VC_HW1_107703006

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, and 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.

   subsample後Cb和Cr通道的大小會減為原本的1/4，Y則和原本的一樣。

   - Orginal RGB

   - Orginal Y

   - Orginal Cb

   - Orginal Cr

- Subsampled RGB
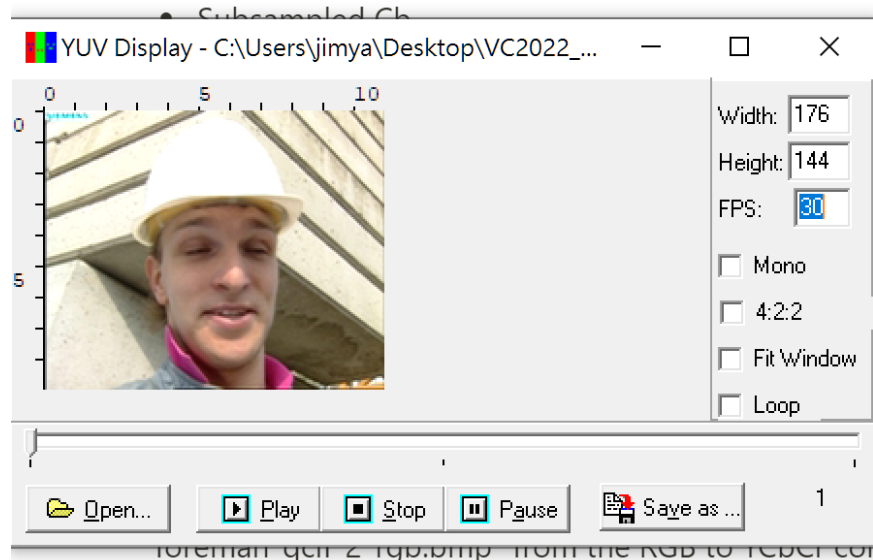

- Subsampled Y

- Subsampled Cb

- Subsampled Cr

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. Subsample Cb and Cr components based on the 4:2:0 YCbCr format. Save all three frames in a file with its extension ".yuv" , and then display it with "YUVDisplay.exe" provided.
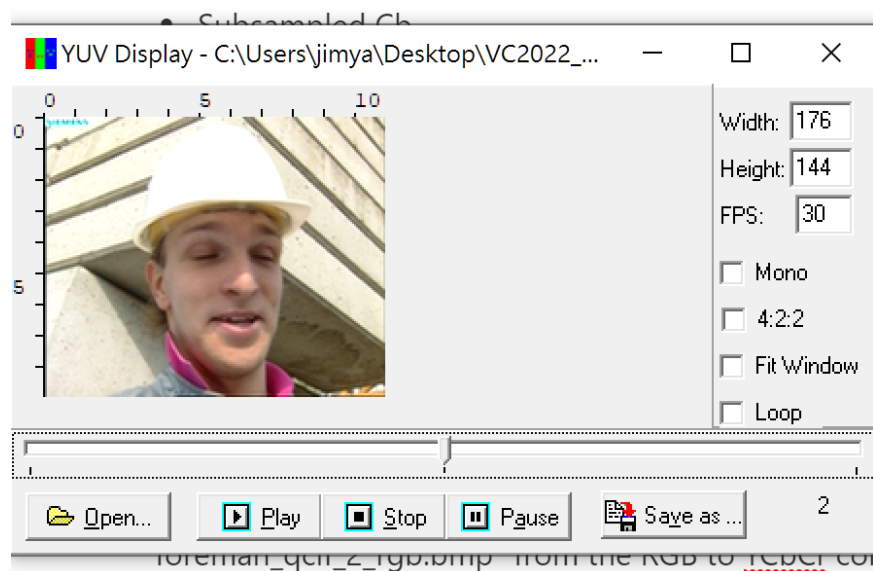
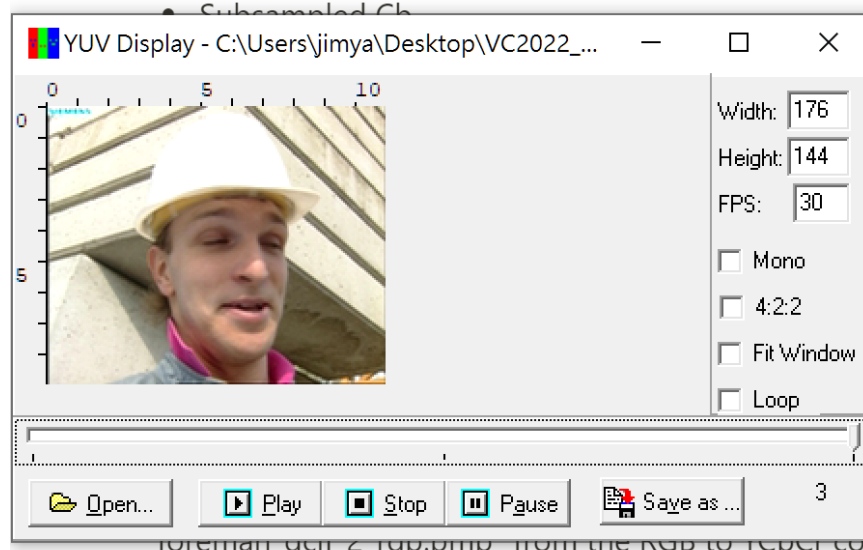- All frame in grayscale

- Frame 1

- Frame 2

- Frame 3

3. (50%) Following Question 2, please quantize all the possible intensities evenly in 8 levels (0, 1, 2, 3, 4, 5, 6, 7) 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.

- Huffman Tree:
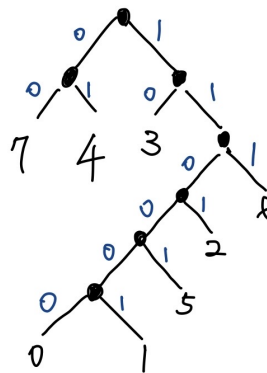
- Code for each level:

  - {7: '00', 4: '01', 3: '10', 0: '110000', 1: '110001', 5: '11001', 2: '1101', 6: '111'}

- Use YUVDisplay.exe to save image (.bmp file)

- Code for encoding and decoding is in "huffman_coding.py"

- Encoded bitstream is in "q3_encoded_bitstream.txt"

- Decoded frame 1

- Decoded frame 2

- Decoded frame 3