Report on experiment (3/10/18)

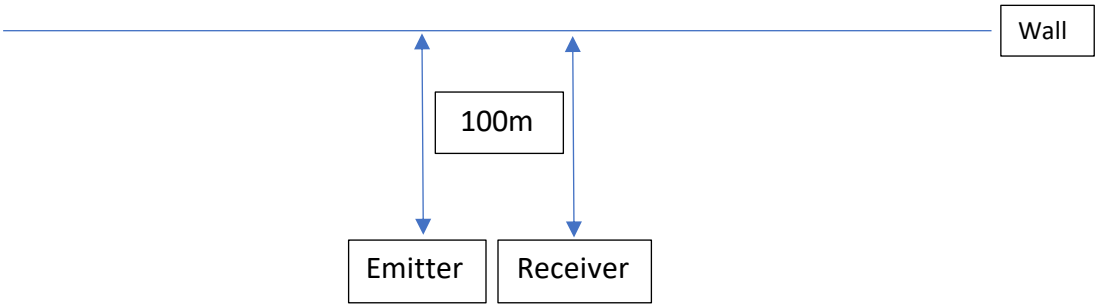
Introduction: The aim of the experiment is to calculate and verify the speed of sound through air using different methods.

The equations we will use are:

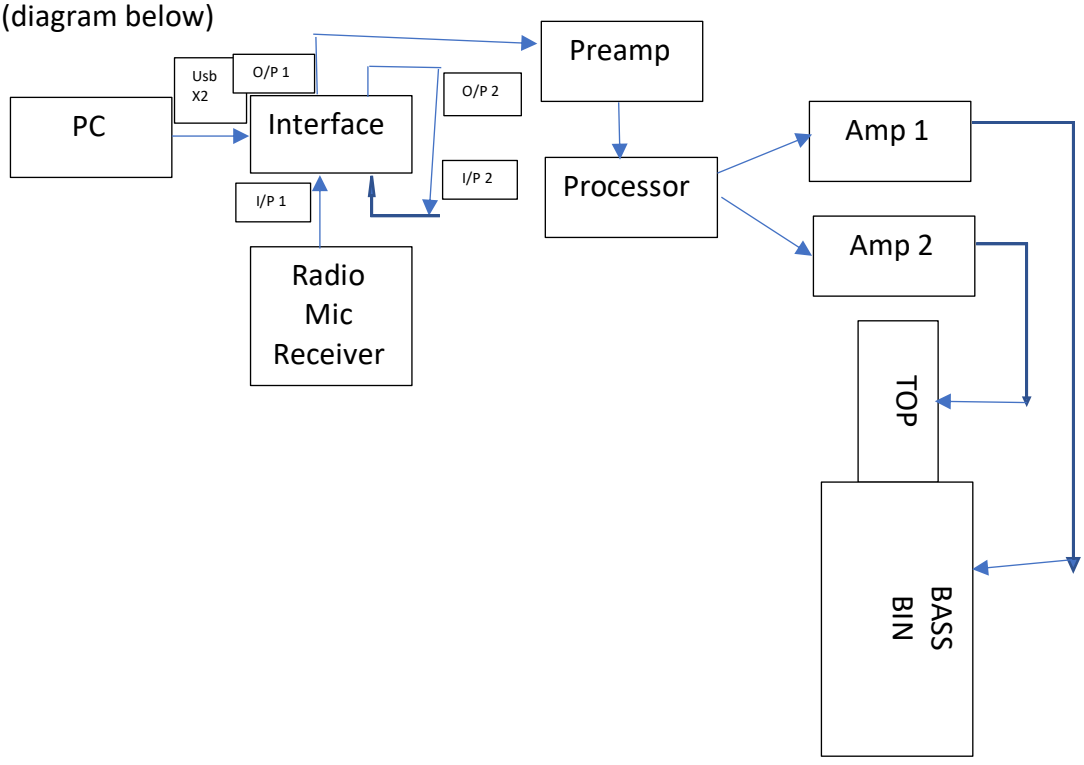
1) V = d/t where V = velocity (ms-1); d = distance (m) and t = time (s)
2) $V_{sound} \approx 331.4 + 0.6T_c$ where V = Velocity of sound through air; Tc = Temperature (°C)

Methods:

Method 1; Receiver stands next to emitter, who is 100m from a wall. The emitter claps, and the receiver times from when they see the clap to hearing the reflection of the clap. This method is more inaccurate than Method 2 as it involves human error.
(Diagram below)



Method 2; This method uses a spectrum analysis microphone deployed at distance *x* from a loudspeaker emitting pink noise. The transfer function of the sound will give us a time in milliseconds between the sound being generated and being measured.
(diagram below)



Results:

Method 1;

Time = 0.65s
Distance = 200m
Temperature = 10°C

V = d/t = 200/0.65 = 307.97 ms-1

$V_{sound} \approx 331.4 + 0.6T_c$ = 331.4 + 0.6 x 10 = 337.4 ms-1

Method 2;

Distance = 6.2m (laser reading) Computer reading = 8m (due to latency) error = 1.8m
Temperature = 10°C
Time = 23ms (x10-3)

V = d/t = 6.2/23ms = 269.57ms-1

V = d/t = 8/23ms = 347.83ms-1

Conclusion:

Neither of these methods accurately gave us the correct speed of sound according to equation 2.

Method 1 had error due to human reaction times, resulting in the speed of sound being too slow. This resulted in an error of 29.43 ms-1.

Method 2 was more accurate, as there was no human components. However, it was still inaccurate due to latency, resulting in a discrepancy of 10.43ms-1.

In conclusion, every system we use to measure the speed of sound has some error in it, but generally speaking, those that involve the least human involvement the better.