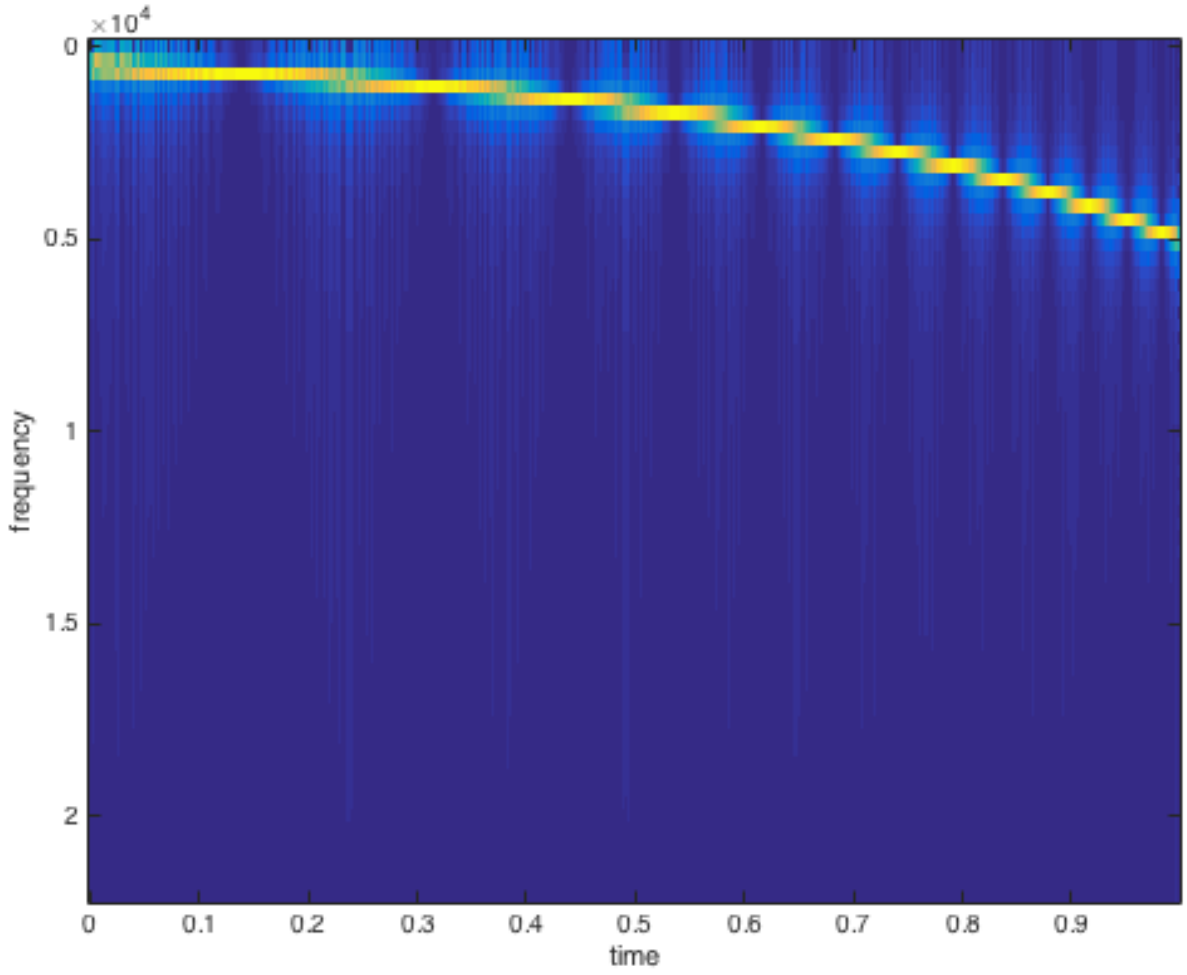
ASSIGNMENT 1

By Anmol Monga
N18513543

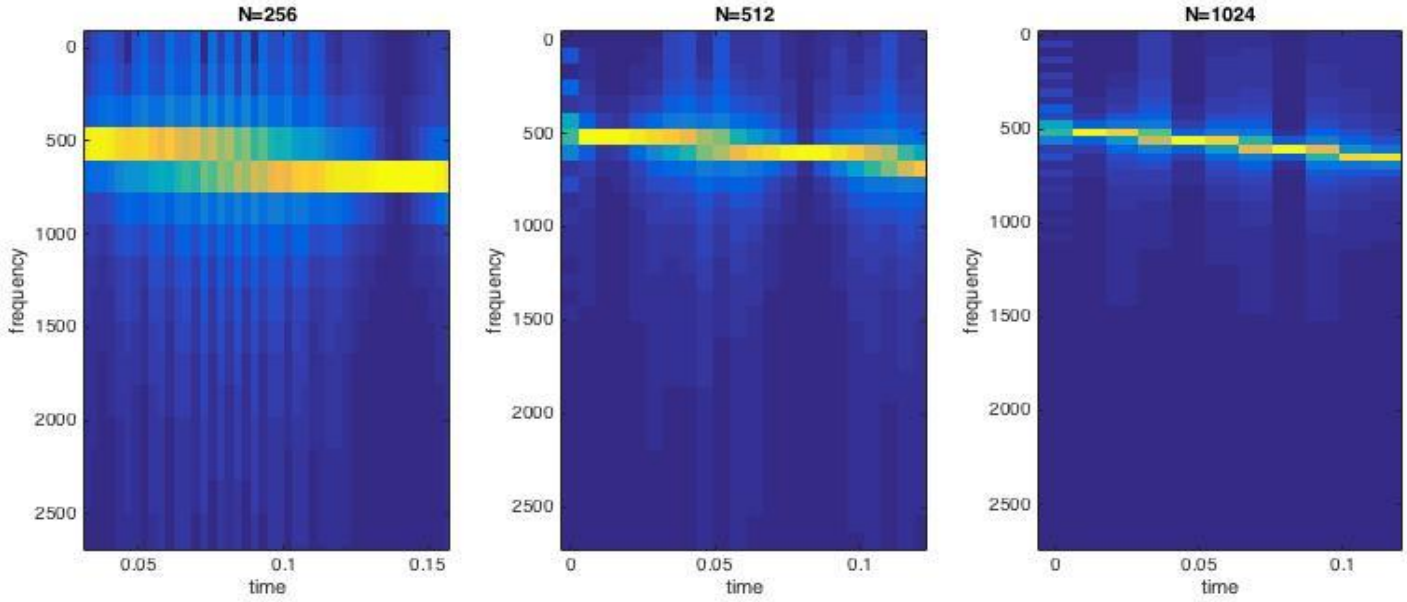
B. ANALYSIS

Q.a :



The above graph is the graph of the default Spectrogram of a sine sweep wave for default parameters value of window size = N, hop size = N/2, rectangular window, fft length = N, where N = 128.

Q.(b): In this question we vary the default window size from 256,512 and 1024
The comparison can be seen in the next page.

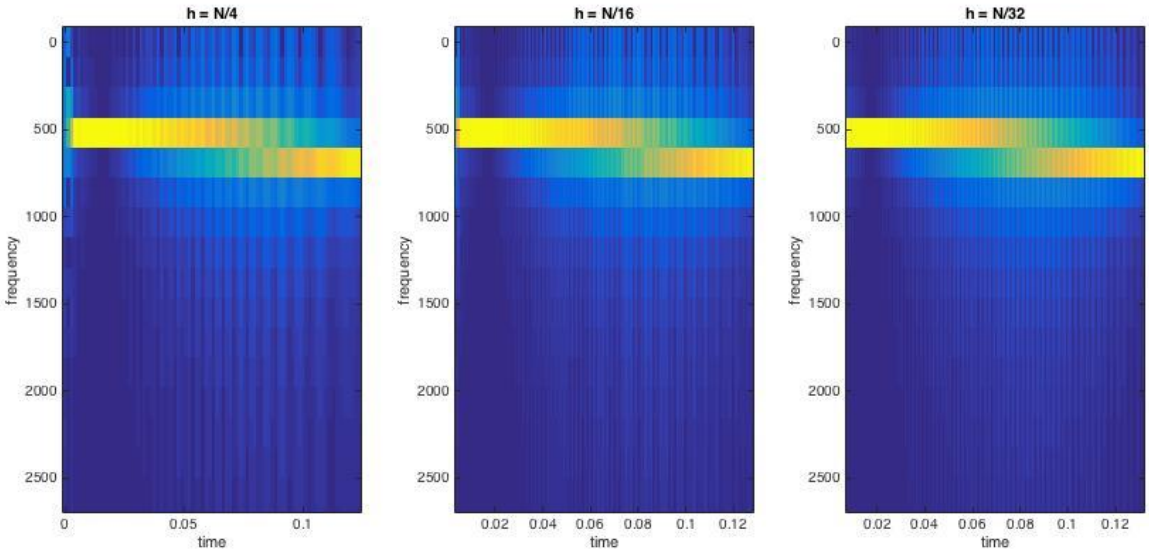


As we can see from the Image as the window size increases the frequency resolution increases and the time resolution decreases for N=256, the frequency resolution is low and hence we see large block artifacts in the spectrogram but the block artifact in time domain is low and hence has higher resolution.

For N = 1024 the opposite is true the frequency resolution is high but the time resolution is low, hence along the time axis the block artifact is visible.

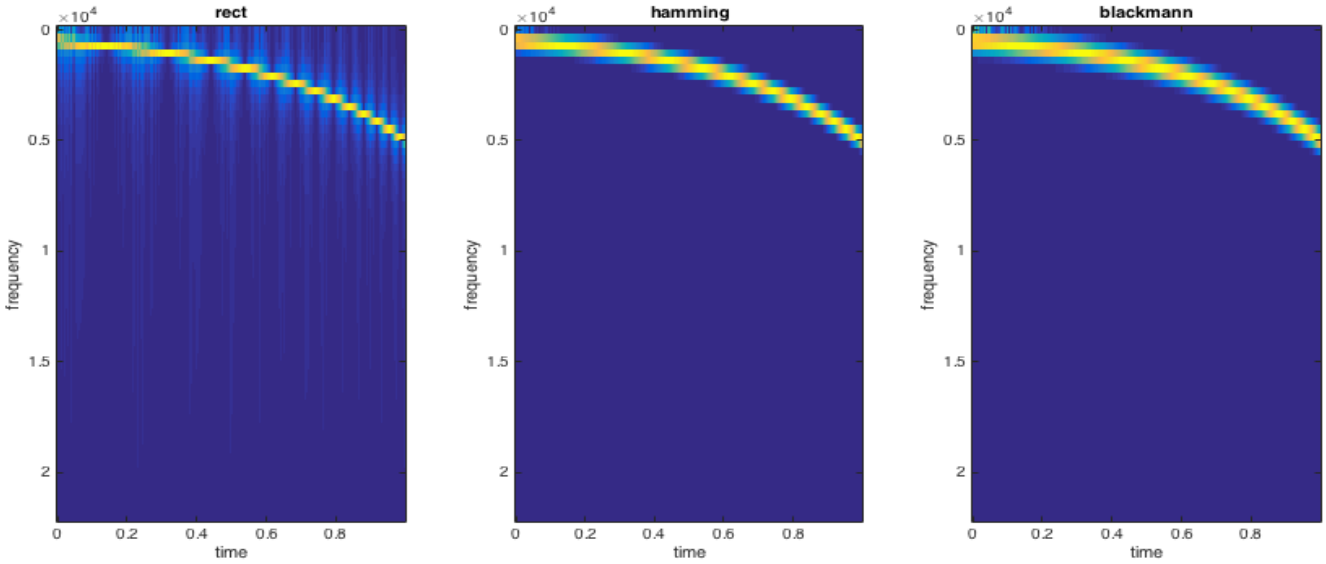
Q.(c):

As we can see in the the graphs below spectrogram of hop size N/4, N/16 and N/32 are compared . We can see from the graph since the overlap for spectrogram of hop size N/4 is smaller hence the blocky artifact is more pronounced in spectrogram of hop size N/4 as compared to hop size of N/16 and N/32. We can see that as hop size decreases the blocky artifacts become less pronounced. Resolution of the spectrogram in Time domain increases with decrease in hop size. The transition of the spectrogram across time is more gradual when hop size is small. The transition of spectrogram is more gradual in N/32 and N/16 when compared to N/4. The resolution across frequency axis remains same in all the figures



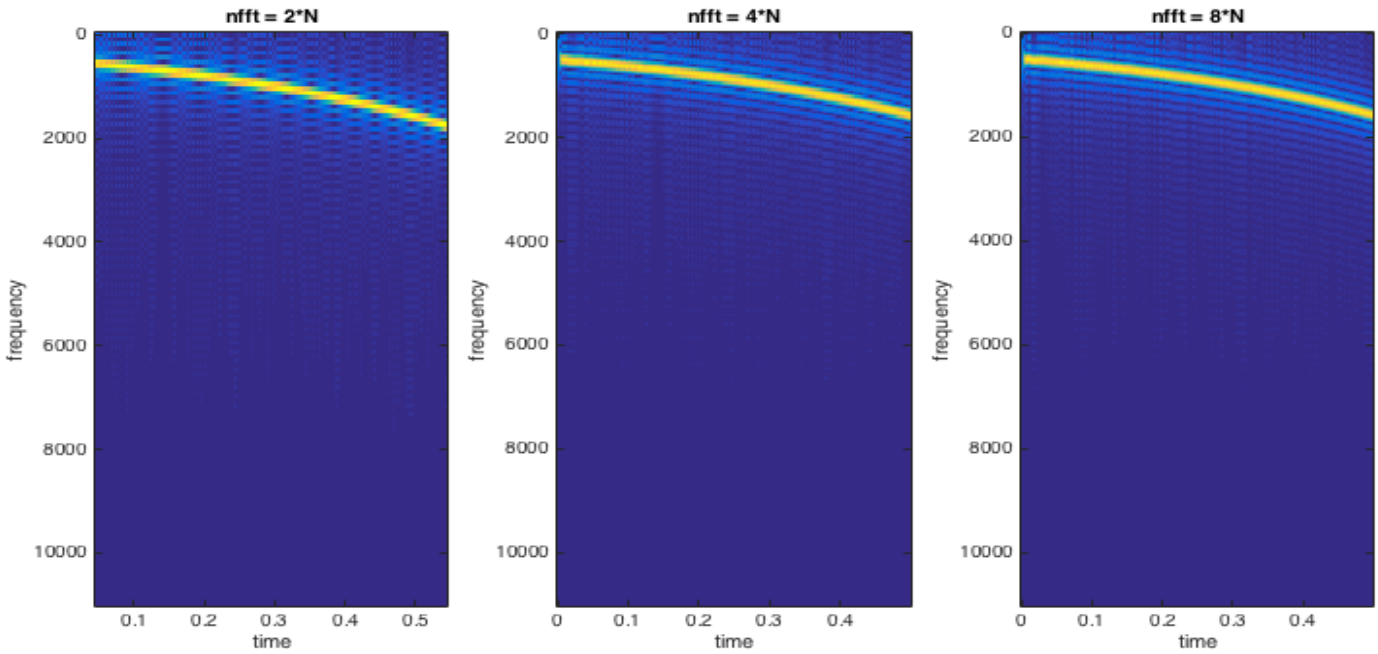
Q.(d):

In this question we use the default setting but compare the results for different windowing filter: rectangular, hamming, blackmann.



As is pretty evident from the Image in case of rectangular filter a there is low attenuation in the side band but the main lobe is narrow. When we use hamming the side bands have high attenuation and hence low energy in the rest of the spectrogram but has a large main lobe . Blackmann has a similar Image as hamming but a larger side lobe and low energy in rest of the spectrum. This is because the the hamming filter and Blackmann filter in frequency domain has large main lobe but very high attenuation in the side band.

Q.(e):



as we Increase the size of dft by padding the original signal with zeros and performing the dft on the spectrogram, with increase in size of dft the frequency resolution increase but the resolution along time is not effected at all as the window size remains same.

Q.(f): The imagebelow compares the spectrogram generated using my_spectogram function createdby me with the spectrogram function defined in the matlab. We can see that both the graphs are pretty much the same . The initial condition used is the default parameters.