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We are currently working on data collection for the gunshot localization project. Our plan is to use four computers to collect data from a source location, and three different locations in order to determine the location of a gunshot. Figure 1 shows the data collection set up.

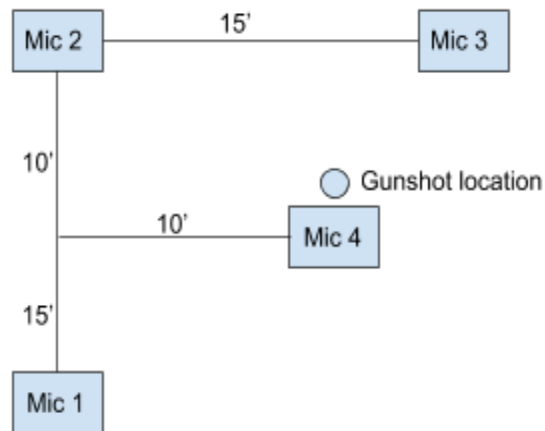


Figure 1: Data Collection Set Up

In figure 1, each microphone (computer) is set at a known distance apart, both the gunshot and Mic 4 are located at the same spot. The Gunshot location is know, however we will use this only for comparison sake at the end of the project.

From the gunshot location in Fig 1, we play a 1KHz signal with Mic1, Mic2, and Mic 3 located at the gunshot location. The Microphones are then moved to the respective locations in Fig 1, and a gunshot sound is played, again, from the gunshot location. Figure 2 shows an attempted recording from Mic 1.

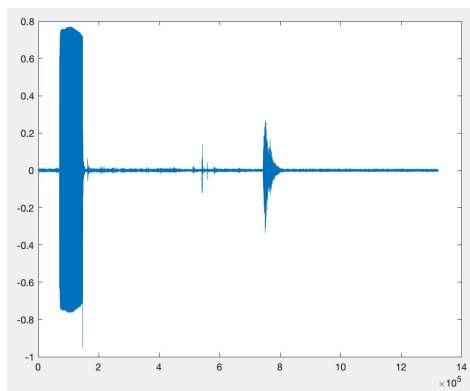


Figure 2: Mic1 Attempted Recording

Figure 2 shows the 1Khz signal being played at the beginning, this will potentially be used for data analysis. We are thinking of lining up all four of the signals in order to get proper timing using the 1KHz signal. There are a few other methods we have come up with as well. Also in Figure 2, you can see the gunshot sound at around 8 seconds into the recording.

In order to analyze the data in an accurate manner, timing will be very important. There are a few ways we have come up with to determine the location of the gunshot. Figure 3 shows the primary method we are attempting.

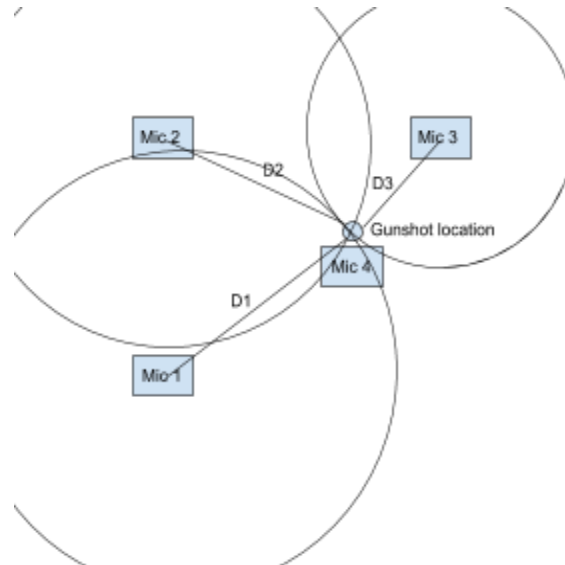


Figure 3: Gunshot Localization

Figure 3 shows the primary method we will attempt to determine the gunshot location. If the timing of the gunshots can be correctly and accurately lined up, there will be three distances (D1, D2, D3) we can find using the distance equation:

$$\text{Distance} = \text{Velocity} * \text{Time}$$

This will generate three distances from each microphone, however, the direction of the gunshot is still unknown. As shown in Figure 3, there are three circle around each microphone generated with a radius equal to the calculated distance. The location of the gunshot will be the point at which all three circles are closest.

This project has been split into three jobs for equal work:

Derek Brissey: Responsible for lining up all four data sets in order to provide accurate timing.

Tyler Buchanan: Determining distances from microphone to sound source.

John Clapham: Responsible for locating the gunshot with the data provided.

Thanks to Mike Jensen for helping obtain the data set recordings by providing the fourth computer.