Technical Report

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In this report the environmental conditions as well as the hardware used for the recording of drone audio data are shown.

1 Recording Environment

The audio data was collected on a field in a sparsely populated area. Only a small road with little traffic is located nearby the flying environment. A highway passes in a distance of approximately 600 m and only a faint amount of assoiated noise was audible. It was not windy on recording day. Figure 1 shows a picture of the recording setup.

Figure 1: Recording setup consisting of the DJI Phantom 4 PRO Professional Drone and the recording board with battery power supply. The microphone array is fixed on the bottom side.

2 Hardware

For flying, a DJI Phantom 4 PRO Professional Drone with four rotors was utilized. We recorded with an array consisting of 16 MEMS microphones, distributed two-dimensionally

in the horizontal plane. The adjoined microphone pair outputs are summed, resulting in 8 recording channels. The dimension and geometry of the array are shown in Figure 2. Figure 3 and 4 exhibit the top and bottom side of the measurement board. In Listing 1 relative microphone postitions are specified in form of Matlab code.
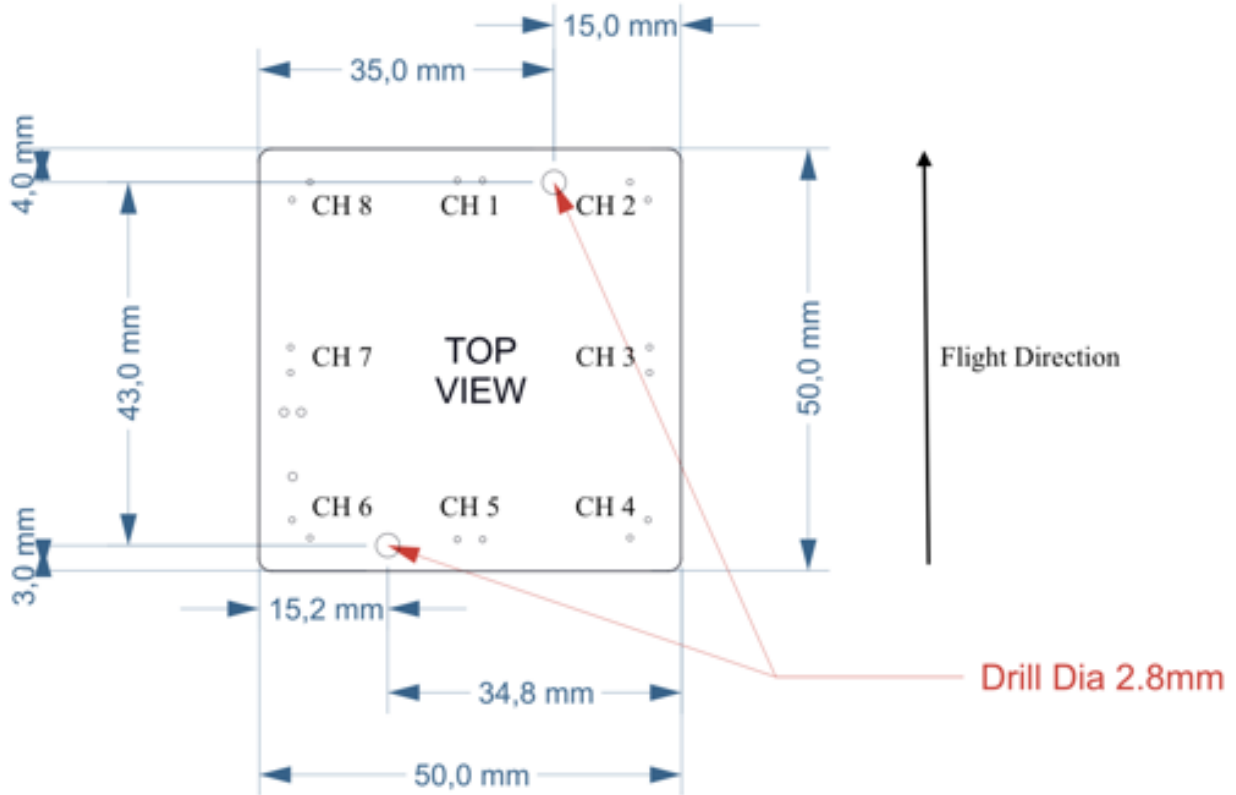

Figure 2: Size and positions as well as channels relative to the flight direction. The draft was taken from a data sheet by [1].

Listing 1: Relative microphone positions of the microphone array used in recordings as matlab sourcecode

```
microphonePositions = [ ...
    0.0426 0.0213 0.0;
    0.0424 0.0424 0.0;
    0.0213 0.0426 0.0;
    0.0002 0.0424 0.0;
    0.0000 0.0213 0.0;
    0.0002 0.0002 0.0;
    0.0213 0.0000 0.0;
    0.0424 0.0002 0.0;
]; % [x y z]
```
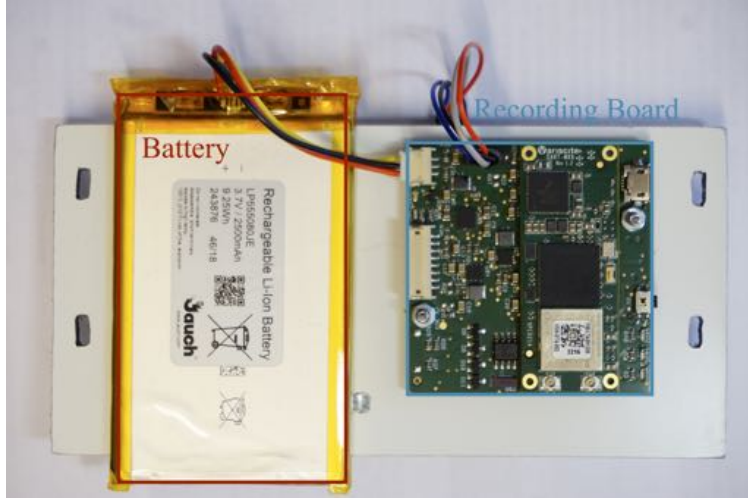
Figure 3: The recording board managing the storage of the audio files on an SD card and the battery supplying power to the board and microphone array (top view).
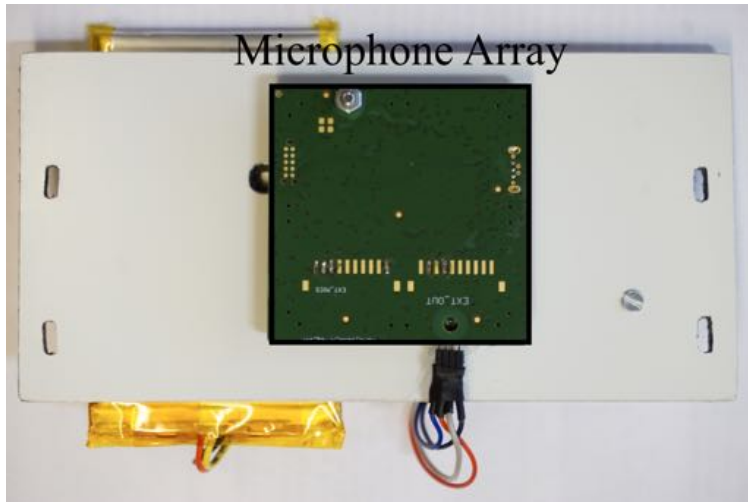

Figure 4: Microphone array fixed on a aluminum plastic composite plate (bottom view).

3 Audio Data

Table 1: File names and containing flight situations.

file name	flight maneuver
static_2_m	drone stands in 2 m heights
static_10_m	drone stands in 10 m heights
rotate_right_left_10m	rotation along center axis of drone
rectangle_10_m	flying along a rectangle path (20×20 m)
01	unlabeled situation

Audio data is recorded as 32-bit PCM wave files with a sampling frequency of 48 kHz.

Two static situations, one in 2 m height and the other in 10 m height, were recorded. In addition, two flight situations where measured. In the first maneuver, the drone rotated along its vertical center axis. The second file contains audio from a flight in which the drone followed a rectangular path in the size of circa 20×20 m. Both flight maneuvers took place in about 10 m height. supplementary, an unlabeled free flight recording with a total duration of about 3 minutes of data was taken. Table 3 shows the file names and the corresponding flight paths.

References

[1] Wellmann, Jan. *Octopus Array Dimensions*. de. Datenblatt. Oldenburg: Fraunhofer IDMT, May 2018, p. 1.