EE2703: Assignment 8 - Image Capture and Reconstruction

Atreya Vedantam, EE22B004

12th November 2023

Below are the three images of the `sinc` signal which is sent out from the source for the purpose of object detection.

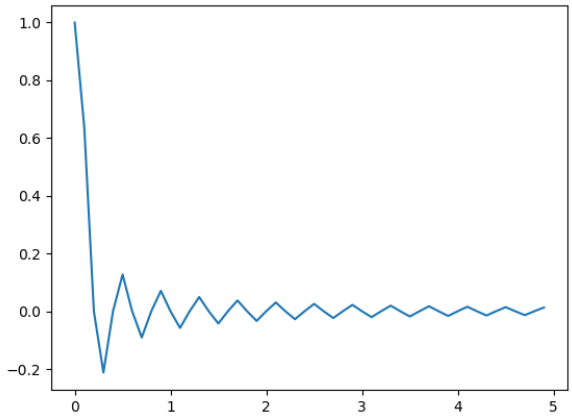

Figure 1: Plot of the sinc function with the parameters given in the assignment

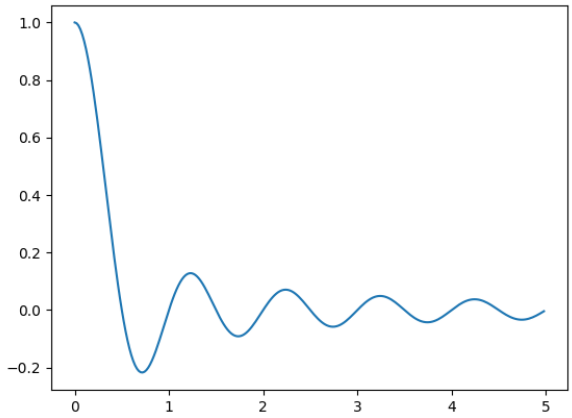

Figure 2: Plot of the sinc function with the parameters `dist_per_samp` = 0.02, `Nsamp` = 250 and `SincP` = 2.0

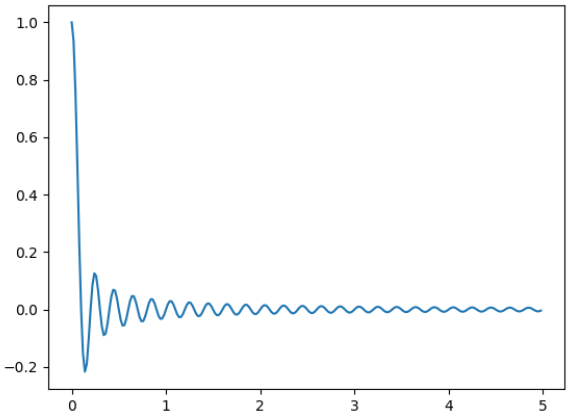

Figure 3: Plot of the sinc function with the parameters `SincP` = 10.0

Below is the image captured by all the microphones as a function of the timesteps (each row corresponds to the signal recieved by a particular microphone).

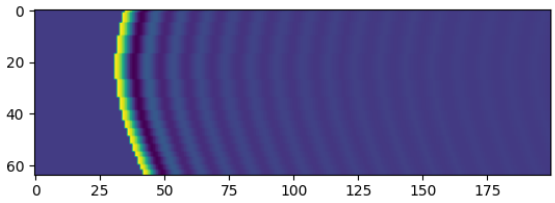

Figure 4: Image Captured by the microphones with the object kept at (3, -1)

Below is the reconstructed position of the object obtained the DAS algorithm.

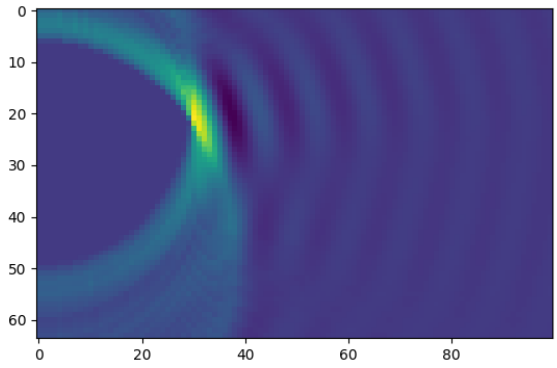

Figure 5: Reconstructed obstacle position using DAS algorithm

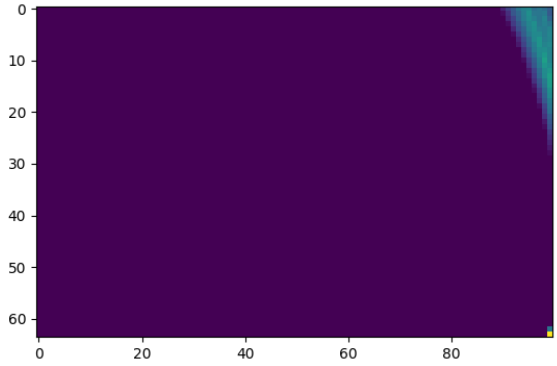

Figure 6: Extreme position of an object that can be reconstructed

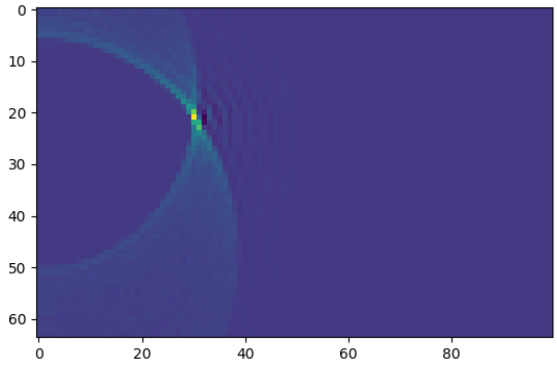

Figure 7: Obstacle position reconstructed with a C = 0.5

Below lie the 9 required images with all the possible combinations of `Nsamp` and `Nmics` from the sets:

- `Nmics` = [8, 32, 64]
- `Nsamp` = [50, 100, 200]

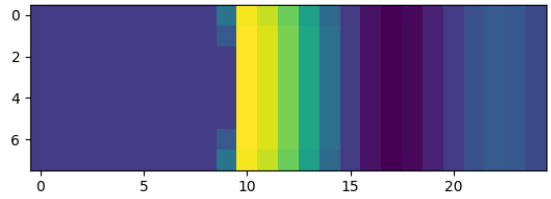

Figure 8: Reconstructed image when `Nmics` = 8, `Nsamp` = 50

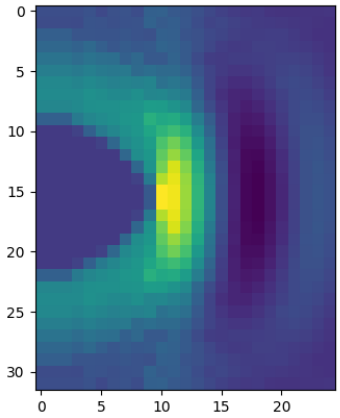

Figure 9: Reconstructed image when `Nmics` = 16, `Nsamp` = 50

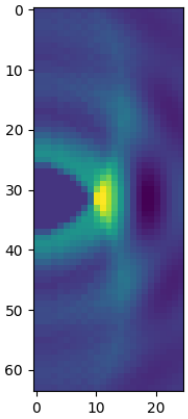

Figure 10: Reconstructed image when `Nmics` = 32, `Nsamp` = 50

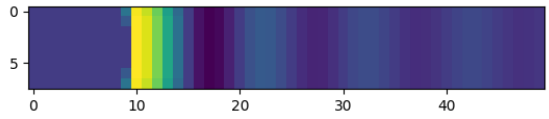

Figure 11: Reconstructed image when `Nmics` = 8, `Nsamp` = 100

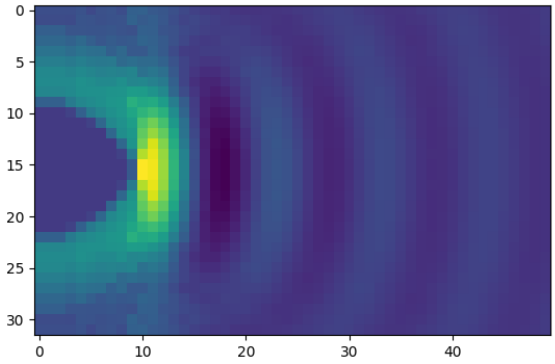

Figure 12: Reconstructed image when `Nmics` = 16, `Nsamp` = 100

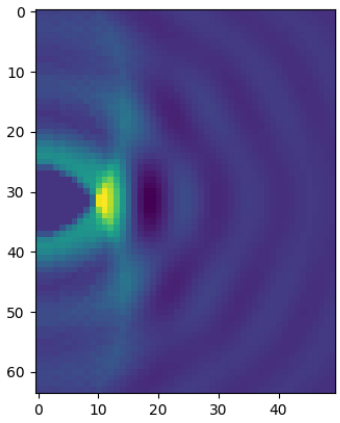

Figure 13: Reconstructed image when `Nmics` = 32, `Nsamp` = 100

Figure 14: Reconstructed image when `Nmics` = 8, `Nsamp` = 200

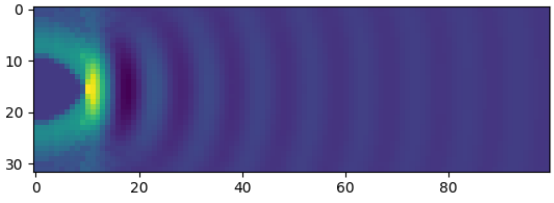

Figure 15: Reconstructed image when `Nmics` = 16, `Nsamp` = 200

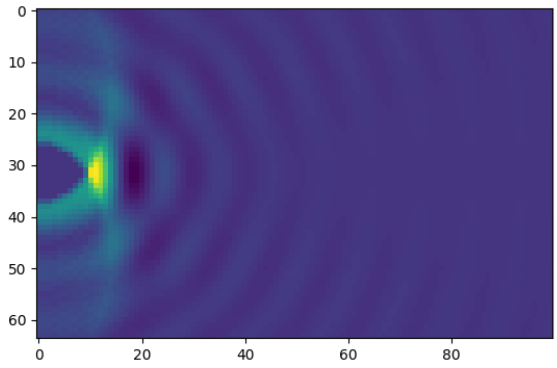

Figure 16: Reconstructed image when `Nmics` = 32, `Nsamp` = 200

Below are the two images reconstructed for the given two text files.

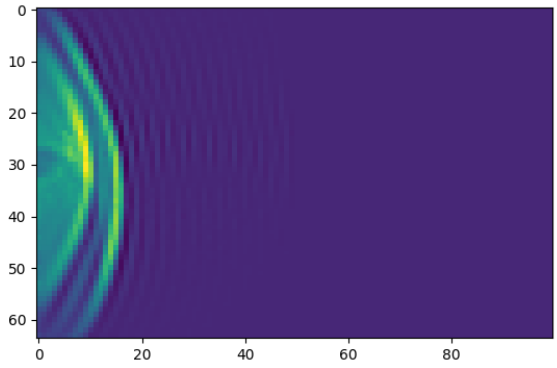

Figure 17: Reconstructed image for the given text file `rx2.txt` of microphone responses

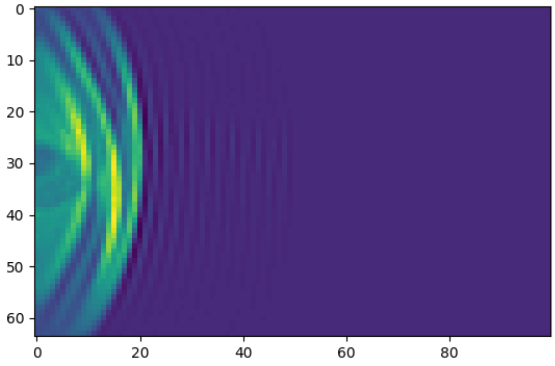

Figure 18: Reconstructed image for the given text file `rx3.txt` of microphone responses