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FACULTY OF EGINEERING

Digital Image Processing
LECTURE-12

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OUTLINE

- Histogram Algorithm
- Average Image Gray Level
- Histogram Equalization
- Statistical Techniques
- MCQ
- References

Histogram Algorithm

A Histogram Algorithm. We present an efficient algorithm here for computing the histogram of an image. The algorithm is described in a high level pseudo language that is easily translated into C or C++.

Algorithm :

Computation of Histogram for k = 0 to 255 do //Initialize all counts

c[k] = 0; //c[k] = count of pixels at gray level k

for m = 0 to M-1 do //For each row and

for each for n = 0 to N-1 do //column in the image

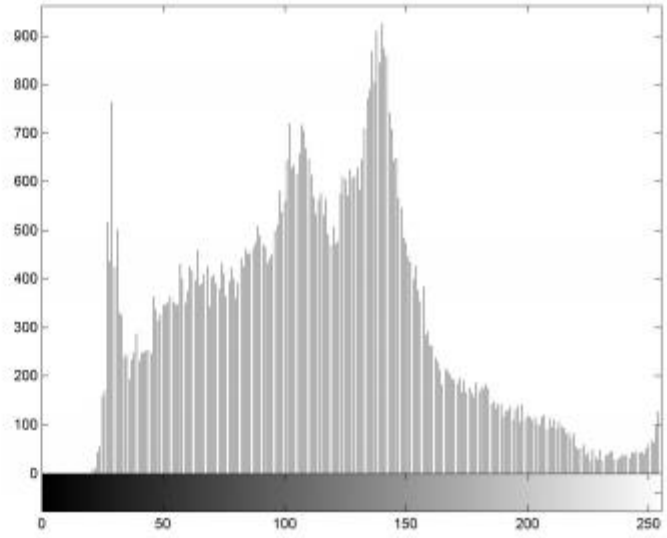
c[f[m,n]] = c[f[m,n]] + 1; //increment count at gray level f(m,n)

for k = 0 to 255 do //Proportionalize each gray level count

h[k] = c[k]/(M*N); //M*N = total pixel count, h[k] is proportion

Average Image Gray Level

Average Image Gray Level. Each image has an average gray level : and a variance F computed from 2 : (k=0,255) k = E (k)(h) (2.11) F (k=0,255) k = E (k-:) (h) (2.12) 2 2 Without apriori information we would expect that : is approximately L/2 = 256/2 = 128. However, many important details may be in the lower range (or in the upper range) of gray levels. In that case we want more pixels to be distributed over the gray level range of interest. It is sometimes useful to use the average : over the entire image, or over a portion of interest, in a process that changes : to a desired value. The gray level variation can also be increased to increase contrast.



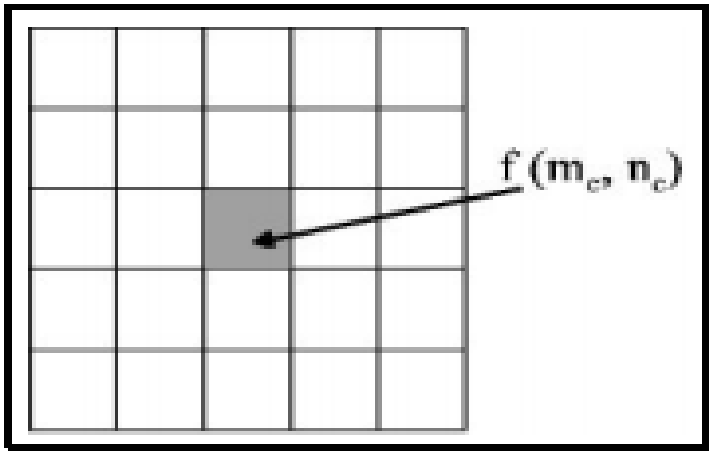
Histogram Equalization

Cumulative Distributions. A histogram {h } for an image may have its nonzero proportions predominately in the lower, upper or middle part of the grayscale. Ideally, the image grays should cover the range [0,L-1] and not have too many or too few counts in any gray levels. A transformation that spreads out the gray levels used and also changes the proportions to be more uniform is called histogram equalization. Figure 2.10b shows an approximately equalized histogram.



Statistical Techniques

Statistics-based Linear Transformations. Let : be the average pixel gray level over an image {f(m,n)} and d let F^2 be the variance. If the overall image is too dark or too light, we may choose a desired mean : . If d d d the contrast is too low or too high, we may choose a desired variance F^2, where either F > F or F < F. We compute the slope (gain) for a linear transformation g = af + b via



MCQ

1. The property indicating that the output of a linear operation to a constant times as input is the same as the output of operation due to original input multiplied by that constant is called _____

   a) additively

   b) heterogeneity

   c) homogeneity

   d) None of the Mentioned

2. Enhancement of differences between images is based on the principle of _____

   a) Additively

   b) Homogeneity

   c) Subtraction

   d) None of the Mentioned

3. A commercial use of Image Subtraction is _____

   a) Mask mode radiography

   b) MRI scan

   c) CT scan

   d) None of the Mentioned

MCQ

4. Region of Interest (ROI) operations is commonly called as _____

a) Shading correction

b) Masking

c) Dilation

d) None of the Mentioned

5. If every element of a set A is also an element of a set B, then A is said to be a _____ of set B.

a) Disjoint set

b) Union

c) Subset

d) Complement set

References

- https://www.javatpoint.com/digital-image-processing-tutorial
- https://www.geeksforgeeks.org/
- Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
- Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: JohnWiley and Sons, NY.
- Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall,Upper Saddle River, NJ.