Quiz 1, Monsoon 2019, CSE340/540, ECE350

Duration # 35 minutes, Total marks # 8

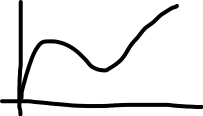
Q1. A histogram equalization transfer function has a form of CDF, which is monotonically increasing function. What happens when this transfer function is not monotonically increasing.

1. The relation between dark and bright pixels between input and output will not be maintained in output image i.e. brighter input pixels may appear darker in output image, and, darker input pixels may appear brighter in output image.



S1

S2



R1

R2



For the above function, a brighter pixel R2 will be mapped to darker pixel S2.

A darker pixel R1 will be mapped to brighter pixel R2.

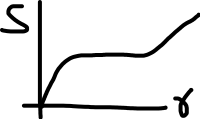
R2>R1 but S2 is not greater than S1, thus relation is not maintained.

1. Output image will be same whether or not transfer function is monotonically increasing.

False, Output will always change whenever the transfer function changes. If the function is monotonic, output image is say I, and if function is not monotonic say G, then

G is not same as I.

1. Output image may have a darker appearance with a transfer function which is not increasing monotonically compared to the case when transfer function is monotonically increasing.



This is monotonicaly increasing with flat portion in middle.

Here, if R2>R1, then S2>=S1.

However, when transfer function is not monotonic increasing, ie function in a,

Then S2 < S1 is possible, this image will certainly appear darker.

Which of the statements are true or false? Explain reasons behind whether it is true or false. Your explanations should include the plot of transfer functions. [3]

Q2. Perform histogram matching [2]

|  |  |  |  |
| --- | --- | --- | --- |
| r | p(r) | Z | P(z) |
| 0 | 0.5 | 0 | 0 |
| 1 | 0.0 | 1 | 0 |
| 2 | 0 | 2 | .5 |
| 3 | 0.5 | 3 | .5 |

Your answer should explicitly state which r values are mapped to which z values.

Q3. A transformation is made from U to X with transformation T1. Then X is transformed to Y using T2. Express U in terms of T1, T2 and Y. [1]

Q4. An interpolation function varies quadratically in X and has no dependence on Y. Write the function and then derive the unknown parameters. Following information is given,[1.5]

Coordinates (x,y) = (2,4), pixel value at (2,4) is 10

(x,y) = (3,4), pixel value at (2,4) is 20

Find the value at (4,4). [.5]