

EEE 508 - Project 1 - Report

By Sreekanth Gandavarapu

Comment for question 2 and detailed report as per question mentioned after 3:

1. Dyadic -16 band (Highest Frequency zero)
 - The 16 band decomposition is obtained by first decomposing the image into 4 and then decomposing further till level 5 (the approximation or LL quadrant- which contains the highest details). The complete decomposition forms a pyramid structure, hence the name.
 - The Original noisy image contains complete white / gray in the DFT spectrum. It is improved slightly by setting the highest frequency to zero. But, the noise is present, details are still sharp and more clear image can be obtained in further images.
2. Dyadic -16 band (Highest 3 Frequencies zero)
 - Here, the 3 highest frequencies are set to zero. The image is better than previous one, contains little less noise and has more clarity. The DFT magnitude spectrum contains less gray region compared to previous one.
3. Dyadic- 16 band (Highest 6 Frequencies zero)
 - This is the best out of the 3 experiments done for 16-band decomposition of lena noisy image. It contains lesser noise compared to previous cases and lot clear than the initial noisy image. It is not as sharp as the initial image and got little blur as more noise is removed. The DFT magnitude spectrum contains lot of black region compared to the previous cases, which is indicative of the noise that is being improved with removal of each highest frequency as we progress.
4. Modern Pyramid -22 band (Highest 3 Frequencies zero)
 - We chose to split into 16 equal sub-bands first and then decompose more , nullify the highest frequencies based on requirement and plot the graph. Since it is not completely pyramid structure, It was split after an initial equal split of 4 bands, I believe it is named modified pyramid. Here, we chose to use **haar** filter and **swt2** for experimentation.
 - In this case, we have removed the 3 highest frequencies. It resulted in slight change compared to the original image. The details are sharp, and image contains noise. The DFT of the image is better than original noisy image.
5. Modern Pyramid - 22 band (Highest 10 Frequencies zero)
 - In this case, we have turned 10 highest frequencies to zero. This resulted in better image without any blur or loss of detail (yet contains little noise). It is improved in the next case.
 - The DFT magnitude spectrum contains more blacker region than previous one. It is evident of more noise being removed compared to the previous case.
6. Modern Pyramid - 22 band (Highest 15 Frequencies zero)
 - Since, we have nullified 15 highest frequencies, the noise present or caused by those frequencies are diminished. Hence, we get the best output (compared to previous ones). The noise is reduced and image is much clear(can be improved more- based on applying the techniques according to requirement).
 - The magnitude spectrum of the DFT is also supporting the conclusion by having more black part than white/ gray part(which is indicative of noise) in the spectrum.