DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING,

FACULTY OF ENGINEERING,

UNIVERSITY OF PERADENIYA

EE 596: IMAGE AND VIDEO CODING

LABORATORY 01-HUFFMAN CODING

INTRODUCTION:

In this lab we focus on compression of digital images. Compression is a general concept that applies to all types of data, not just images. Image compression schemes aim to decrease the number of bits used to represent the image. Using fewer bits allow the image to take up less storage space on a computer, and it can also be transmitted faster over a network. In this lab, we apply Huffman codes to achieve lossless compression in a given image and compare the output quality of the input image and reconstructed image.

Standard Software: MATLAB

Note: You may use C++ or Python. You are not allowed to use any libraries unless otherwise stated by the instructor.

LABORATORY ACTIVITY:

Step 1: Download the images from the webpage (Instructor will provide the URL at the lab).

Step 2: Read the original image into a Matrix.

Step 3: Select 16×16 cropped sub-image from your input at step2. Note that the starting point of the cropping window will depend on your Registration number. (Instructor will provide these details at the lab.)

Step 4: Quantize the output at Step 3 into 8 levels (level 0-7) using uniform quantization.

Step 5: Find the probability of each symbol distribution of the output at Step 4.

Step 6: Construct the Huffman coding algorithm for cropped image at Step 4.(Do not use inbuilt algorithms.)

Step 7: Compress both cropped and original images using the algorithm and the codebook generated at step 6. You may round any intensity values outside the codebook, to the nearest intensity value in the codebook, where necessary.

Step 8: Save the compressed image into a text file.

Step 9: Compress the original image using Huffman encoding function in the Matlab tool box and save it into another text file.

Step 10: Decompress the outputs at Step 8 and 9, by reading in the text files.

Step 11: Calculate the entropy of the Source

Step 12: Evaluate the PSNR of

i. The original images

ii. The decompressed images

DISCUSSION:

1. Calculate the entropy of,
    i. The original image
    ii. The cropped image
    iii. The decompressed images
2. Calculate the average length of the cropped image.
3.Compare the performance of your algorithm and inbuilt algorithm of Matlab by comparing the compression ratios, for cropped and original images.
3. Discuses about Entropy of the input image, the compression ratio achieved, and the output quality of the decompressed image.
4. How can you improve the compression ratio of the given image? Discuss.

LAB REPORT:

1. Submit MATLAB code and the cropped image (Make sure that each figure is properly labeled and also include your registration number in the title).
2. The report must be a pdf file with the figures and MATLAB codes for each step in the laboratory activity. Include extractions from the m file, and command prompt, figures. Also, please include the probability distribution of the cropped image and the Huffman code developed
3. The answers to discussion question should also be provided on the same pdf file.
4. Adhere to a proper report writing format throughout the lab report.