

Measuring the speed of sound*

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The objective of this task is to measure the speed of sound using the ‘time of flight’ technique. The apparatus comprises a meter rod, two microphones and a speaker that are connected to the computer’s sound card. This is shown in Figure 1. The microphones are separated by a distance d which can be varied, in steps of 10 cm (say 100 to 10 cm).

Note: Before you begin, be sure that the Matlab’s hardware support package to acquire and analyze data from the sound card is installed and configured properly. The provided software code will not run unless the package is installed. You can verify if this package is installed properly by typing `daq.getDevices` on the Matlab prompt. This should return all the sound related hardware installed on the computer system. Ask the instructor if you need help.

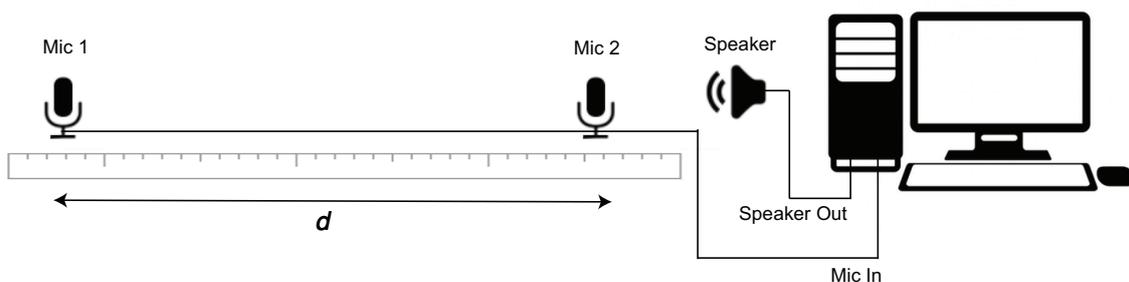


Figure 1: Proposed experimental setup for determining the speed of sound in air.

Set up your apparatus. The provided software generates a short, fading burst of sound. This sound file is named `pluck.wav`. The sound will be played on the right channel of the speaker. The microphones will record the corresponding sound, and the provided code will automatically generate a plot of the received audio. The time delay between the start of the wave from one microphone and the other will be used to measure the speed of sound. Devise an experimental strategy that helps you determine this speed. How do you calculate uncertainties? What type are they? Could you think of clever ways of improving the accuracy?

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