21.06.2023
İlknur Baş
151226814

COMP.SGN.210 Signal Compression Project

1. Main Project

For this project *'Image_4.png'* is used. Implementation of Task 1-6 can be found in the attached file.

Task 1.1:

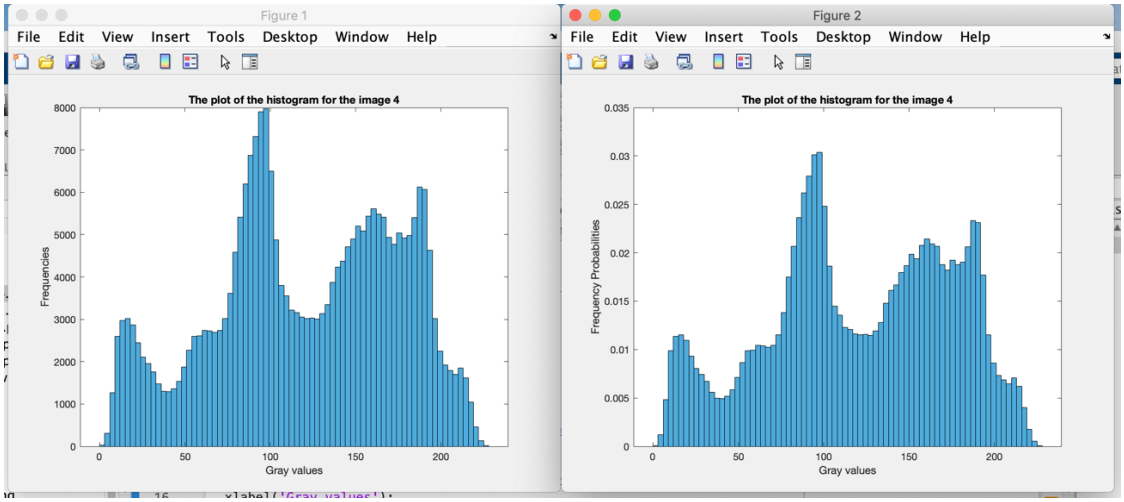

Figure 1: The plots of the histogram for *'Image_4.png'*: with frequencies (left) and frequency probabilities (right)

Task 2.1

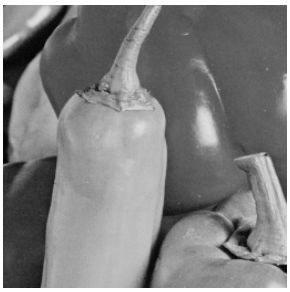

Figure 2: The image called 'MyImage_4.png'

Figure 3: The size of the file 'MyImage_4.png' which is attached to the uploaded file as well

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Task 2.2

Note that since *'histc'* function is deprecated in MATLAB, I have used *'histogram'* function.

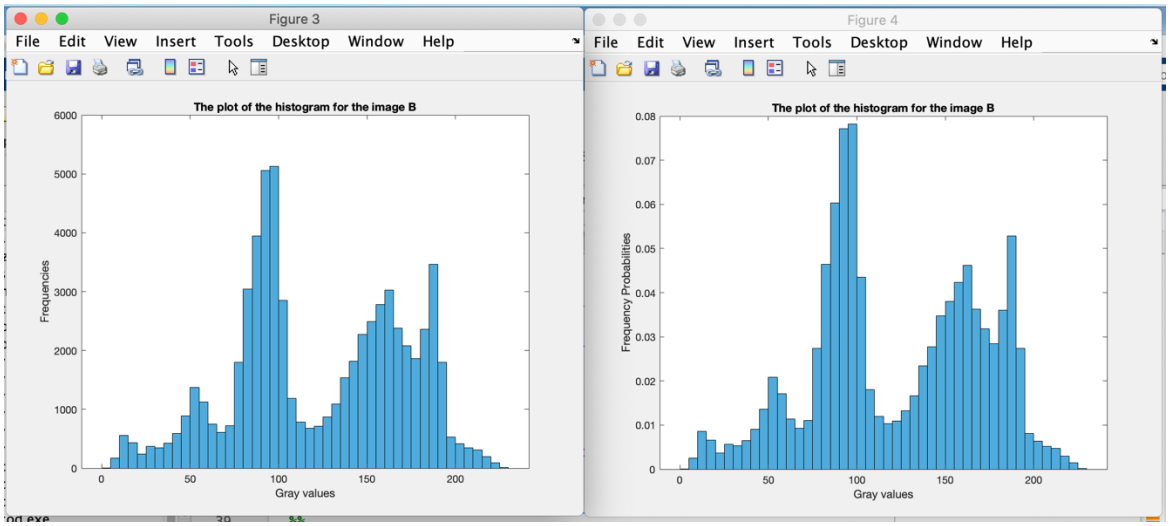

Figure 4: The plots of the histogram for *B*: with frequencies (left) and frequency probabilities (right)

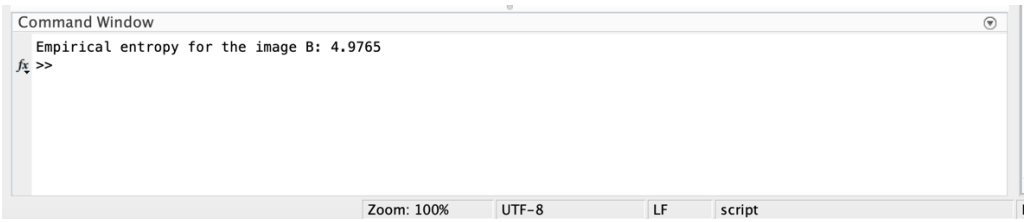

Figure 5: Entropy corresponding to the empirical probability obtained from the histogram in Figure 4 (right)

Task 3.1

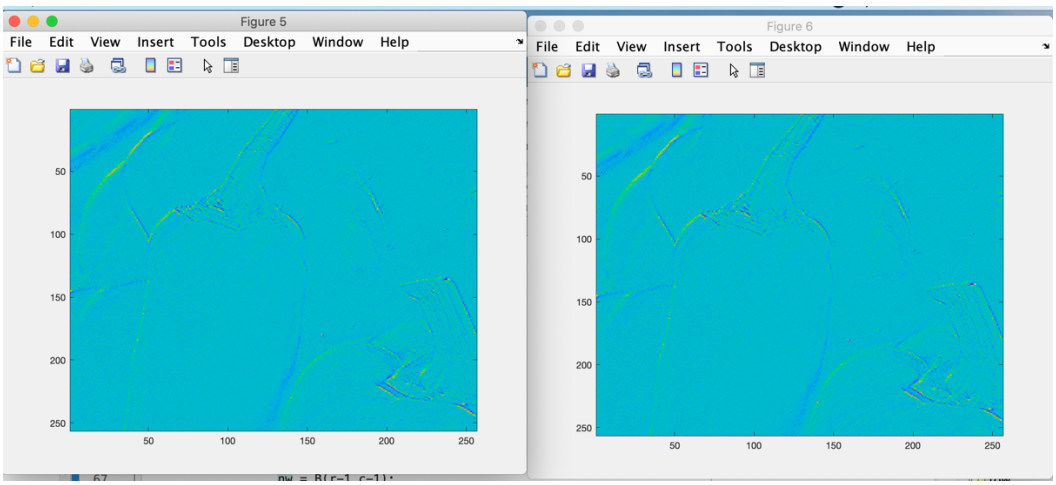

Figure 6: The prediction error matrix E: not shifted (left) and shifted (right)

As we can observe it from the plots above, especially the corners, edges, the areas where there are sharp intensity changes are emphasized in the prediction error matrix.

The first column and the first row are predicted as follows: we make the prediction by row by row; hence we have to first find the values for all rows, and then we will be able to get the 1st column prediction values. We find the values according to the algorithm written in the assignment.

Task 6

As it can be seen from the figure below, the best block size is 2000 which is the one that produces the smallest codelength for encoding the prediction errors (e_vec).

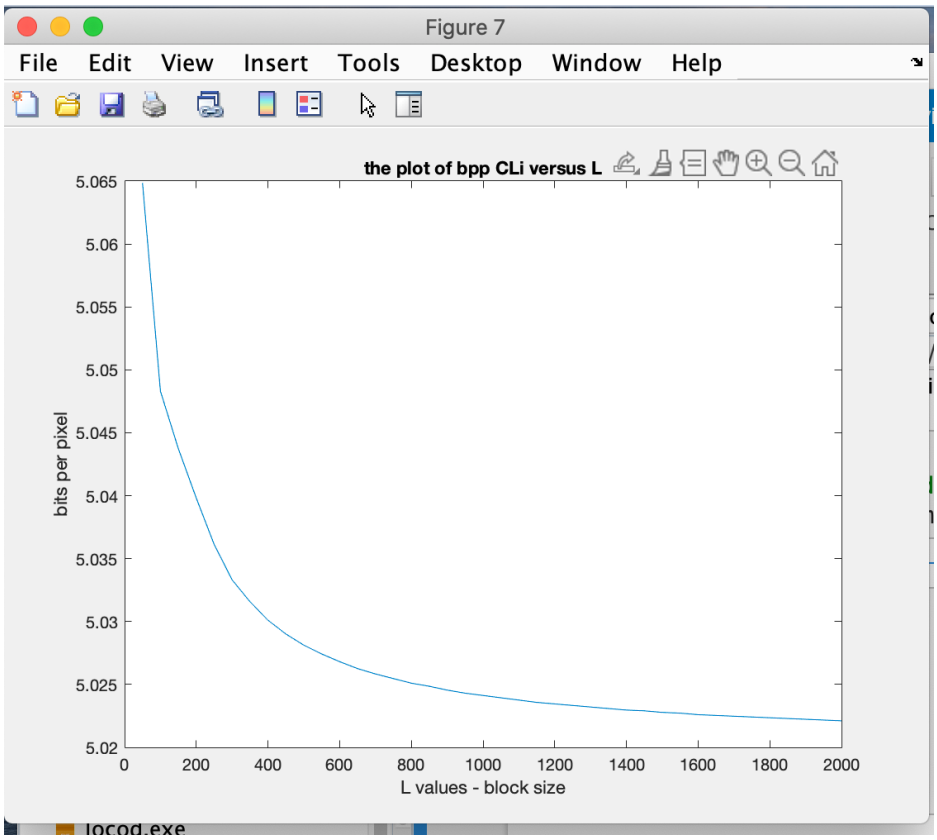

Figure 7: The plot of *bpp_CLi* versus *L*

As a final step, I have compared the values in the e_vec and the output of the decoding process (decoded values) and each value is turned out to be the same with the initial e_vec. I have also tried this with all the images given in the assignment and observe the same behavior.

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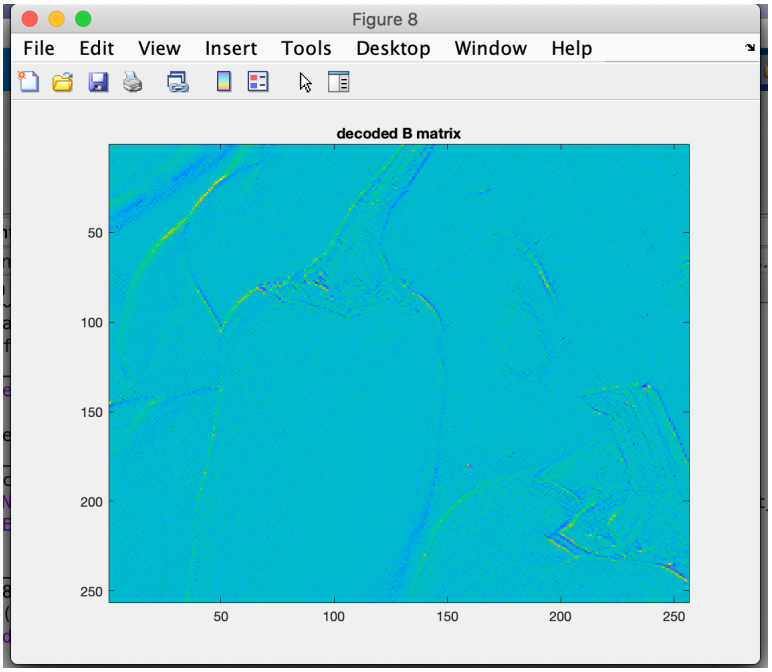

Figure 8: The output of the decoding process; decoded matrix B