

Name: \_\_\_\_\_

**Assignment 6: Bearing Angle Estimation**

Due: Tuesday, May 26

1. \_\_\_\_\_/10

2. \_\_\_\_\_/10

3. \_\_\_\_\_/10

4. \_\_\_\_\_/10

5. \_\_\_\_\_/10

Total: \_\_\_\_\_/50

### **Part A: Bearing-angle estimation**

A passive detection system consists of two acoustic receivers. The separation between the receivers is *2.5 meters*. The acoustic propagation speed in air is *343.6 m/s*. The acoustic data tracks detected by the receivers are given. The sampling rate of the A/D conversion is *48 kHz*.

1. Perform cross-correlation of the two data tracks and plot the resultant correlation function as the time-delay profile (estimate of the time delay).
2. Observe the accuracy of the time-delay estimation and its relationship to the bandwidth of the power spectrum.
3. Plot the bearing-angle estimation profile of the acoustic source by rescaling the time-delay profile.

### **Part B: Rolling thunder**

You are given a single-channel (mono) sound track. The objective is to produce a stereo sound track such that the acoustic source seems to move steadily from  $-60^\circ$  to  $+60^\circ$ .

4. Describe the concept of your approach.
5. Implement your technique and evaluate the performance.