RSoANU: RIR Dataset

RSoANU is a dataset of real multichannel Room Impulse Responses (RIRs) captured in a recording studio at the Australian National University (ANU). The dataset features RIRs captured using both a 32-channel spherical microphone array and a B-format Soundfield microphone array. The recordings encompass two distinct wall panel environments within the room, three source positions, and a planar receiver grid.

1 Room Configuration

The recording studio has variable wall paneling for two adjacent walls, offering options of felt and wood. RIRs were captured for two room configurations: one with all variable panels set to felt as shown in Figure 1a and another with all panels set to wood as shown in Figure 1b.

(a)

(b)

Figure 1: Panorama of the ANU Recording Studio, showing the variable wall panels **(a)** felt wall panels, **(b)** wood wall panels.

2 Measurement Setup

The recordings were conducted using two microphone arrays: a 32-channel spherical microphone array (MH Acoustics em32 Eigenmike) and a B-format Soundfield microphone array (Rode NT-SF1). A Tannoy System 600 loudspeaker served as the source.

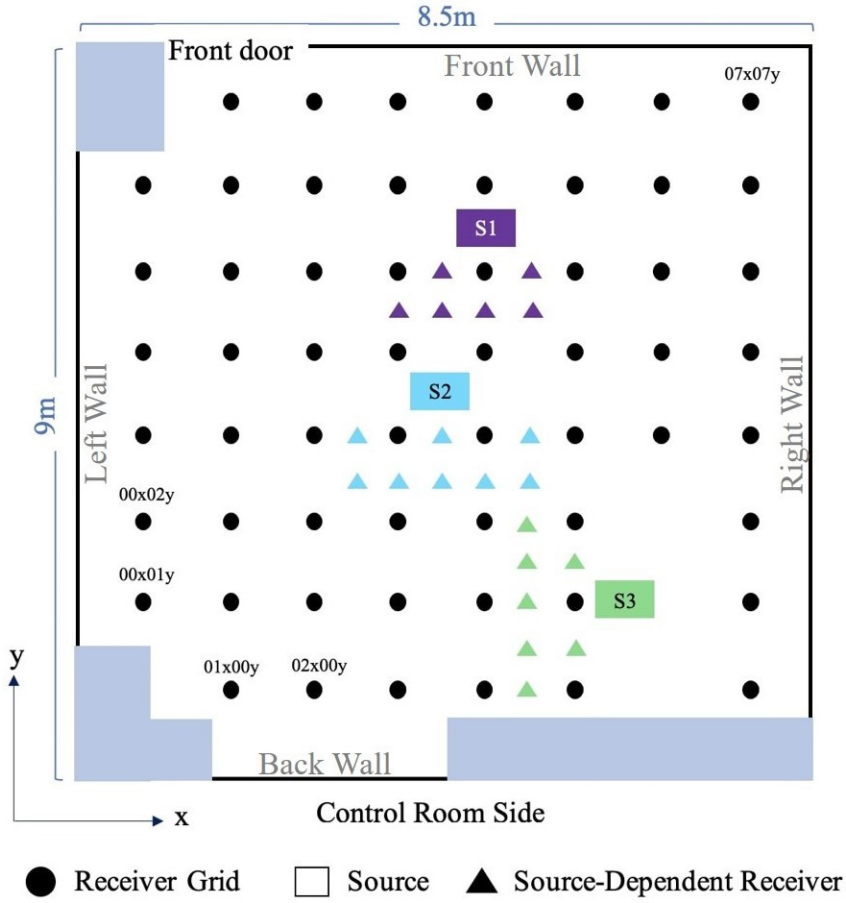

Figure 2: Diagram of the source and receiver positions. Light blue rectangular shapes indicate the locations of furnishings.

The source and receiver arrangement used in the RIR measurement is illustrated in Figure 2. The RIRs were measured for three source positions (S1, S2 and S3), with only one source being active during each measurement. The Cartesian coordinates of the source positions are given in Table 1. Both S1 and S2 faced the Control Room, while S3 was oriented to the left wall.

Table 1: Source coordinates (in meters) and code names

	X	**Y**	**Z**
S1	4.75	6.75	1.2
S2	4.25	4.75	1.384
S3	6	2.25	0.93

Receiver positions were arranged in a planar grid spanning a 7 m × 7 m region with 1 m resolution, supplemented by additional points with a finer grid spacing of 50 cm in front of each active source. During the measurement, the microphone array was centered at these positions at a consistent height of 1.7 m. Each receiver position is assigned a code name based on its coordinates along the x and y axes. Tables 2 and 3 list the Cartesian

coordinates and code names of the regular grid receiver positions and source-dependent receiver positions, respectively.

Table 2: Receiver coordinates (in meters) and code names

Code Name	**X**	**Y**	**Z**	**Code Name**	**X**	**Y**	**Z**
00x00y	0.75	1.25	1.7	04x00y	4.75	1.25	1.7
00x01y	0.75	2.25	1.7	04x01y	4.75	2.25	1.7
00x02y	0.75	3.25	1.7	04x02y	4.75	3.25	1.7
00x03y	0.75	4.25	1.7	04x03y	4.75	4.25	1.7
00x04y	0.75	5.25	1.7	04x04y	4.75	5.25	1.7
00x05y	0.75	6.25	1.7	04x05y	4.75	6.25	1.7
00x06y	0.75	7.25	1.7	04x06y	4.75	7.25	1.7
00x07y	0.75	8.25	1.7	04x07y	4.75	8.25	1.7
01x00y	1.75	1.25	1.7	03x00y	5.75	1.25	1.7
01x01y	1.75	2.25	1.7	05x01y	5.75	2.25	1.7
01x02y	1.75	3.25	1.7	05x02y	5.75	3.25	1.7
01x03y	1.75	4.25	1.7	05x03y	5.75	4.25	1.7
01x04y	1.75	5.25	1.7	05x04y	5.75	5.25	1.7
01x05y	1.75	6.25	1.7	05x05y	5.75	6.25	1.7
01x06y	1.75	7.25	1.7	05x06y	5.75	7.25	1.7
01x07y	1.75	8.25	1.7	05x07y	5.75	8.25	1.7
02x00y	2.75	1.25	1.7	06x00y	6.75	1.25	1.7
02x01y	2.75	2.25	1.7	06x01y	6.75	2.25	1.7
02x02y	2.75	3.25	1.7	06x02y	6.75	3.25	1.7
02x03y	2.75	4.25	1.7	06x03y	6.75	4.25	1.7
02x04y	2.75	5.25	1.7	06x04y	6.75	5.25	1.7
02x05y	2.75	6.25	1.7	06x05y	6.75	6.25	1.7
02x06y	2.75	7.25	1.7	06x06y	6.75	7.25	1.7
02x07y	2.75	8.25	1.7	06x07y	6.75	8.25	1.7
03x00y	3.75	1.25	1.7	07x00y	7.75	1.25	1.7
03x01y	3.75	2.25	1.7	07x01y	7.75	2.25	1.7
03x02y	3.75	3.25	1.7	07x02y	7.75	3.25	1.7
03x03y	3.75	4.25	1.7	07x03y	7.75	4.25	1.7
03x04y	3.75	5.25	1.7	07x04y	7.75	5.25	1.7
03x05y	3.75	6.25	1.7	07x05y	7.75	6.25	1.7
03x06y	3.75	7.25	1.7	07x06y	7.75	7.25	1.7
03x07y	3.75	8.25	1.7	07x07y	7.75	8.25	1.7

3 File Format and Organization

RIRs recorded by the em32 Eigenmike and NT-SF1 microphone are stored in multichannel formats with 32 and 4 channels, respectively. NT-SF1 microphone recordings are in Ambisonic B-format with FuMa normalization. All RIRs share a common sampling frequency of 48 kHz and a duration of 1.5 s.

Each multichannel RIR is saved in two file formats: MATLAB struct (∗.mat) and 16-bit audio (∗.wav). For the em32 Eigenmike, the 32-channel RIR is saved under the IR_Data field name in the (*.mat) struct file. For the Rode NT-SF1 microphone, the RIR is saved under the $Bformat$ field name with separate child fields for W, X, Y, Z channels.

Table 3: Coordinates (in meters) and code names of additional receiver locations corresponding to each source

Source	Receiver			
	Code Name	X	Y	Z
S1	e30x45y	3.75	5.75	1.7
	e35x45y	4.25	5.75	1.7
	e35x50y	4.25	6.25	1.7
	e40x45y	4.75	5.75	1.7
	e45x45y	5.25	5.75	1.7
	e45x50y	5.25	6.25	1.7
S2	e25x25y	3.25	3.75	1.7
	e25x30y	3.25	4.25	1.7
	e30x25y	3.75	3.75	1.7
	e35x25y	4.25	3.75	1.7
	e35x30y	4.25	4.25	1.7
	e40x25y	4.75	3.75	1.7
	e45x25y	5.25	3.75	1.7
	e45x30y	5.25	4.25	1.7
S3	e45x00y	5.25	1.25	1.7
	e45x05y	5.25	1.75	1.7
	e45x10y	5.25	2.25	1.7
	e45x15y	5.25	2.75	1.7
	e45x20y	5.25	3.25	1.7
	e50x05y	5.75	1.75	1.7
	e50x15y	5.75	2.75	1.7

The filenames follow a convention based on the source code names and receiver code names outlined in Tables 1, 2 and 3. The files are categorized into separate folders based on the microphone array, panel configuration, and source positions.

3.1 Outliers

RIRs captured by the NT-SF1 microphone at the receiver position $00x04y$ exhibited distortions due to interference from air conditioner noise coming from the duct situated directly above this receiver. Increasing the SNR with respect to this receiver position could have mitigated this issue. However, the loudspeaker volume was set to emulate typical studio performance levels and kept unchanged while measuring at all receiver positions. Despite the acknowledged impact, the RIR measurements were intentionally conducted without turning off the air conditioners to capture real recording scenarios. Therefore, the RIRs corresponding to the receiver code $00x04y$ measured by NT-SF1 microphone are still included in the dataset but separated into an 'Outlier' folder. While these RIRs may exhibit anomalies, they still hold value for denoising applications, provided users exercise appropriate considerations during analysis.