Department of Electrical Engineering and Computer Science

CIS 465 Multimedia
Fall 2021

Assignment 2
(Due date: 10/04/21)

1. Construct the Huffman code of the source whose symbol probabilities are defined below. [3 points]

r_k	$p_r(r_k)$
$r_0 = 0$	0.11
$r_1 = 1/7$	0.01
$r_2 = 2/7$	0.09
$r_3 = 3/7$	0.17
$r_4 = 4/7$	0.23
$r_5 = 5/7$	0.07
$r_6 = 6/7$	0.17
$r_7 = 1$	0.15

2. Consider the simple 7×7, 8-bit image: [6 points]

77	122	111	0	0	255	255
0	111	111	77	111	77	77
111	111	0	111	111	0	255
122	0	111	111	122	255	0
111	111	77	111	111	255	255
49	49	3	49	49	3	3
3	122	111	200	122	111	111

a. Compress the image using Huffman coding.
b. Compute the compression achieved and the effectiveness of Huffman coding.

3. **Write** programs to perform the following transformations on the grayscale images (you may *pick any image)*. **Display** the output images along with the respective input images. [11 points]

$$g(x,y) = \begin{cases} 0 & if\ f(x,y) < t \\ L-1 & if\ f(x,y) \geq t \end{cases}$$ where *t = 70 and 170*

$$g(x,y) = \begin{cases} 0 & if\ f(x,y) < t1 \\ f(x,y) & if\ t1 \leq f(x,y) \leq t2 \\ 0 & if\ f(x,y) > t2 \end{cases}$$ where *t1 = 70 and t2 = 170*

$$s = c\ \log\left(1+|r|\right)$$

$$s = c\ r^{\eta}$$

What to turn in:

Submit your work through **Blackboard** as **one single** folder including:

- An `HTML` file called `index.html` that links to the overall summary of your answers (screenshot of part 1 output).
- A folder called `CIS_465` that includes all files, program codes along with the supported files, dataset needed to reproduce your code (if any), etc.

Notes:

- Please make sure that your program runs successfully at other machines!
- Late submissions will receive a penalty of 10% per day up to two days.
- No material will be accepted after two days past the deadline.
- Email submissions will not be accepted.