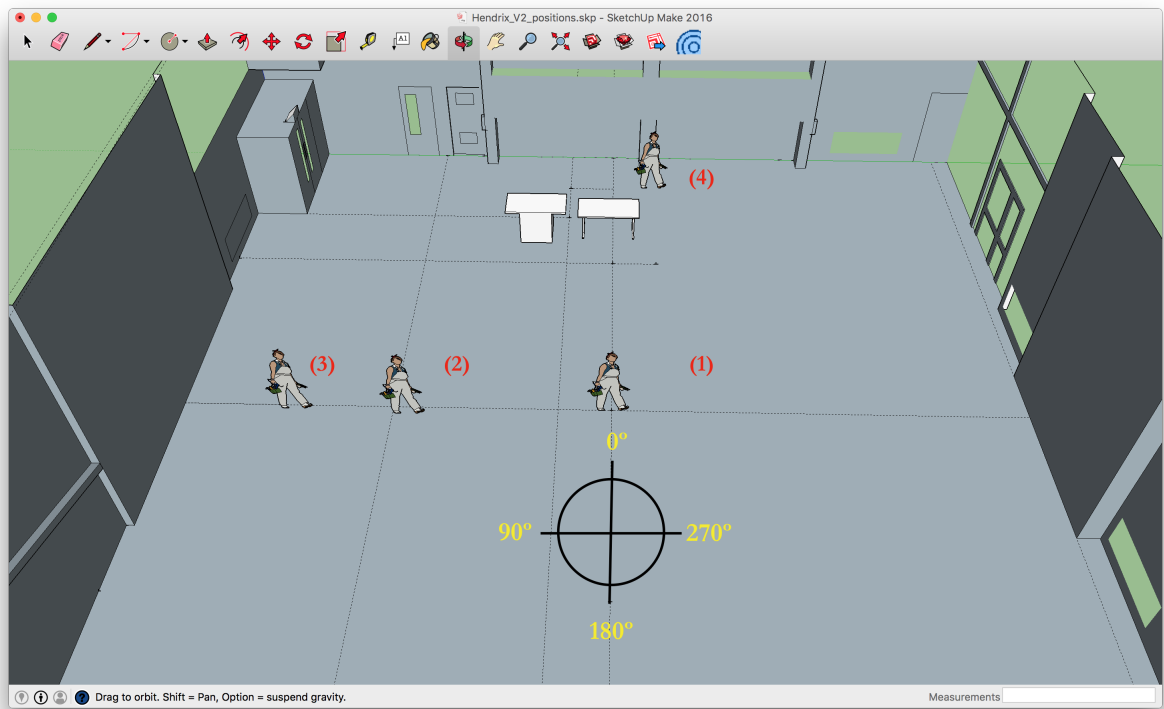


Figure 3: Google SketchUp model showing the positions of where the real RIR's were taken



Figure 4: Google SketchUp model showing the positions of where the real **RIR**'s were taken