CPSC 4040/6040
Computer Graphics Images

Assigned: 9/6/2021
Due: 9/15/2021 (start of class)

Quiz 2 *(Grading: 0–10 points)*

1. Please answer the following potpourri questions from lectures 4-6:

   - **[2pt]** You are given an 8-bit grayscale scanline that must be converted to a bitmap (black and white). Please describe your strategy to do so. Using your strategy, what is the bitmap version for the following scanline: 90 100 100 100 90 90 90 90

use image dithering to diffuse error. First, find closest color (black or white), calculate difference between the closest color and pixel color. Then add that difference to the adjacent (right) pixel. Find closest color again.

The bitmap would be: 0 1 0 | 0 0 | 0

   - **[2pt]** Assume that you are using a run-length encoding scheme that encodes runs and non-repeating sequences to compress a greyscale image of 600 x 400 pixels (600 columns, 400 rows). Pixels and run lengths are stored as unsigned 8-bit numbers. Ignoring the size of the image header, and considering only lossless RLE compression per scanline, what is the smallest possible size of the RLE compressed image?

smallest size is 800 bytes

   - **[2pt]** Consider the following single scanline image: 108, 139, 135, 244, 172, 173, 56, 99. If it is quantized with 4-bit accuracy, compute the RMS error for the quantized image.

before quantize 6C 8B 87 F4 AC AD 38 63

after quantize 6 8 8 F A A 3 6

Decimal = 6 8 8 15 10 10 3 6

$$RMS = \sqrt{\frac{102^2 + 131^2 + 127^2 + 229^2 + 162^2 + 163^2 + 53^2 + 93^2}{8}} = 141.6$$

(Quiz continues in the next page)

2. Consider the following 8-bit greyscale image:

12	12	12	59	179	254	254	254
12	12	12	59	179	254	254	254
12	12	12	59	179	254	254	254
12	12	12	59	179	254	254	254

- **[2 pt]** Compress the image using Huffman coding. *Hint: construct the Huffman table and encode the image scanlines using the table entries.*

Huffman table

12	01	0.375
59	000	0.125
179	001	0.125
254	1	0.375

result:

01010|000 001|111

- **[2 pt]**What is the compression ratio and savings ratio of the Huffman encoded image?

Compression ration : 4.3

Savings ration : 0.77

Extra Credits [2pt]

Use the LZW coding algorithm to encode the ASCII string AAAAAAAAAAA

table:

Value	Index
A	0
AA	1
AAA	2
AAAA	3

result: 0 1 1 2 2