DSAA Assignment-1

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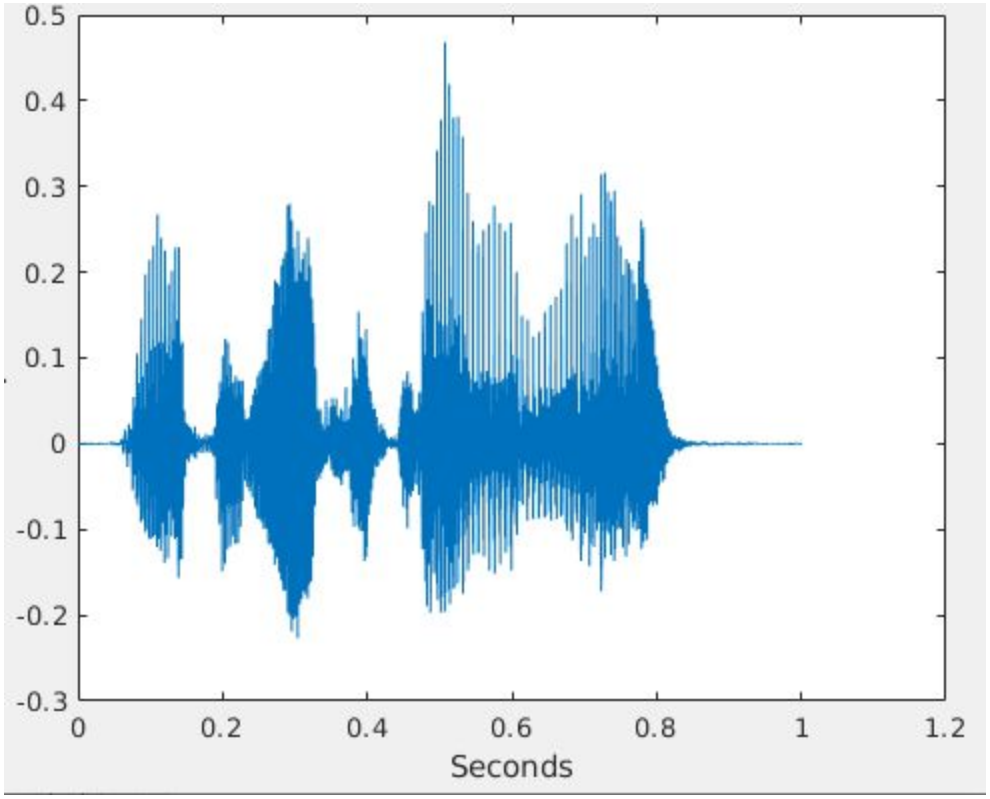
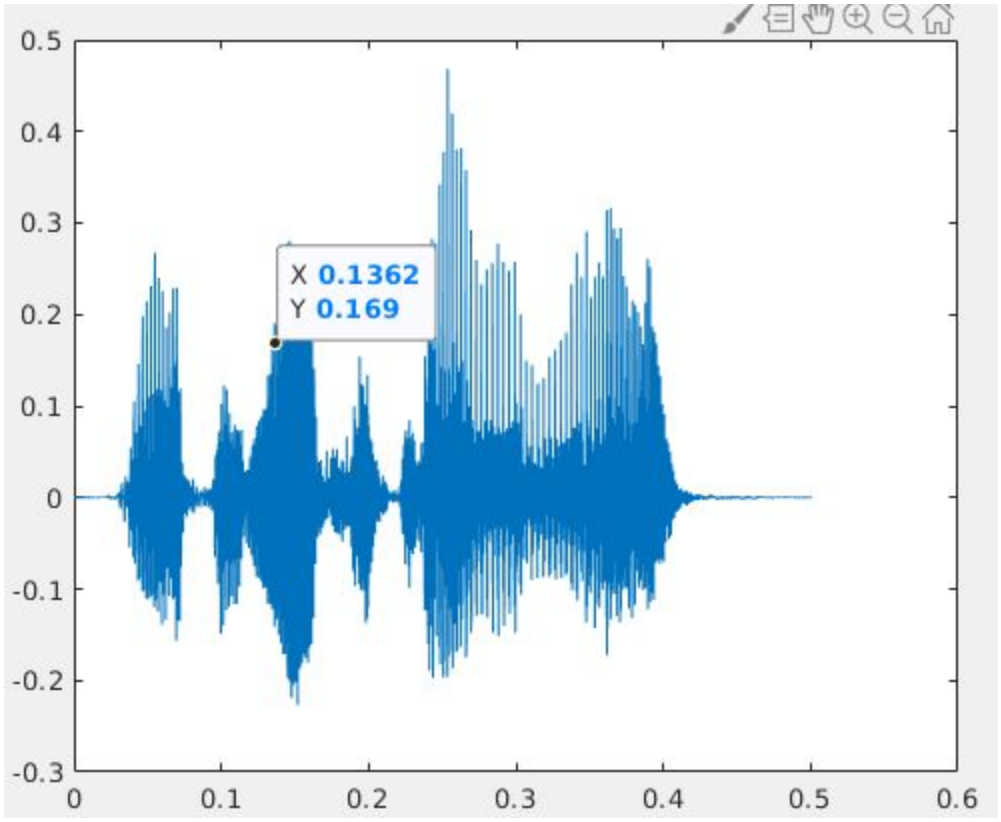
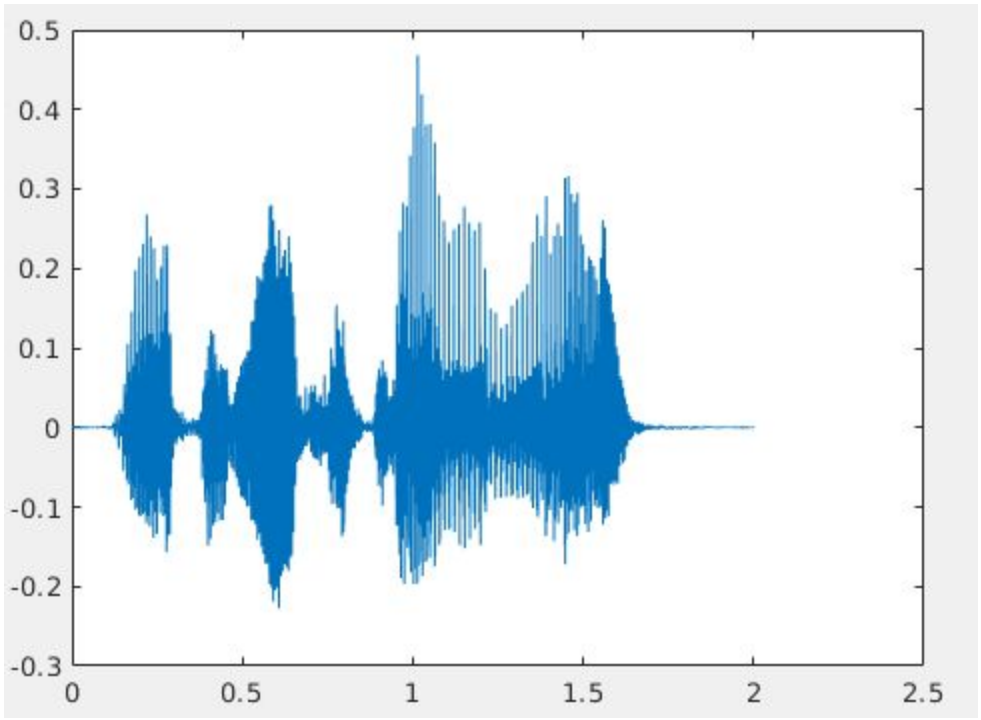
Problem – 1

Implementation - To make the signal faster we decrease the sampling rate by a factor of two. It makes the signal faster because suppose that we were reading s number of samples in 1 second intially but by decreasing the sampling rate by 2 we would be able to read 2s samples and thus signal becomes faster. Similar explaination can be given for making the signal slower where we increase the sampling rate by a factor of 2.
Result - As it can be seen from the figure that when we make the sound fast, the signal length reduces by half whereas when we make the sound slow, the signal length doubles as expected.
Observation -




X 0.1362
Y 0.169
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
0
0.1
0.2
0.3
0.4
0.5
0.6


0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
0
0.5
1
1.5
2
2.5

Problem – 2

Implementation - First we record the audio at 44.1kHz and digitized at 24 bits and then subsample it to the required frequencies as it was asked. Then we convert it all the samples to vector and apply convolution between recorded sound and sound in various systems so that we could stimulate my sound in these environments

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Problem – 3

Implementation – First we read both the images and store them. Then we use normalized cross-correlation to find where in the larger image the smaller image is present.

Face when found in the faces.jpg image, its vertices are recorded and then are further used to display only the face found .

Yes my approach will work on the noisy image because I have used nomralized cross-correaltion to detect the face which works well if the image is noisy as can be seen by running the program.

Problem – 4

Nearest Neighbour Interpolation – First to get the new row and column size, the old row and column sizes are multiplied by the scale factor(x), then round it to the nearest neighbour using floor.

Now this could result into 0 also, which is undesirable, so we take max with 1.

Next we calculate the new set of indices for rows and columns. Each pixel is considered to be of length 1 with center at 0.5. The call to min ensures that none of these indices are larger than the original image. Finally the new enlarged image is created by simply indexing into the original image.

Result – We get the enlarged image by a factor of x(x=3 in the program given).

Problem – 5

Implementation – First we read the audio and then use various smoothing techniques. Then we plot them for comparision.

- When we observe the original data we see that the data is rapidly varying. Then we compare the various smoothing mechanisms, we find that movemean, movemedian,loess,rloess are not suitable for smoothing of data as the noise persists. On comparing other we find that other tha sgolay everyone else reduces the signal amplitude(-0,02 to -0.015) and thus sgolay is

the best as this method is more effective than the other methods when the signal varies rapidly.(The data is sampled from instance 10000 to 10150)
Result - Sgolay

Some of the methods' results are as follows: