CMPT 365 Multimedia Systems

Project 2

Deadline 8:00pm, Nov 3 (Fri), 2023

Note: This is NOT a group-based project. Each student should submit a project report and the codes. We will use code scan tools to ensure that the programs are written by yourself. Please don't copy others or let others copy yours --- both will be considered plagiarism.

The programming language allowed will be C/C++/Java only. No Python or others.

Submission guideline: TA will announce detailed requirement soon.

Q1. Create a program that reads an uncompressed TIFF image file and display it on the screen, together with some operations on the image. Only the 24-bit RGB full color uncompressed mode in TIFF will be considered. You can assume that the image is no bigger than the 4*CIF size (i.e., 704*576).

Your program should first show an open file dialog box for the user to select the BMP file. It should then work as follows:

1. Display the original colored image (left), together with its grayscale image (right);
2. Refreshes by reducing the brightness to 50% for the original colored image (left) and for the grayscale image (right);
3. Refreshes by applying ordered dithering on the grayscale image (left: grayscale image: right: ordered dithering);
4. Refreshes by applying auto level on the original colored image (left: original image: right: auto level);

   To move to the next step, your can either place a "next" button on screen, or pause until any key is pressed. Go back to step 1 after step 4. There should also be a menu item "Exit" for terminating the program.

   You can reuse your code from Project 1 for reading and displaying images. For steps 1 to 3, however, you have to write your own code for conversion to grayscale, ordered dithering, and auto level.

   We will not specify any dither matrix. You can experiment different ones and choose a good one (that you feel having good visual results). You need to discuss your choice of the dither matrix in the report.

   Please refer to the lecture notes for the idea of auto level. You can design your own algorithm for the mapping or use the algorithm (sketch) in the slides. We won't expect a perfect algorithm but there should be some visual improvement (or difference if you don't want to call it "improvement").

Grading scheme
1. File input (2 marks)
2. Display the original images and grayscale image (4 marks)

3. Display the 50% bright images (4 marks)
4. Display the dithered image and discuss about the dither matrix (6 marks)
5. Display the auto leveled image and discuss the key steps in your algorithm design(6 marks)

Q2. Create a program that reads a .wav file and compress the audio samples in the file using Huffman coding. You should display the entropy of the audio samples and the average code word length.

We assume that the audio file is PCM coded and stereo only (i.e., no mono or multi-channel beyond 2), and the total number of samples will be an even number less than 65536. You can reuse your code from Project 1 for reading the .wav file. For entropy calculation and Huffman coding, you have to implement by yourself without using existing libraries.

Grading scheme
1. File input (2 marks)
2. Display the entropy (4 marks)
3. Display the average code word length (6 marks)