Image Compression and Denosing

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Level II

Write your own Matlab code to perform the following items 1 though 5 with the PS41-typeI wavelet system which you can get from The IDR FrameNet Portal (Go to 1 Dimension > Transform Options > Edit Transforms and choose PS41-typeI transform from the list).

1. Load the image *wbarb* image into Matlab (You will need the the Wavelet Toolbox in Matlab).
2. Add Gaussian white noise with the standard deviation = 15 to the original image.
3. Apply the PS41-typeI decomposition to the noisy image.
4. Set all detail coefficients to be zero except those whose magnitude is larger than a threshold = 45.
5. Reconstruct the image using the modified coefficients.

Experiment with several thresholds and choose the best. Discuss the pros and cons of PS41-typeI wavelet system as compared to the Haar wavelet system which you did in the assignment 6. Turn in both an electronic copy (to yeon@cs.wisc.edu) and a hard copy of the report.

Level III

Embedded zerotree wavelet (EZW) coding, introduced by J.M Shapiro, is a very effective and computationally simple technique for image compression. Our goal in this project is to use the embedded zerotree wavelet (EZW) coding (the second algorithm, called *spiht*, from the paper "A new fast efficient image codec based on set partitioning in hierarchical trees" which you can get from *http://thanglong.ece.jhu.edu/˜cjtu/link/SPIHT.pdf*), together with the Haar wavelet transform in order to compress images.

1. Create Matlab encoding and decoding functions that implement the *spiht* algorithm
2. Load the image *wbarb* image into Matlab (You will need the the Wavelet Toolbox in Matlab).
3. Apply the Haar decomposition to the image with three levels (You can use dwt2.m from the Wavelet Toolbox in Matlab).
4. Apply your spiht encoding Matlab code to the decomposition coefficients. Check the size of the output file.
5. Threshold the decomposition coefficients with threshold := 4, apply again your spiht encoding Matlab code to the coefficients and check the size of the output file.

What is the ratio between the size of your original image and each of the two compressions above? Decode the output file from step 5 to obtain new coefficients with your spiht decoding Matlab code and reconstruct the image from the coefficients (You can use idwt2.m from the Wavelet Toolbox in Matlab) and check visually.
Repeat the above with the images im1, im2, and im3 which you can get from *http://www.cs.wisc.edu/~yeon* and also experiment with one of your own images. Turn in both an electronic copy (to yeon@cs.wisc.edu) and a hard copy of the report.