Department of Computer Science and Engineering

CS4093D Image Processing Laboratory - *Practice Questions*

February 8, 2021

1. Take an image of size 1024 * 1024. Reduce the spacial resolution by half by replacing each 2 by 2 block of pixel by a single pixel. The gray value of the pixel can be taken as the mean of the four pixels in the block. To have a better comparison bring the image up to size 1024 * 1024 by row and column pixel replication. Repeat the experiment to reduce the resolution to 256 by 256, 128 by 128, 64 by 64 32 by 32 and 16 by 16. In all cases bring the image to its original size.

2. Create an image of size 64x64 where

$$I(i,j) = \left| cos\sqrt{(i^2 + j^2)} \right|$$

   Display the image.

3. Quantize the intensity levels in the above image by dividing the range [0,1] into four equal intervals. Quantization happens according to the following table.

Image gray level	Output gary level
$0 \leq I < 0.25$	0
$0.25 \leq I < 0.5$	0.25
$0.5 \leq I < 0.75$	0.5
$0.75 \leq I < 1$	0.75
1	1

4. 4 level quantization of the intensities of the image in Question 1.(max_intensity interval divided into 4 equal intervals and follow the scheme in the previous question).

5. 8 level quantization of the intensities of the image Question 1.(max_intensity interval divided into 8 equal intervals and follow the scheme in the previous question). Observe the difference in image quality (with image in question 5).

6. Perform the following arithmetic operations on two sample images of size 256*256.

   (a) Addition

   (b) Subtraction

   (c) Multiplication by a constant factor

   (d) Division by a constant factor

   Comment your observations.

7. Compute the 1D basis vectors for a 4-point DFT.

8. Using the above results, compute the 2D basis vectors $F(i, j)$ for a 4*4 DFT.

9. If the only 2 non-zero coefficients of a 4*4 image are $F(1, 1) = 3$ and $F(1, 2) = 2$, get the original image.