Assignment I

1. Apply 2D-DCT to an input image of size $512 \times 512$.
2. Apply geometrical zonal filter $H(k,l)$ to the results of step 1. The zonal filters are for 2:1, 4:1, 8:1 and 16:1 sample reduction. (See Fig. 5.10 page 172 of Text)
3. Apply 2D-IDCT to all results of stage 2. (A.K. Jain, "DIP", PH, 1984)
4. Calculate the mean square errors (MSE) between the reconstructed and original images.
5. Calculate the peak signal to noise ratios (PSNR) of the reconstructed images (8 bpp).

\[ MSE = \frac{1}{N} \sum_i \sum_j (c_{ij} - \hat{c}_{ij})^2 \]

where $c_{ij}$ and $\hat{c}_{ij}$ are original and reconstructed pixels.

\[ PSNR = 10 \log_{10} \frac{(255)^2}{MSE} \quad (dB) \]

Assignment II

1. Apply 8x8 block based 2D-DCT to the same image.
2. Apply zonal filter $H(k,l)$ to the results of step 2. The geometrical zonal filters are for 2:1, 4:1, 8:1 and 16:1 sample reduction (in each block).
3. Apply (8x8) block based 2D-IDCT to all results of stage 2.
4. Calculate the mean square errors (MSE) of the reconstructed images.
5. Calculate the peak signal to noise ratios (PSNR) of the reconstructed images.

Show the reconstructed images.

(Download an image from http://sipi.usc.edu/services/database/Database.html)

Go to database (web-site) in my course EE 5356
2:1 Geometrical Zonal filter in DCT domain

\[ MSE = \frac{1}{512 \times 512} \sum_{i=1}^{512} \sum_{j=1}^{512} (C_{ij} - \tilde{C}_{ij})^2 \]

\[ PSNR = 10 \log_{10} \left( \frac{255^2}{MSE} \right) \text{ (in dB)} \]
Original image divided into (8*8) blocks. Apply 2D-(8*8) DCT, Geometrical Zonal filter and 2D-(8*8) IDCT to each (8*8) block in a raster scan fashion. Calculate MSE and PSNR. Show the reconstructed images.