ASSIGNMENT

PART - A

Q1. How does DCT perform in relation to its energy compaction for the images which are correlated and not correlated ?

A1. DCT performs excellent energy compaction for highly correlated images when compared to low correlated images. With this compaction few coefficients are sufficient to represent a highly correlated image and we can discard other coefficients with low amplitudes.

Q2. In what ways the properties of separability and symmetry of DCT are useful ?

A2. The separability property allows us to separate a 2D DCT int a row and column transform, so we can first compute the row transform for each row of the image and for the resulting image we can compute the column transform which is computationally efficient when compared to normal computation.

The symmetry property depicts the identical nature of separability property and expresses the transformation as

$$T = AfA,$$

where A is NxN matrix that can be computed offline and then applied to the image which supports computation efficiency.

Q3. Consider the Table 1, what does reduction of entropy indicate ?

A3. The reduction of entropy indicate that it decreases the average number of bits to represent a image. In the example of baboon if the original image in spatial domain is encoded as it will require more number of bits because it has high frequency component and spatial detail, whereas when converted to frequency domain with DCT there is a drastic decrease in entropy indicating that low number of bits are sufficient to code the resulting image.

JPEG

The salient features that paper discusses are

- The DC coefficients of consecutive blocks can be encoded as the difference term.
- The paper also discusses the multiple component images with color components and its aspect ratio and color space information.
- The encoding order can be raster-scan order or left-right top-bottom order.
- Different techniques for entropy coding like run-length coding , variable length coding, baseline entropy coding are discussed.

PART - B REPORT

The error is measured using mean square error(MSE).

For **6/64** coefficients retained
MSE for DCT = 46.077
MSE for DFT = 87.1425

For **15/64** coefficients retained
MSE for DCT = 16.596
MSE for DFT = 66.039

For **28/64** coefficients retained
MSE for DCT = 9.3679
MSE for DFT = 53.575

For **36/64** coefficients retained
MSE for DCT = 8.7457
MSE for DFT = 21.199

For **64/64** coefficients retained
MSE for DCT = 8.716
MSE for DFT = 1.683