



# 2019 IEEE Signal Processing Cup: *Search and Rescue with Drone-Embedded Sound Source Localization* - Final @ICASSP Instructions -



## 1. Static source localization

For this task, 20 **8-channel** audio recordings at 44.1 kHz and of roughly 2 seconds each are provided in the form of wav files, named **1.wav** to **20.wav**. They can be found in the **static\_task/audio/** folder. All recordings were made with the SPCup2019 8-microphone array (See Section 4). Each were obtained by summing a clean recording of a static loudspeaker emitting speech from an unknown (azimuth, elevation) direction in the array's frame, and a recording of UAV noise of the same length in various flight conditions and using various signal-to-noise ratios.

The goal of this task is to retrieve the azimuth and elevation angles of the static speech source for each of the 20 recordings. To do so, a **mat file** called **SPCUP19\_<TEAM\_NAME>\_static.mat** must be provided, containing the following two **20x1** vectors:

- `static_azimuth` such that `static_azimuth(J)` is the estimated real-valued azimuth angle for recording **J.wav**.
- `static_elevation` such that `static_elevation(J)` is the estimated real-valued elevation angle for recording **J.wav**.

In addition to the 20 recordings, the mat file **static\_task/static\_motor\_speed.mat** is optionally provided. It contains a **20x4** matrix `static_motor_speed` such that `static_motor_speed(J,K)` contains the average angular velocity of propeller **K** during recording **J.wav**.

## 2. In-flight source localization

For this task, one **8-channel** audio recording at 44.1 kHz lasting precisely 20.25 seconds is provided in the form of a wav file **1.wav**, placed in the **flight\_task/audio/** folder. The source is a loudspeaker emitting speech. The recording was made **during flight** with the 8-microphone array described in Section 4 attached to the SPCup2019 Mikrokopter UAV showed in Figure 1. The flight was performed in a large room with moderate reverberation level. While the source (loudspeaker) is static during the flight, the microphone array is moving with the drone and hence, the (azimuth, elevation) source direction in the array's frame is **time-varying**.

For this recording **80 timestamps** are defined as follows:

{0.25s, 0.5s, 0.75s, 1s, 1.25s, ..., 19.75s, 20s, 20.25s}

The goal of this task is to retrieve the mean azimuth and elevation angles of the source within a **500ms** window centered on each of these timestamps. To do so, a **mat file** called **SPCUP19\_<TEAM\_NAME>\_flight.mat** must be provided, containing the following two matrices:

- `flight_azimuth` (1x80) such that `flight_azimuth(T)` is the estimated real-valued azimuth angle at timestamp `T`.
- `flight_elevation` (1x80) such that `flight_elevation(T)` is the estimated real-valued elevation angle at timestamp `T`.

In addition to the 20 recordings, the mat file **flight\_task/flight\_motor\_speed.mat** is optionally provided. It contains a **1x80x4** array `flight_motor_speed` such that `flight_motor_speed(1, T, K)` contains the average angular velocity of propeller `K` around timestamp `T`. The averages are over **500ms** windows centered on timestamps.

### 3. Setup and Array geometry



Figure 1. Setup used for the SPCup2019: A Mikrokopter UAV equipped with an array of 8 microphones

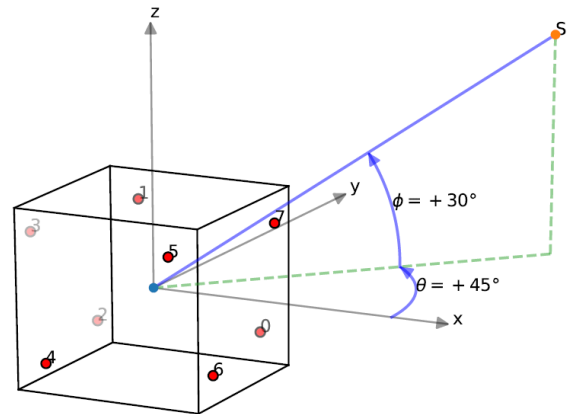


Figure 2. Array coordinates frame

The array and UAV are strictly the same as in the open competition. The positions of the eight microphones in the array's coordinate frame centered at the barycenter of the array are given in the file **micPos.txt**.

### 4. Development files

The same development files as in the open competition are provided for the final, in the folder **dev\_data/**.

***Best of luck to everyone!***