

Visual Matching System

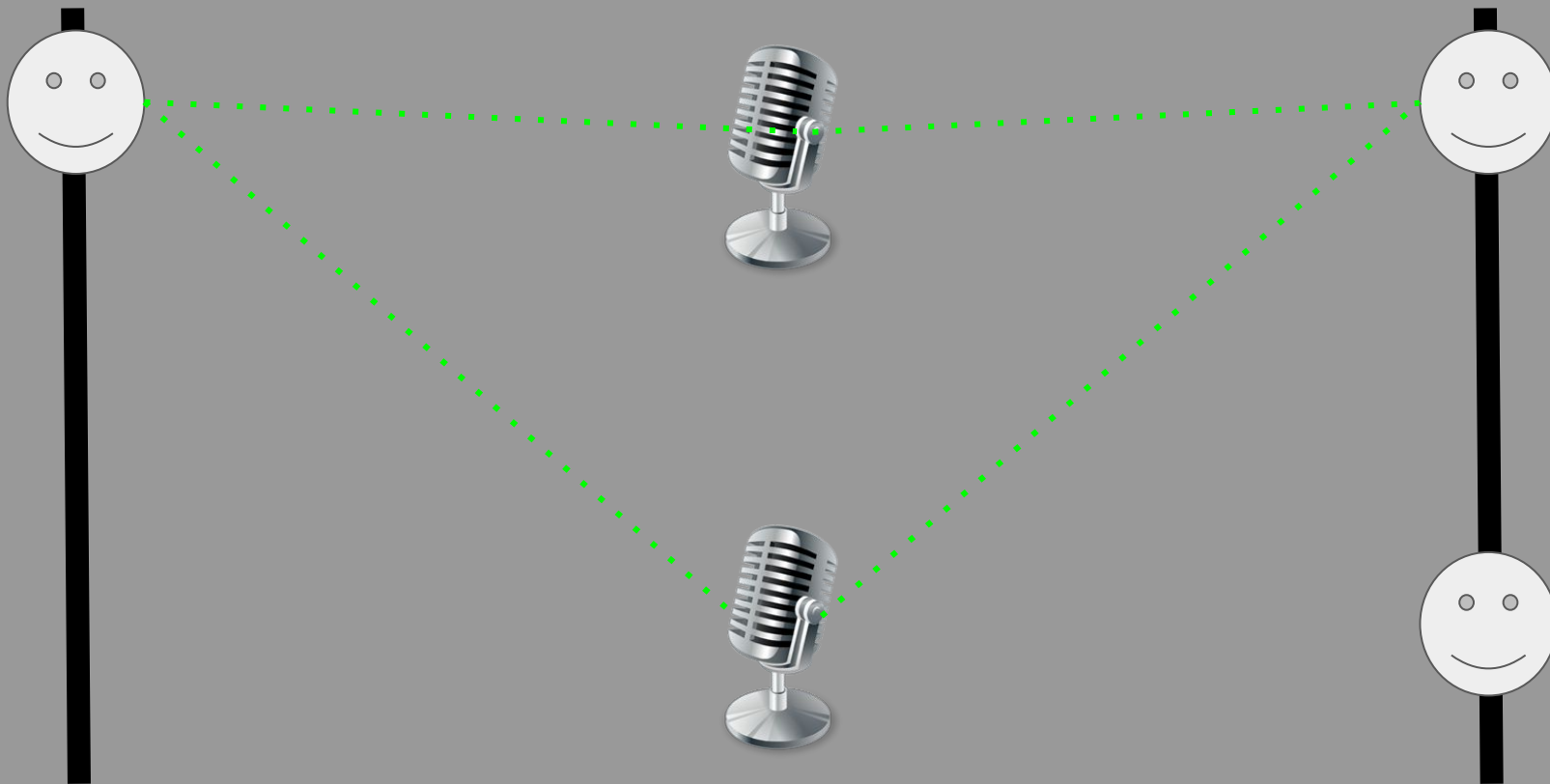
Nusret Tas and Faysal Shair

Mentor: Madeleine Waller

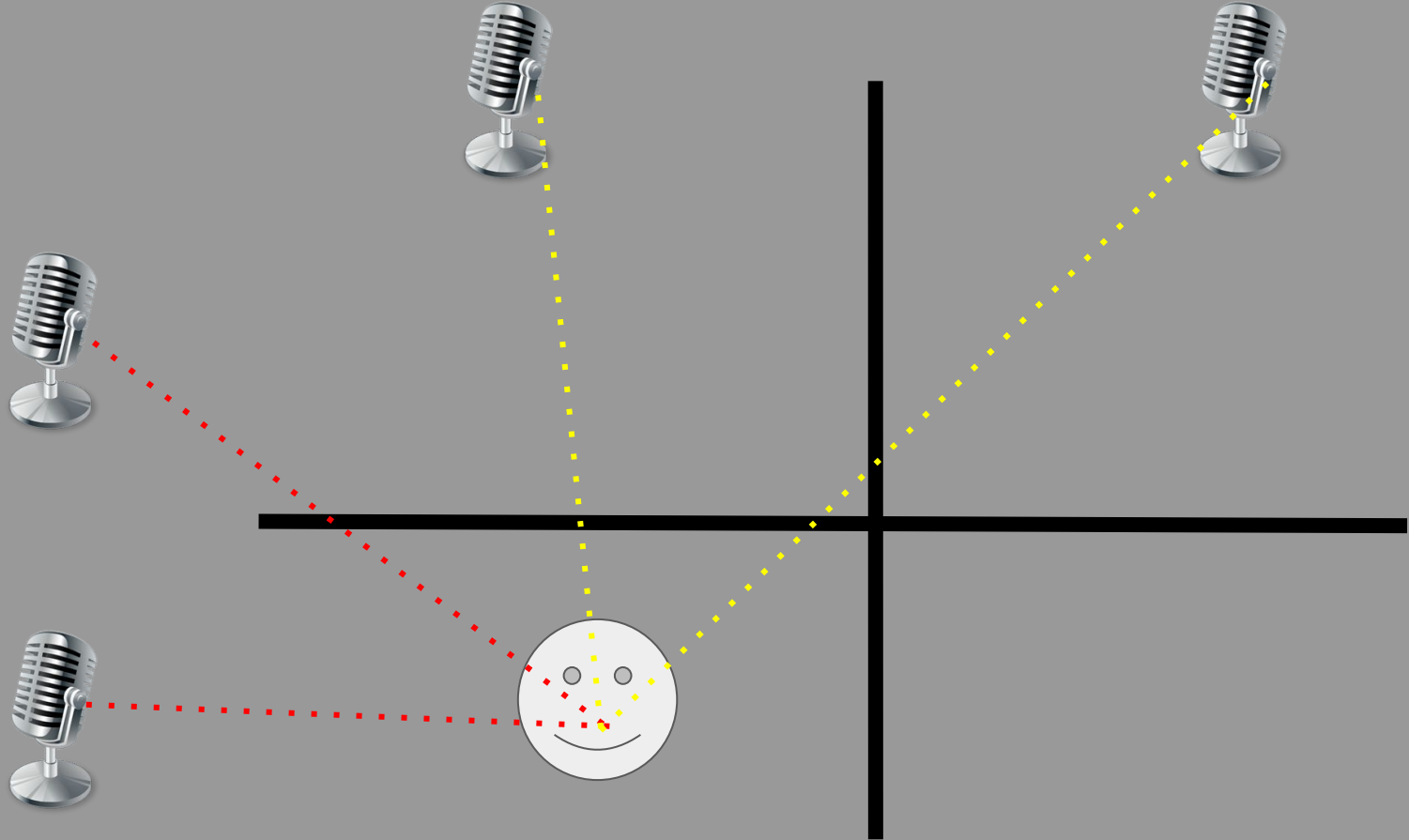


For 2-D we need
4 microphones.

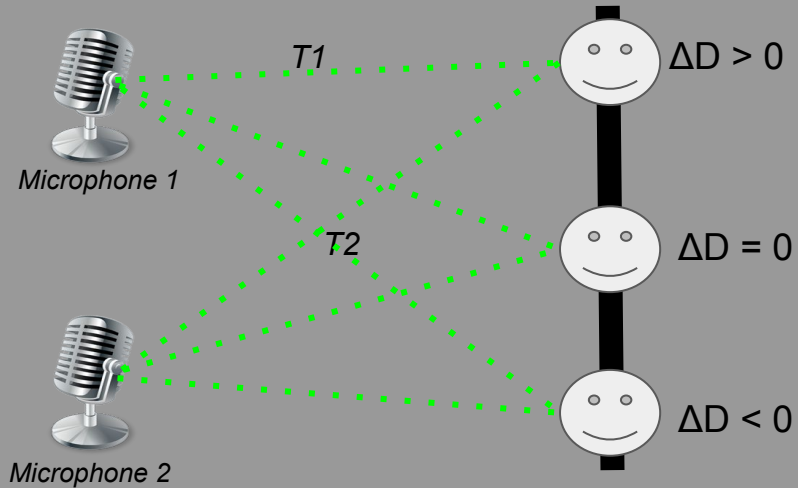
The Theory



In 2-D



Calculating the Position



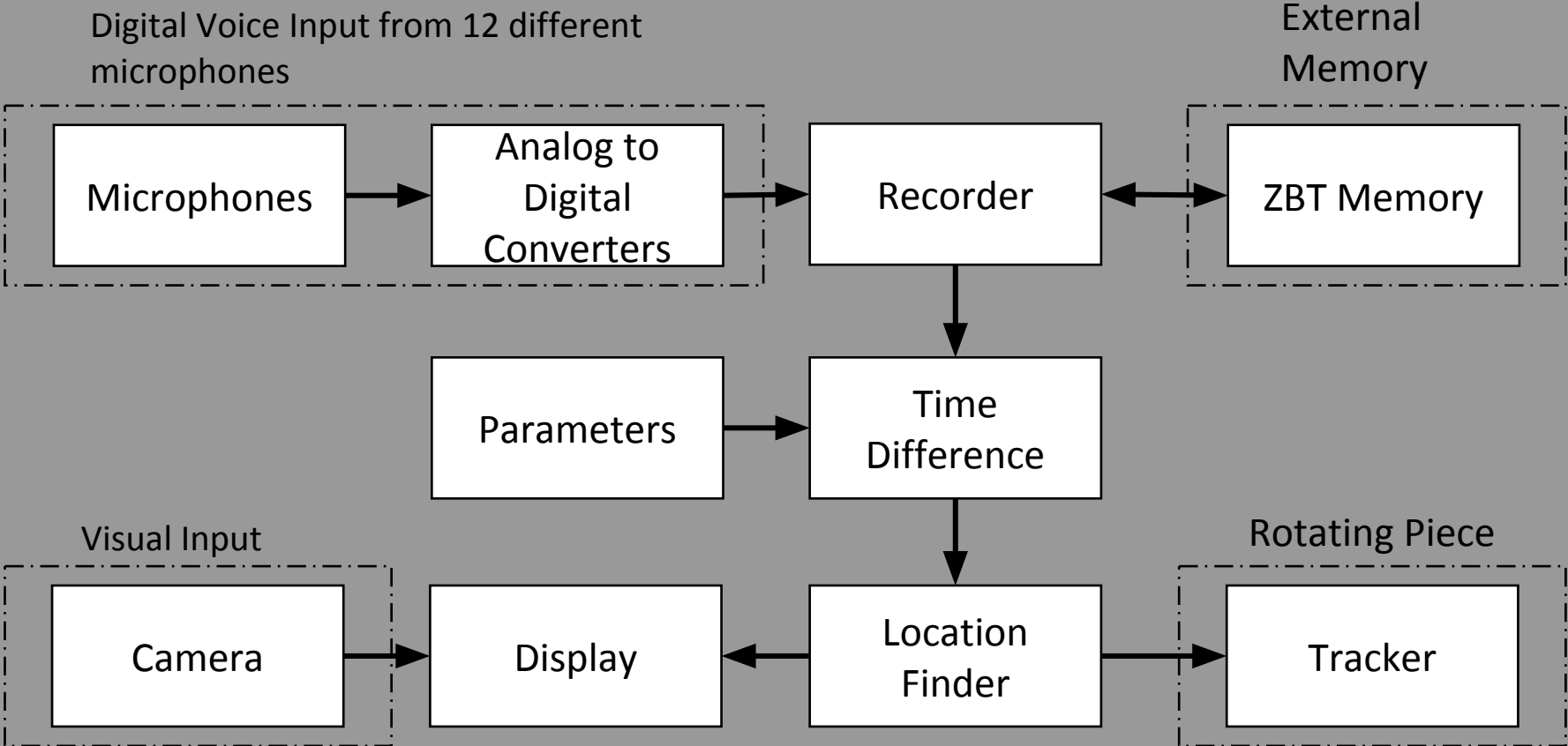
We do not need to necessarily calculate the individual distances, but the difference between them.

Speed of Sound = 343 m/s
Distance = Speed of Sound x time

Let's say the sound arrived to microphone 1 at time $T1$, and to microphone 2 at time $T2$.

$$\Delta \text{Difference} = \text{Speed of Sound} \times (T2 - T1)$$

Block Diagram



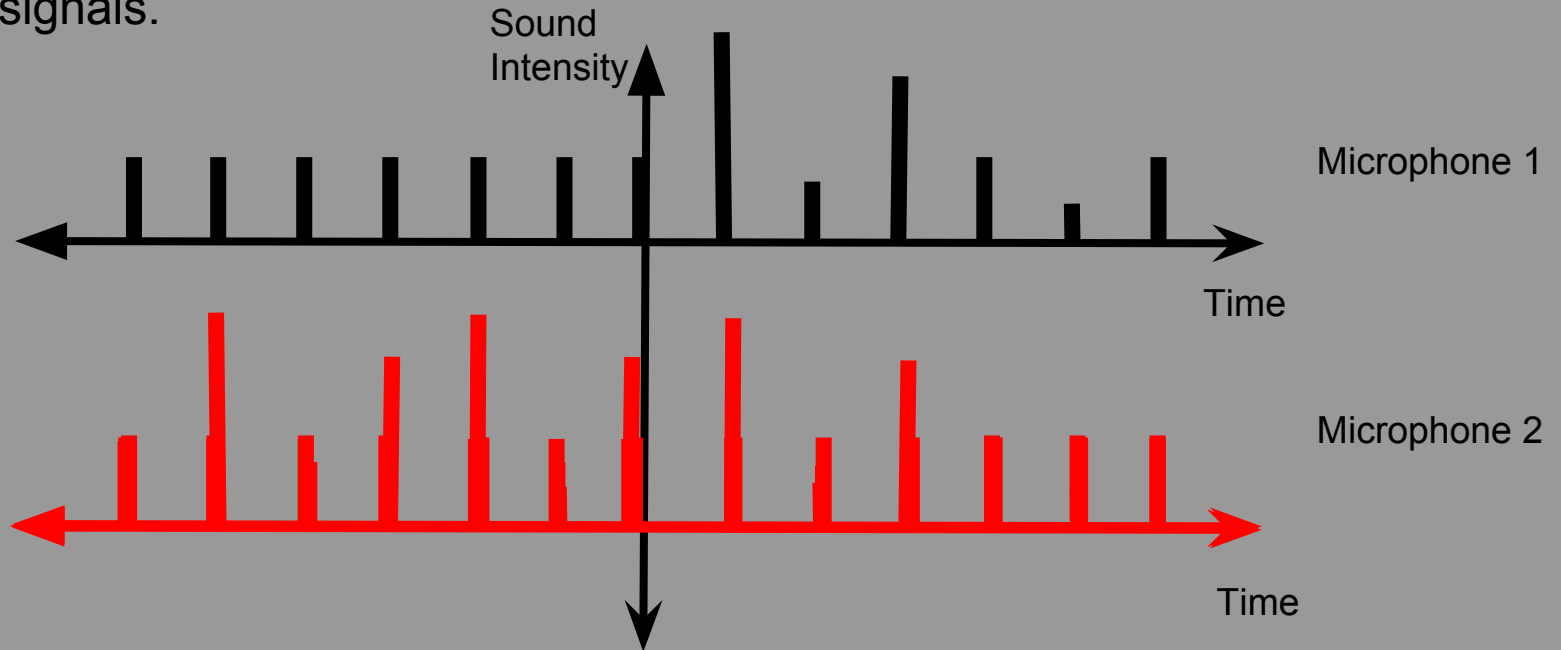
Recorder Module

Functions:

1. Receives sampled sound signals from the analog-to-digital converter.
2. Stores the digital sound signal in the ZBT memory.
3. Accesses the ZBT memory to receive voice signals when asked to.

Time Difference Module

This module finds the difference between the arrival times of a sound wave at the first and the second microphones by calculating the intensity difference of the two sampled signals.



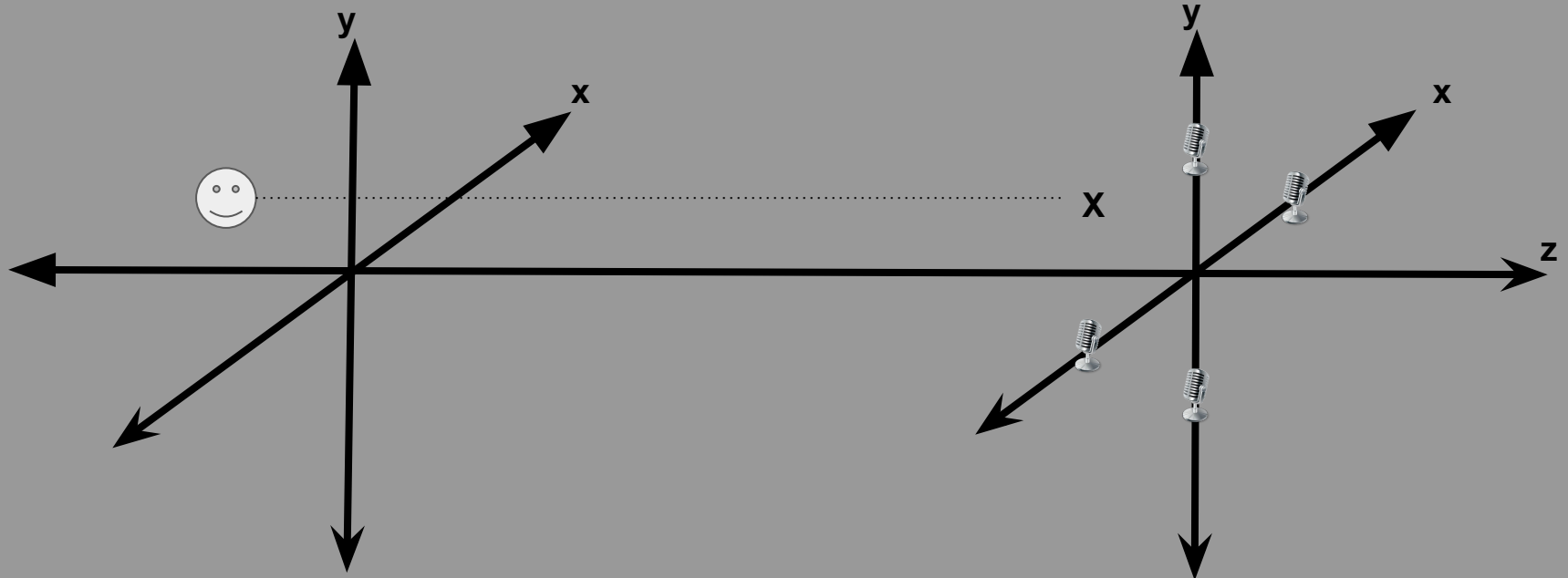
Time Difference Module

Tuneable parameters of the Time Difference Module:

- Size of the Memory Window (performance vs. accuracy)
- Intensity Threshold (accuracy vs. fault-tolerance)
- Calculation Frequency of the Time Delay (speed vs. precision)

Location Finder Module

This module finds the location of the sound source on a given sound plane by processing the time differences from the Time Difference Module.



Display and Tracker Modules

Display Module:

Displays the camera image and the location of the sound source on its plane (sound plane).

Tracker Module:

Rotates the camera so that it faces the location of the sound source.

Project Schedule

	Implementation	Verification
Week of November 6	Buy microphones and the ADCs. (Nusret and Faysal) Modify the recorder module from lab 5 with ZBT memory implementation. (Faysal)	Test the microphone, ADC unit. (Nusret and Faysal) Test the recorder module and its memory. (Faysal)
Week of November 13	Start working on the time difference (Nusret) and location finder (Faysal) modules.	Test the time difference and location finder modules. (Faysal and Nusret)
Week of November 20	Complete the time difference and location finder modules. Combine the modules. (Faysal and Nusret)	Test the combined system. (Faysal and Nusret)
Week of November 27	Implement the display (Faysal) and tracker (Nusret) modules. Implement the Parameters module (Nusret).	Test the combined system again with the added modules from this part. (Faysal and Nusret)
Week of December 4	Debugging	Debugging
Week of December 11	Debugging (if necessary)	Debugging (if necessary)