EEU44C08

<u>4C8 DIGITAL IMAGE AND VIDEO PROCESSING</u>

Submitted By

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Q1 Image Entropy

ANS-

1.2)

(a) Entropy and hqi of the quantized image

1.3)

Since Quantization of image causes distortion and eventually loss of entropy, the quantized image entropy is lesser than that of the original image. The entropy of original image is 7.4474 and at Q_step = 15 the entropy is 3.5798 (due to increase in step size available grey pixel reduced)
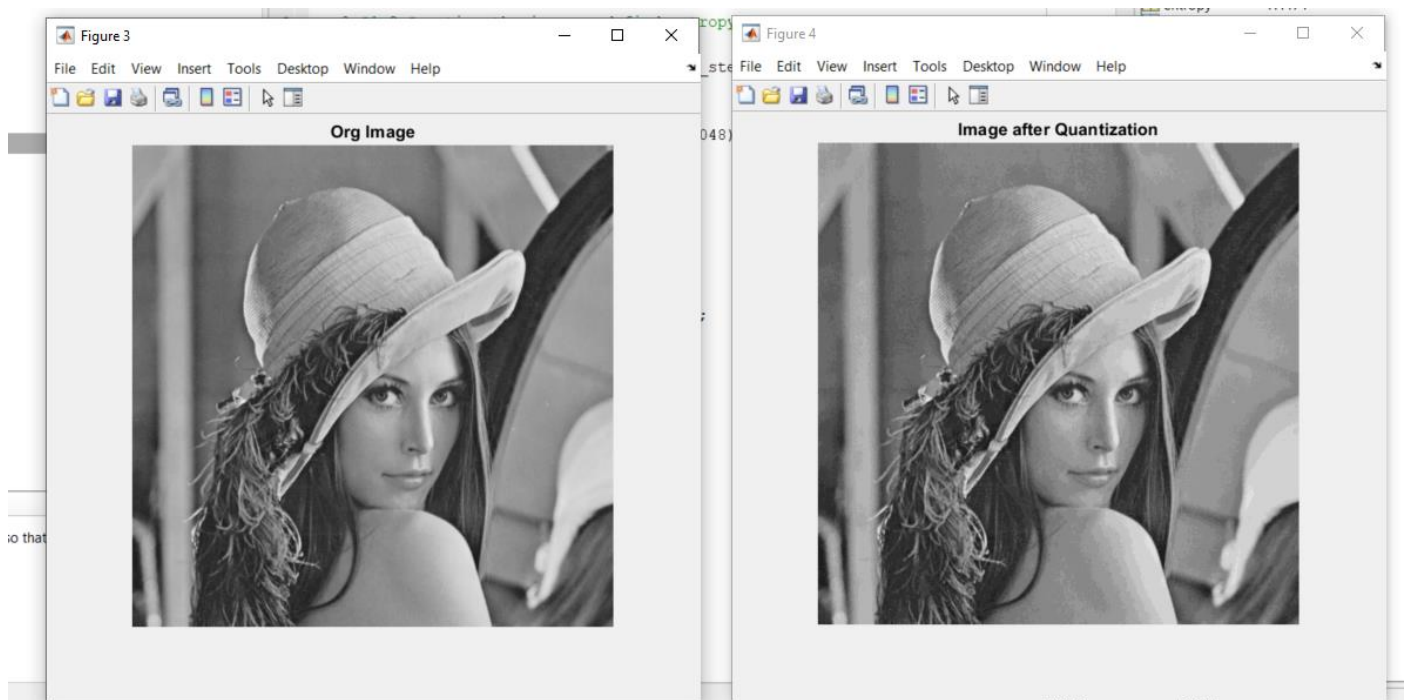
1.4)

(b) PSNR

The PSNR value comes out 35.3470

1.5)

In the images below we could observe that quantized image is distorted as compared to the original image. (picture quality is reduced)
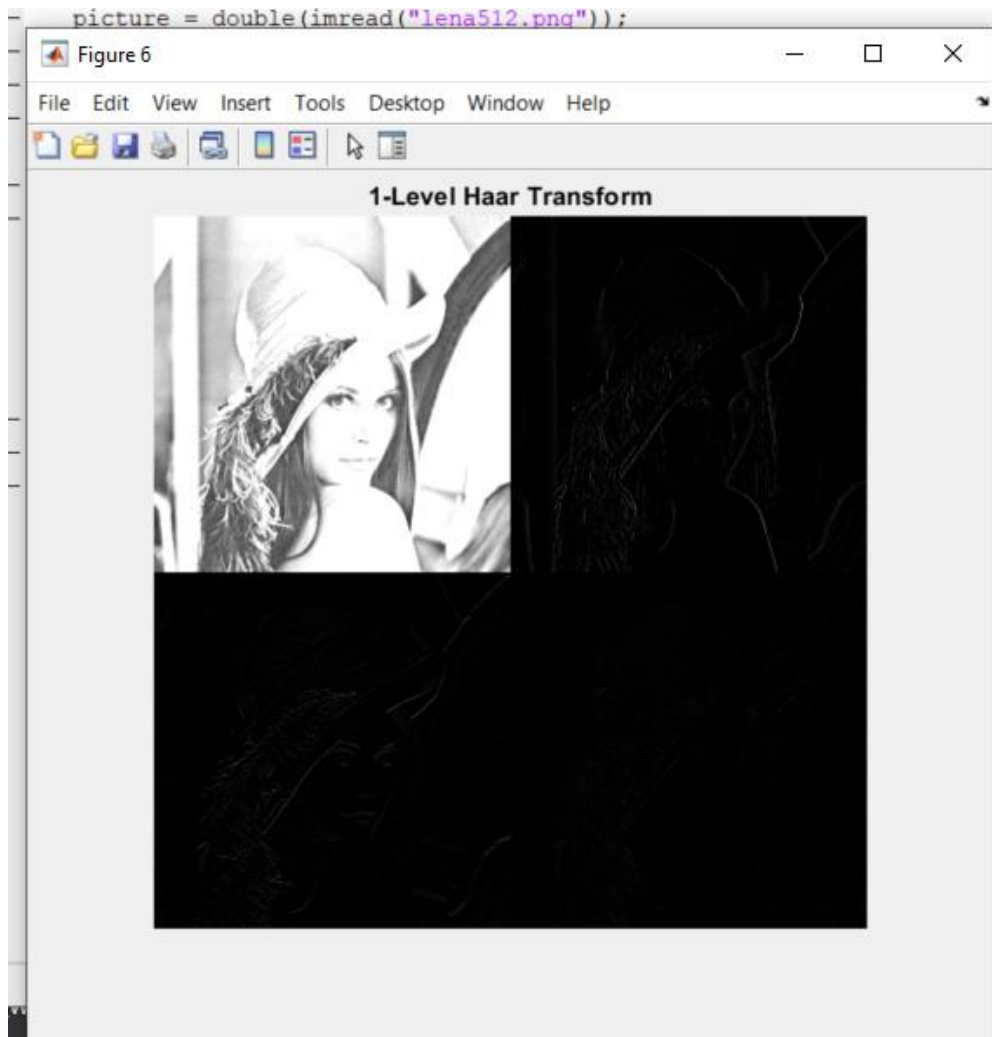

(c) Original and Quantized Image

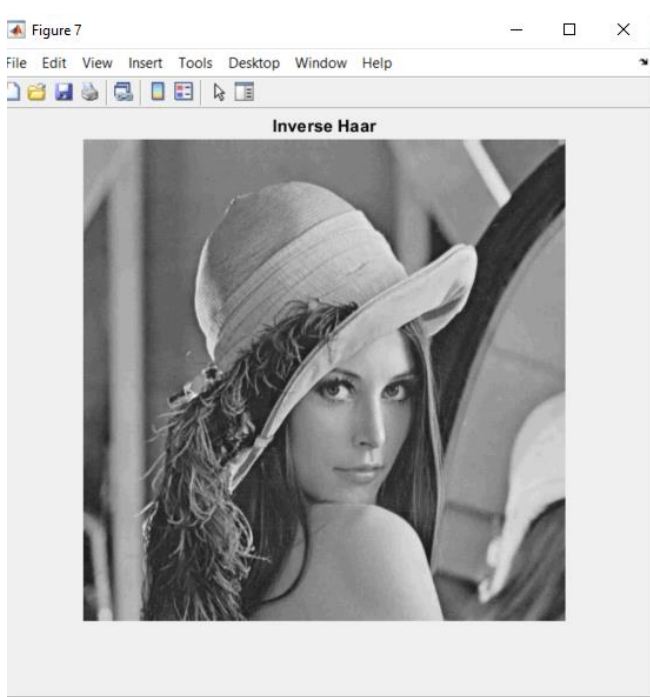# Q2 The 2D Haar Transform

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2.1)

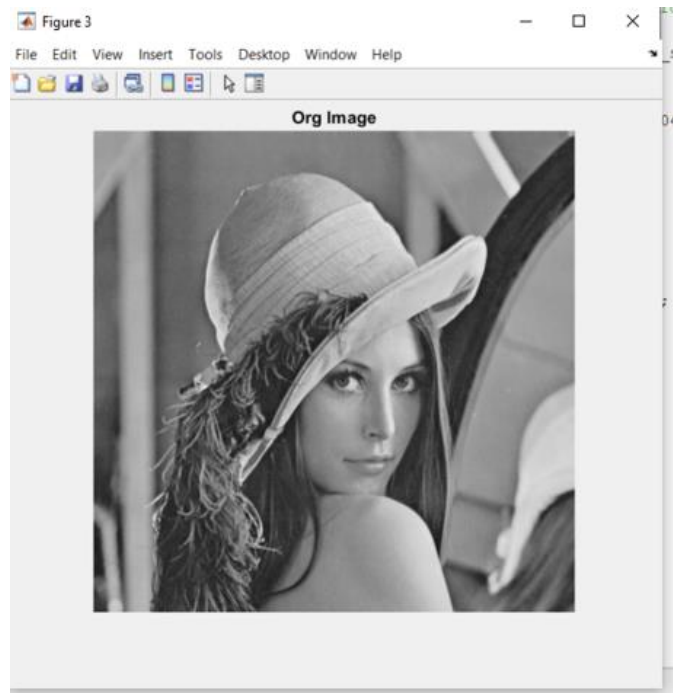(d) 1-Level Haar Transform

2.2)

| Hqhar | 1.7500 |
| Hqi | 3.5798 |

(e) Hqhaar

2.3) Hqi is the entropy at Q_step =15, since the brighter pixel lies in the Lo sub band, the entropy decreases on Haar Transform

2.4)

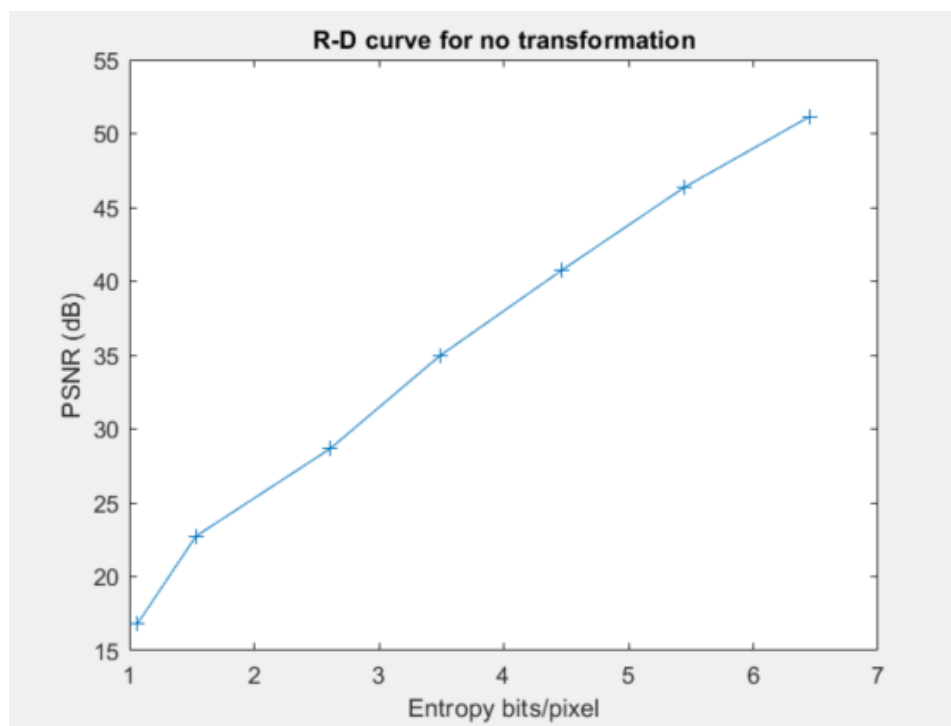   (f) Decoded Haar   (g) Original Image

On the left is the decoded haar image and on the right is the original image on visually comparing both of them we can observe that when an image is quantized it results in loss of no. of greyscales and therefore it results in loss of pixels.
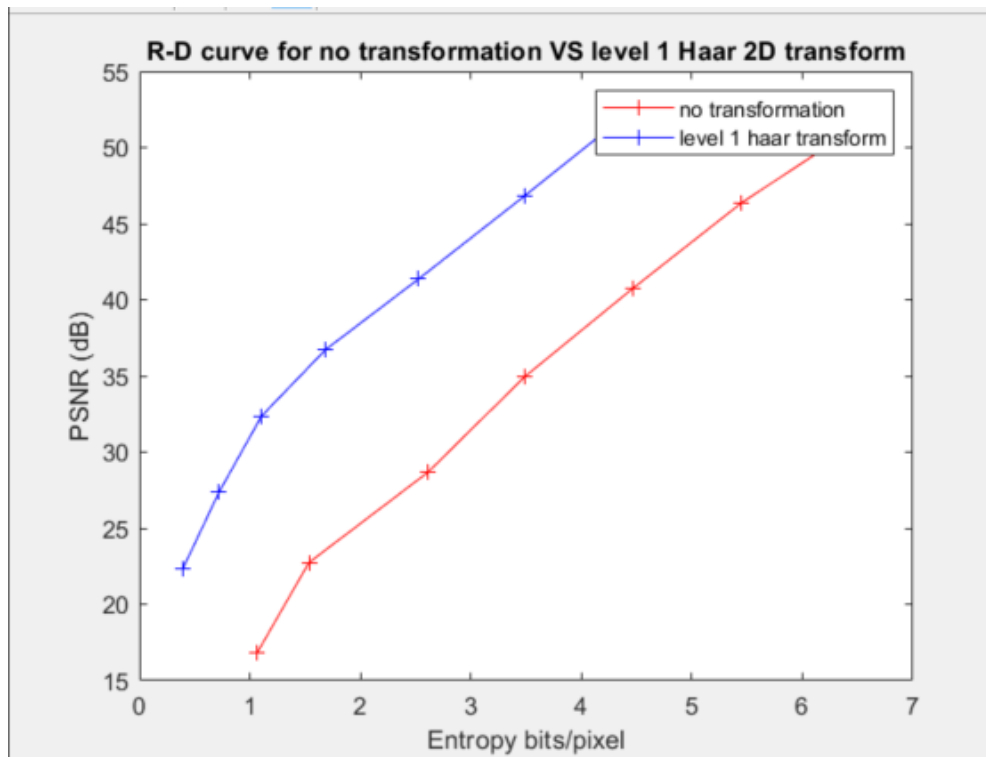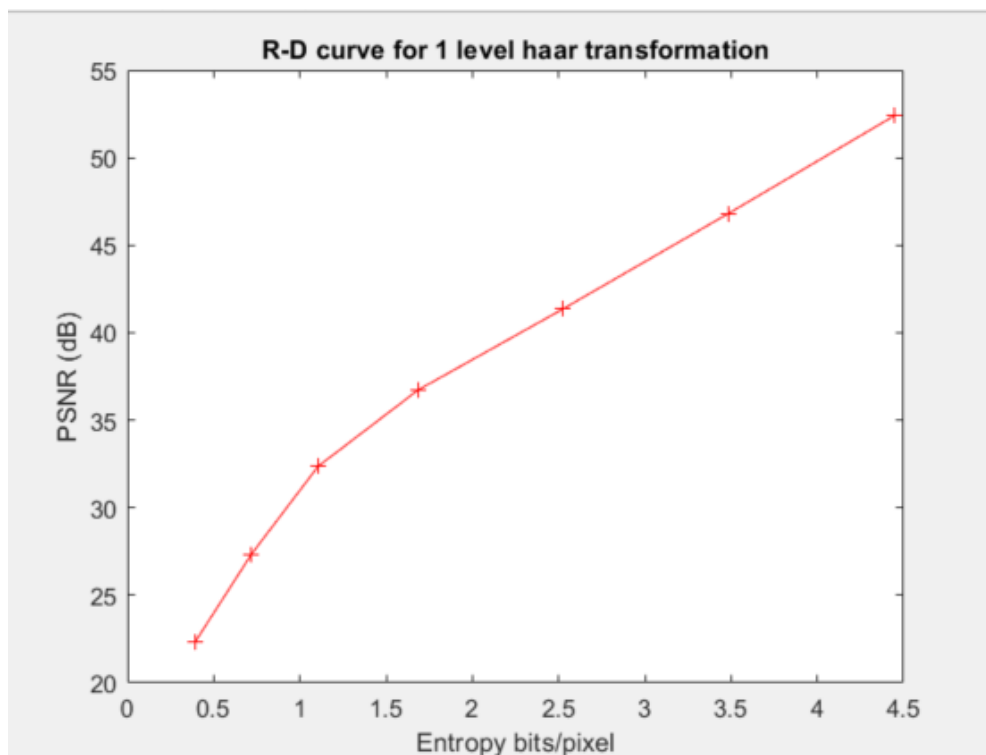
Q3Rate-Distortion Curve

3.1)

(h) Curve for no transform

3

3.2)

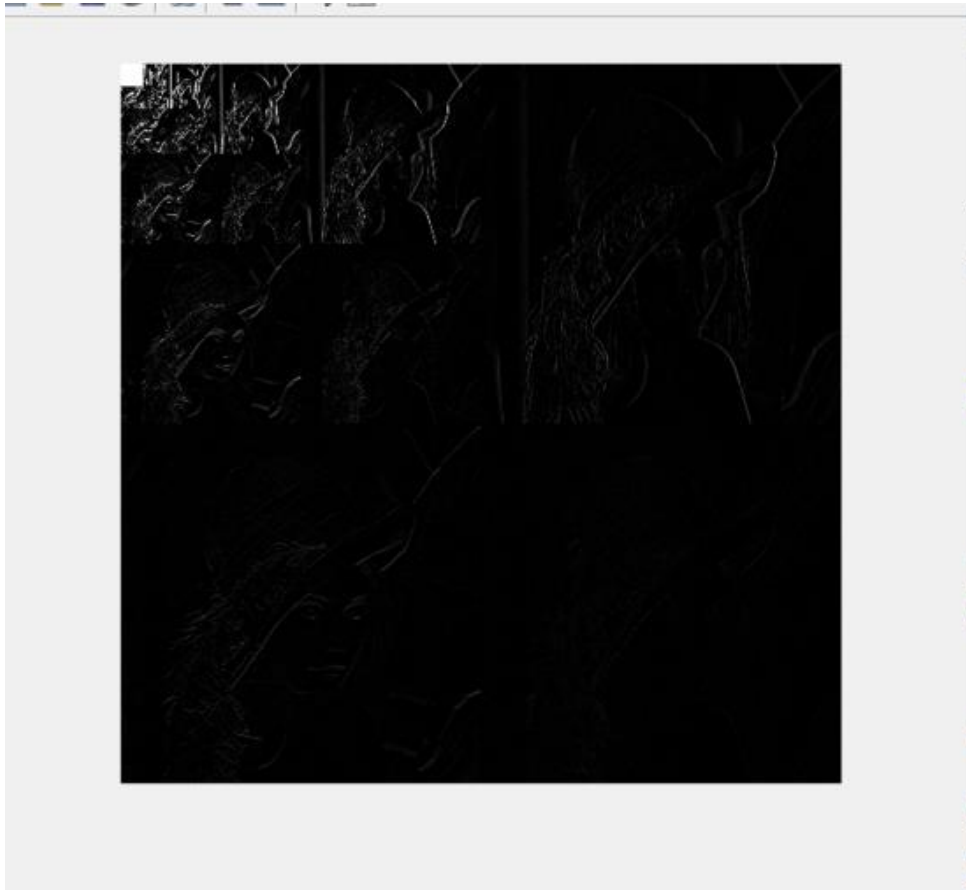(i) No transform vs level 1 haar 2d

3.3)

(j) Level 1 Haar Transform

In fig h i j we can see the graphs for no transform and Level 1 Haar transform, the r-d value for level 1 haar 2d is lesser than no transform because of good compressing efficiency of level 1 haar 2d transform as compared to no transformation.
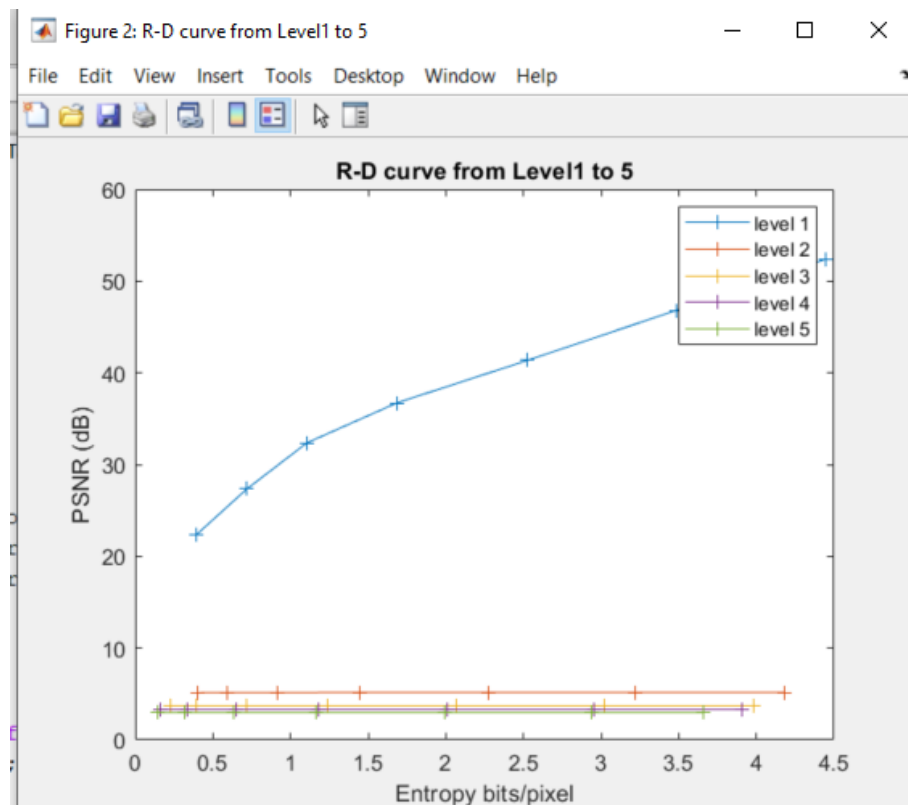
Q4 The Muti-Level 2D Haar Transform

4.1)

(k) Level 5 Haar Transform

4.2)

(l) R-D curve from level 1 to level 5

On increasing the level of Haar transform the details of image gets visible as compared to original image, though the entropy decreases