

All plots in time domain and about STFT can be found in page 2 of this report.

1

I record the alarm of my roommate and load it into MATLAB. Then the plot in time domain and about STFT can be derived easily.

2

Simply do a downsampling with different sampling frequency and the plots can be given in the same way as problem 1.

3

As we can see from the result, after interpolation, the plot either in time domain or STFT can be recovered. Now the magnitude distribution of STFT as we can see in the colormap is more similar to the original signal in problem 1.

Another thing we can see is that as the sampling frequency is increasing, the colormap after resampling is more similar to the original map. This is because as we increase the sampling frequency, we reserve more information about the original signal. So the result after interpolation is also more close to the original signal.

4

We use ellipord function to generate a filter. By setting the passband and stopband we can filter out some frequency components we do not want.

After the filtering process the sound is more smooth because now there are less frequency components.

Also, since our music signal is from a record instead of some music from studios. There are naturally noise from the environment added to our record. But the filtering process cannot filter out these noises, assuming they follow a normal distribution. This means that after the filter process our music will appear to have more noise, which is a drawback of the filter.