BIG REFINED SEARCH

OPTIONS:

First option: Preset (preconstructed) microphone array connected to computer via USB.

Hardware needed:

1. Microphone array  
   Microphone array options:

miniDSP UMA-16 USB Mic Array (16 microphones MEMS Knowles SPH1668LM4H in rectangular form, comes with mini-usb cabel) (price: 1600 zlotys) ([link](https://blackdotaudio.eu/minidsp-uma-16-usb-mic-array,236,3146124.html?srsltid=AfmBOoorIIpsIopLZSs0oeYNIHo5n1qa4zdJBJn4dVJQYIb3tIj0GMszHcs));

8 Array Directional Microphone Array (8 microphones) (price: 269 zlotys) ([link](https://www.fruugo.pl/8-array-directional-microphone-array-usb-linear-180-degree-sound-pickup-suppression/p-421488677-887768366?language=en&ac=google&gad_source=1&gad_campaignid=22764412488&gbraid=0AAAAADpXug0n_qHMJzWgDLDVJeCDRQYTG&gclid=CjwKCAjwr8LHBhBKEiwAy47uUsZaN_lFHoPzpPL2MqYtC2qO4noTi7zQ5e-PHXSQeb4OaWz8qXUAiRoC36UQAvD_BwE));

Mic6 Microphone Array (6 MEMS microphones) (price: 149 zlotys) ([link](https://www.fruugo.pl/mic6-microphone-array-zrod%C5%82o-dzwieku-modu%C5%82-sledzenia-lokalizacji-expansion-board-msm261s4030h0-ai-z-1/p-139477907-294677739?language=pl&ac=google&asc=pmax&gad_source=1&gad_campaignid=19640376884&gbraid=0AAAAADpXug1VWfSmrk0Y0TW9jRS7m7Mk_&gclid=CjwKCAjwr8LHBhBKEiwAy47uUp9hHLQsBkqYi7uDrYoMrnhcRMe01p84Rrj3Ove-A85wgoPQgX6iehoCYMIQAvD_BwE));

1. Mini-USB cable (or USB-C depending on array);
2. Laptop.

Software needed:

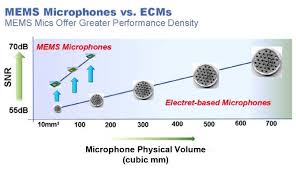
1. Sound processing software.

Scientific article on topic: [link](http://psasir.upm.edu.my/id/eprint/111185/1/Performance%20of%20DOA%20Estimation%20Algorithms%20for%20Acoustic%20Localization%20of%20Indoor%20Flying%20Drones%20Using%20Art.pdf)

Exemplary video: [link](https://youtu.be/n7y2rLAnd5I?si=fKkS3OkO_SMpUJYI)

In the video the XMOS xCore 7 array microphone array (with 6 microphones) was shown and ODAS library was utilized. It was shown that the array, using software with ODAS library was able to determine the location of sound source in 3 dimensional space. In video it was also shown that there is possibility to filter the sound as well as determine the location of sound source in real time.  
  
Advantages:

* Simplicity of construction. Such microphone arrays can be connected via USB to the computer (as shown on the video) and does not require any audio interfaces.
* Portability. Such construction (configuration) does not require a lot of space and can be placed even in very tight places.
* Small cost. Such configuration does not require very big amount of funds as the hardware that it consists of is not very demanding yet still able to efficiently perform sound localization techniques.
* Greater performance of MEMS microphones over Electric-based (see graph).



Disadvantages:

* Complexity of the software. This type of hardware requires the code of the software to be written in the programming language that will manage hardware efficiently. The process of coding may also require external libraries such as ODAS to be used.
* Relatively short range of MEMS microphone detection – up to only 20 meters (for arrays).

Conclusion: this option is relatively cheap and simple to construct and position yet still is complex from the software point of view. Even though it may have better greater performance in terms of sound localization it also has relatively short range for its work.