

Video Compression – HW1 (03/26/2023)

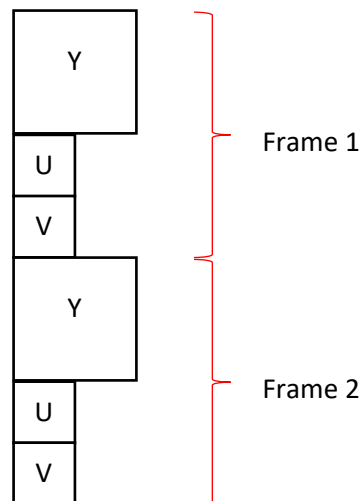
Instructions – Follow these carefully:

1. Please upload your work to Moodle. The zip file must have the source code and a PDF report where you explain and display the outputs for each problem.
2. You can use either C, Python, or Matlab to do the homework.
3. Please feel free to read related materials available in the official Matlab/Python documentation.
4. The due date is 4/9. Please turn in your report and code by 11:59 pm.

Assignment:

1. (30%) Please transform “foreman_qcif_0_rgb.bmp” from the RGB to YCbCr color space. Subsample Cb and Cr components based on the 4:2:0 YCbCr format, then transform it back to the RGB color space. Display all the results (including intermediate ones, such as Y, Cb, and Cr images) and compare the original image with the subsampled version of the image in the RGB color space.
2. (20%) Please transform “foreman_qcif_0_rgb.bmp,” “foreman_qcif_1_rgb.bmp,” and “foreman_qcif_2_rgb.bmp” from the RGB to YCbCr color space. Then, subsample Cb and Cr components based on the 4:2:0 YCbCr format and save all three frames in a file with its extension ‘.yuv’. In the report, you need to show the yuv images with and without subsampling for further comparison. (You can use “YUVDisplay.exe” provided to open a yuv image for display)

A 4:2:0 YUV File is arranged and saved in binary code as



3. (50%) Following Question 2, please quantify all possible intensities evenly in 16 levels (0, 1, 2, 3, 4, 5, 6, 7, 8, ... 15) for the three frames and use Huffman coding to encode these frames. Your report should include the Huffman tree, code for each

level, and decoded frames (including dequantization). You also need to turn in the code for encoding and decoding as well as the encoded bitstream.