**Transform Coding**

We can see that DCT has better quality when compared with DFT . This is because of the reason that in DCT low frequency components are emphasized and as we are speech processing it gives much better results. For high compression rates , it is very audible . In the following figures , you can see the error signals of DFT and DCT . For your convenience , sound signal is multiplied by 108 to see the difference of error signals easier.

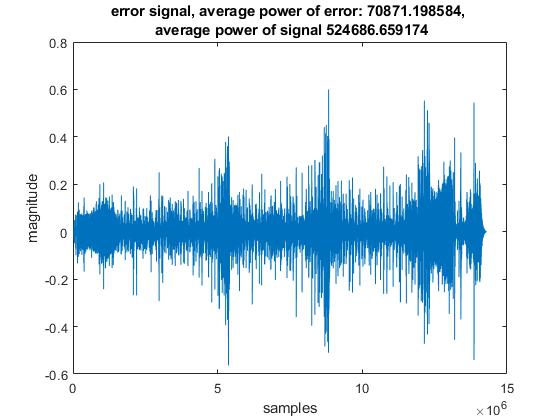


Figure : Error signal of a sound signal compressed with DCT(Blocksize=429 , 99% compression)

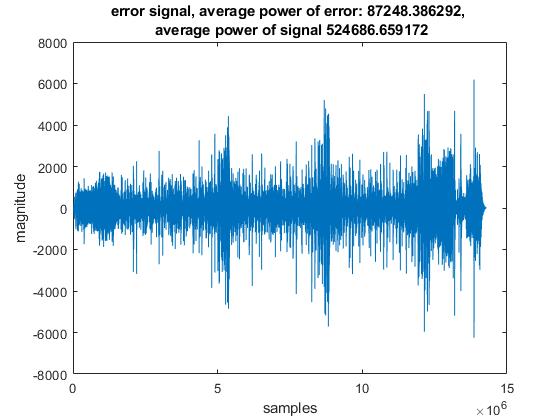
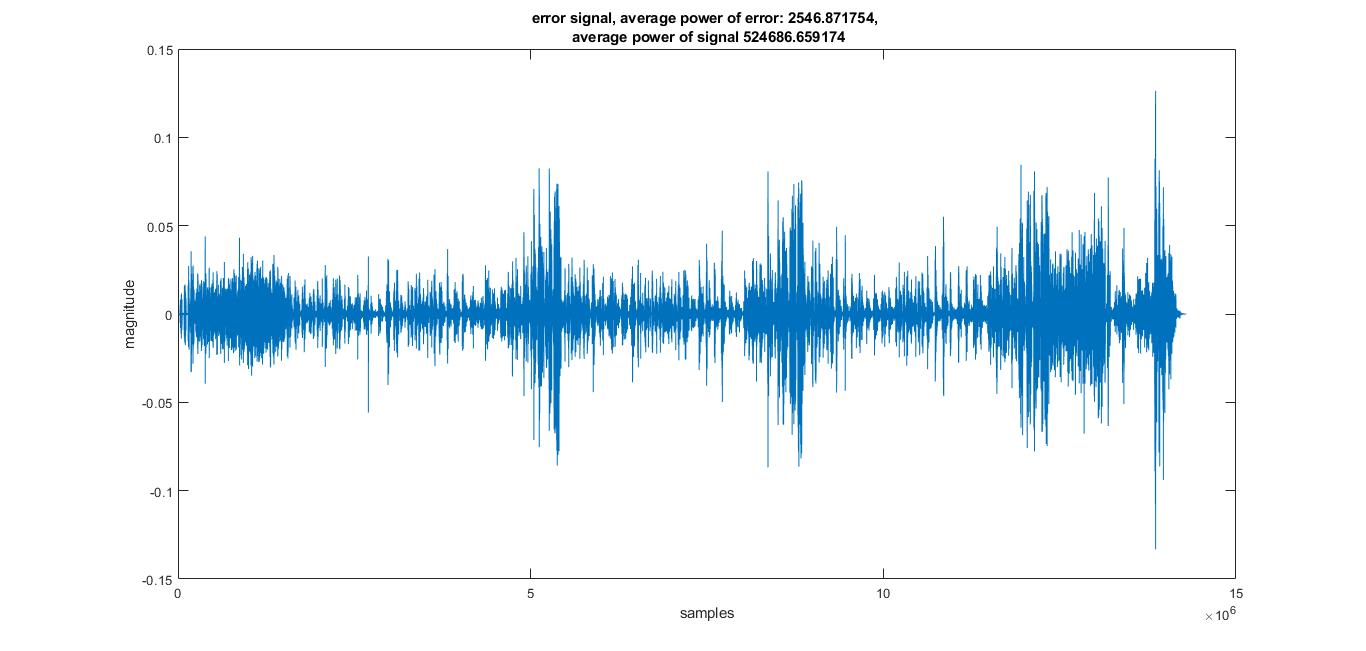


Figure : Error signal of a sound signal compressed with DFT(Blocksize=429 , 99% compression)



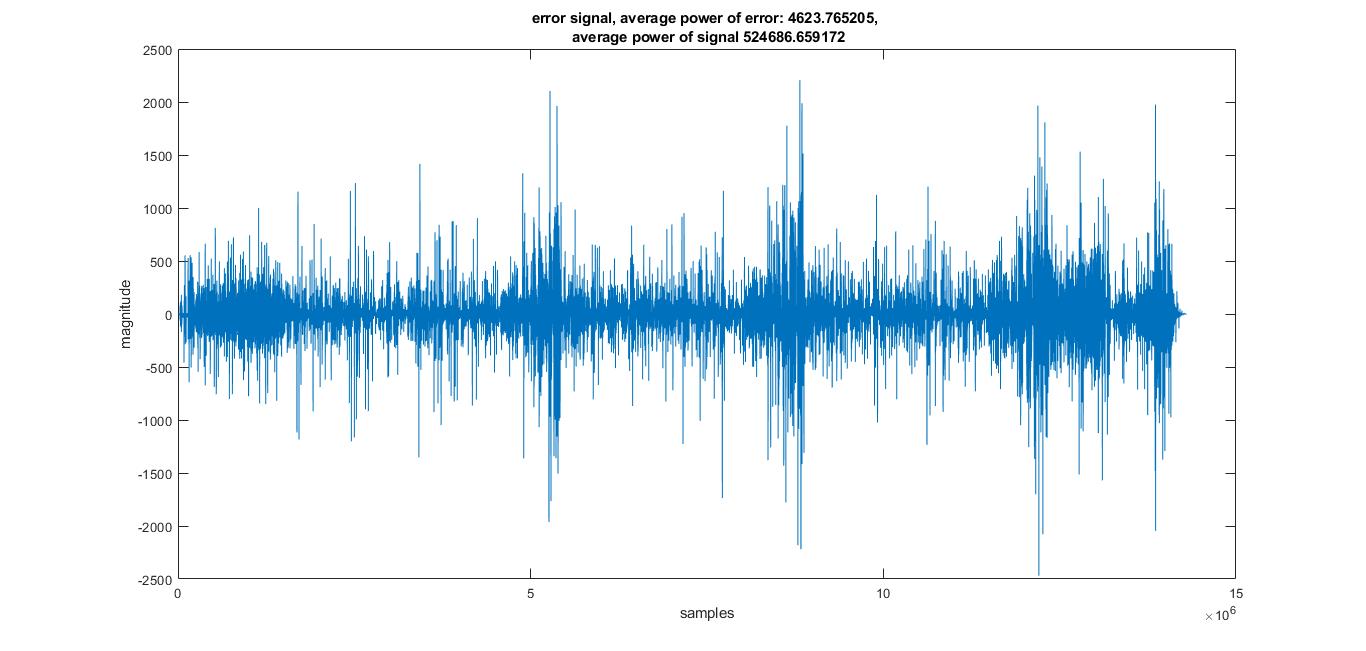
Figure : Error signal of a sound signal compressed with DCT(Blocksize=429 , 90% compression)

Figure : Error signal of a sound signal compressed with DFT(Blocksize=429 , 90% compression)

We can see that , more high frequency components exist in the frequency response of DFT and DCT . This is because DFT is calculated with the extension of input signal to make it periodic and artificial discontinuities occur . This is not the case in DCT as DCT makes input signal periodic by adding its symmetric to its right and then shifts it. Therefore in DCT , artificial high frequency components do not appear and it enhances the quality. You can see it in figures below.

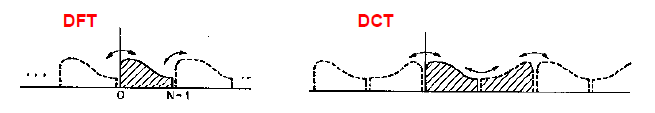


Figure : Comparison of DFT and DCT



Figure : Comparison of DFTs of original signal and DFT thresholded signal

Figure : Comparison of DFTs of original signal and DCT thresholded signal

For %90 compression rate and an input signal’s DFT which has 28252\*501=14154252 coefficients , number of coefficients set to zero is 12861500 which is approximately 90% of the coefficients. It is nearly the same for DCT as compression rate is the same.