

JPEG Image Compression

Ishant Sihag

Department of Computer Science, IIT Ropar
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Dr. Puneet Goyal

Introduction

After applying the basics of JPEG image compression we observe the effect of the variation of certain parameters affect the image generated after decoding.

Here only a part of jpeg compression algorithm is implemented as part of this assignment which is as below:

- If the input image is colored, then it is converted into YCrCb domain to obtain a better compression ratio, then all these 3 streams are compressed independently.
- The image is then divided into blocks of the given size (zero padding if required) and then 128 is subtracted from each pixel value, to make the average mean closer to 0 so as to give better results for DCT (next step).
- The resulted level shifted blocks then undergoes Discrete Cosine Transform (DCT) to get a DCT matrix, which gives a matrix of real numbers
- Obtained matrix is then quantized by dividing each value by corresponding entry in quantization matrix and then rounding off to nearest integer. This is the only step in the whole process where there is data-loss and real compression is occurred.
- Any trailing zeros are trimmed off and then this array is the encoded array which is written into the text file.

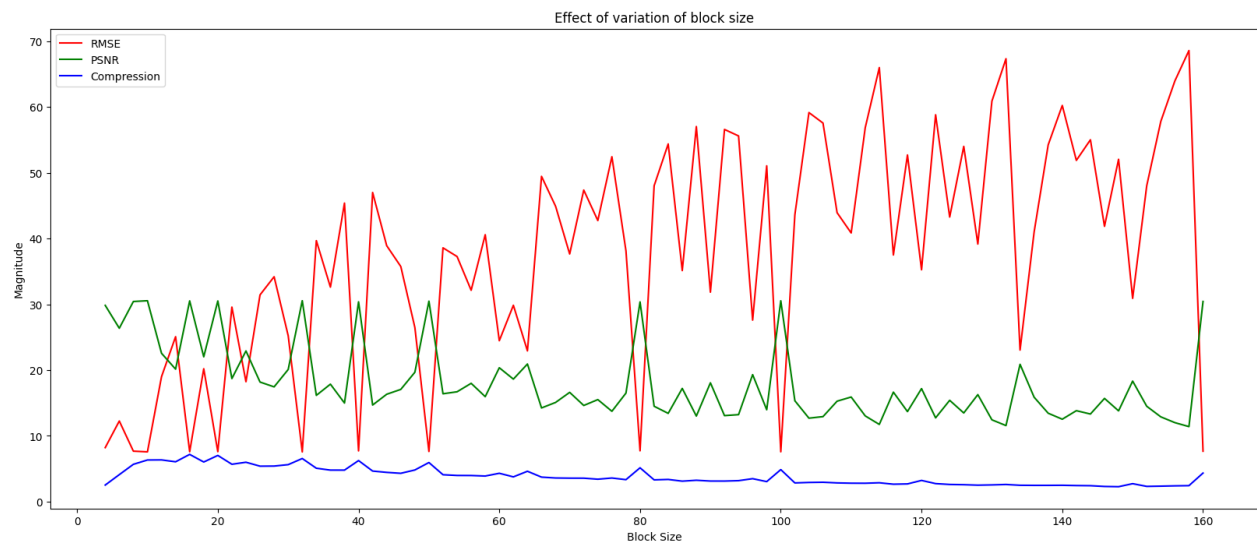
The quality of regenerated image is then checked using the following parameters

- **RMSE** – Root Mean Square Error is the parameter which estimated the average deviation from the expected value of a pixel and obtained pixel
- **PSNR** – Peak Signal to Noise Ratio is considered a better estimate for measuring deviation of images as it also accounts for the maximum possible value of image possible.
- **Compression Ratio** – It denotes by which factor the image is compresses which denotes the save of data to be sent for the image.

The variation of these parameters by changing the block size (multiples of 2) (4 to 158) for this real-world [Test Image](#) is as below:



Image resolution is 2400x1600 pixels



Here we can clearly observe that the graph is oscillating constantly denoting that the RMSE is generally less for multiples of 4.

The variation of the number of coefficients (1 to 64) sent for each block (size of block is fixed to 8) is as shown:

