Department of Electronic & Telecommunication Engineering, University of Moratuwa, Sri Lanka.

EN3551 Assignment 02:

Application of 2D-DCT for Image Compression

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Github: SayuruA / DFT-Basic-Applications-and-Related-Challenges

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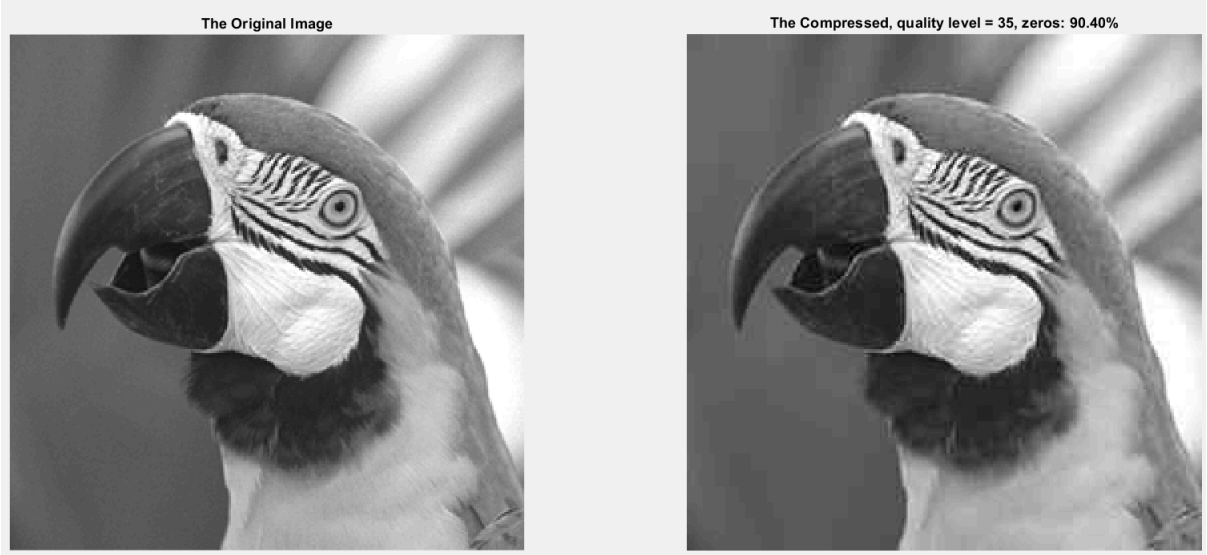
A. Procedure

1. Tasks

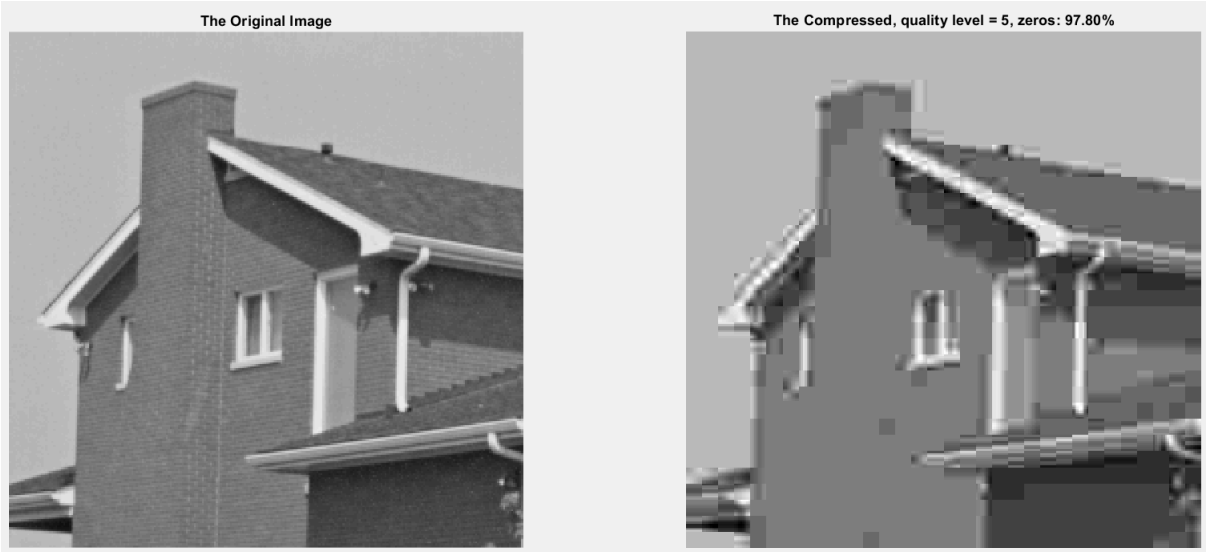
a. Compressed Images.

i. *Barbara* - Quality Level *80*/ Percentage of Zeros *73.6 %* / PSNR *37.58 dB*

ii. *Parrots* - Quality Level *35*/ Percentage of Zeros *90.4 %* / PSNR *33.54 dB*



iii. *House* - Quality Level 5/ Percentage of Zeros *97.8%* / PSNR = *27.76 dB*



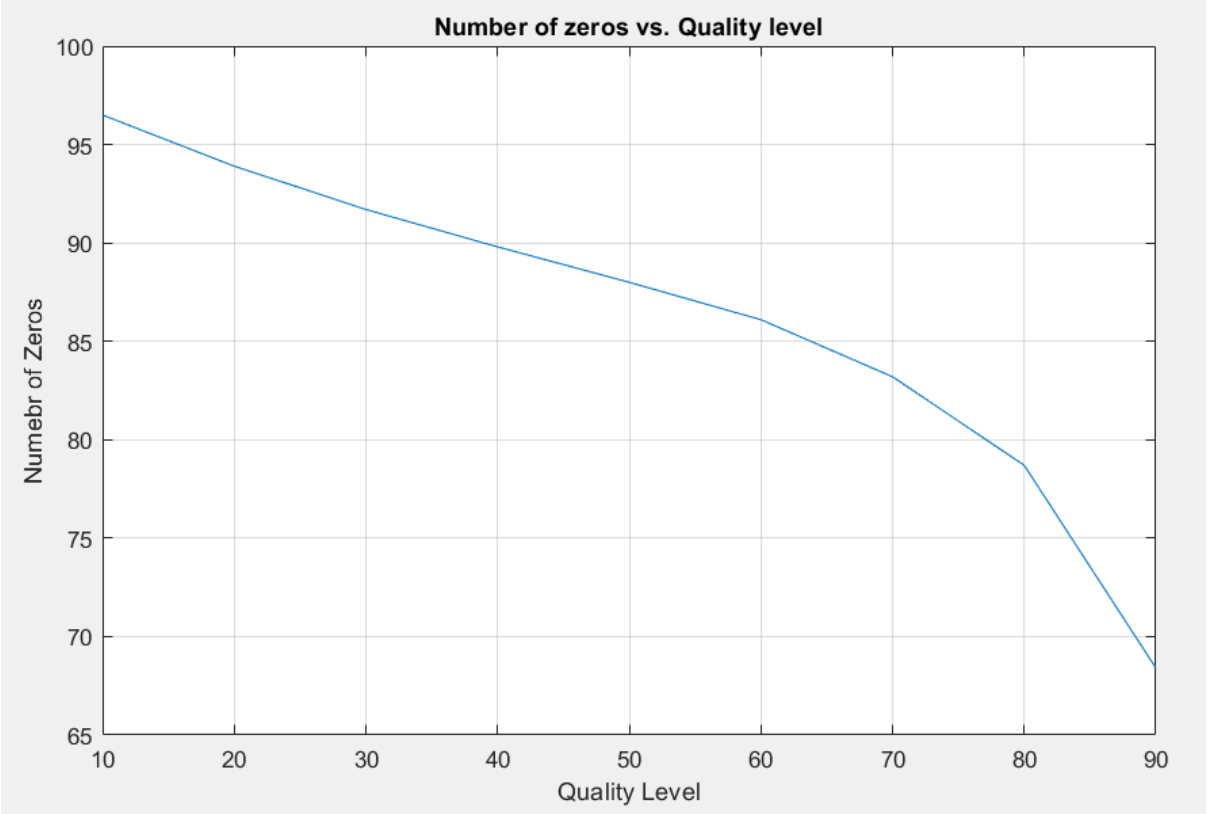
iv. *Blonde* [1]- Quality Level 60/ Percentage of Zeros *60%* / PSNR = *35.66 dB*

[1] Found on Kodak dataset.
https://www.kaggle.com/datasets/sherylmehta/kodak-dataset/data?select=kodim04.png

b. Observations.

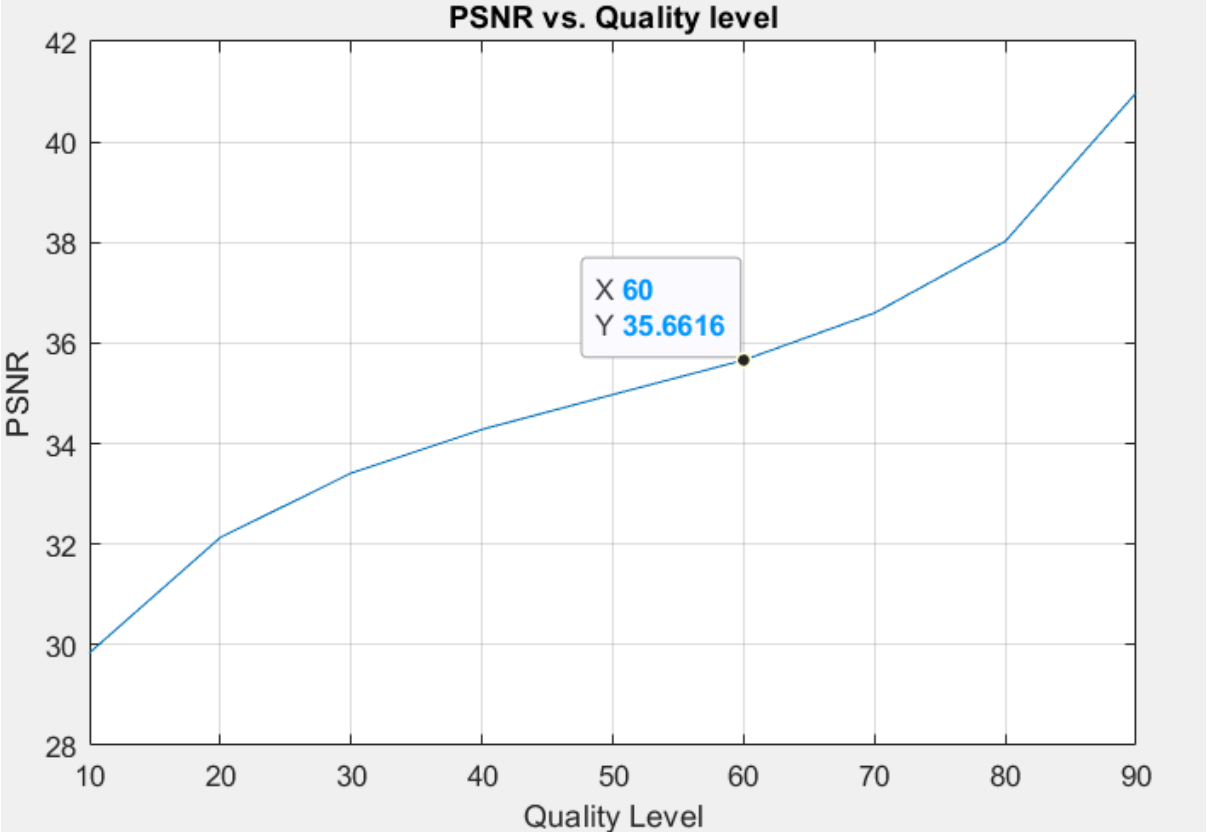
i. *Percentage of zero*

- stays at practically the same level for a large range of quality levels. I have added an extra code block to demonstrate this.
- This implies we can keep a very visually appealing image without reducing the data compression substantially.
- This graph is for the image '*blonde*'. Other images also produce similar graphs.



ii. *Peak signal-to-noise-ratio*

- *PSNR* also shows a small variation in the middle *quality level* range, where we can get both high compression and good visual quality.



iii. Visual quality vs. Quality Level

- Empirically, no large distortions cannot be seen until the quality is reduced to values around 40 -50.
- But upon close inspection (zooming), we can see finer and small details -such as hair, patterns, fur - start getting blotched together or missing entirely.
- Main structure of an object remains until down to very low levels (see '*house*' image).
- And we can also observe images getting slightly darkened, which may be caused by the reduction of overall energy of the image.

c. How different images react to compression.

- As described above, images with objects of high details/ texture get lower visual qualities since the suppressed high frequency components mainly govern these smaller details.
- For the same quality level; We can see that the face of the *'barbara'* image is almost the same, but the clear separation between the bricks in the original *'house'* image has been blotched, causing the two images to have different visual qualities.

- Find all the codes in the github link in the first page.