RAMA UNIVERSITY

www.ramauniversity.ac.in

FACULTY OF EGINEERING

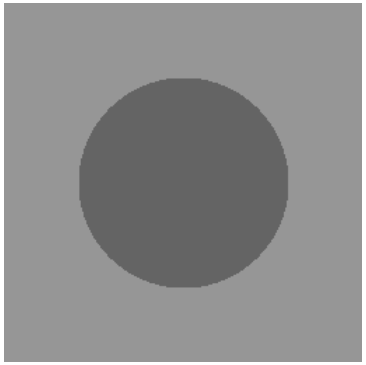
Digital Image Processing
LECTURE-35

Mr. Dhirendra
Assistant Professor
Computer Science & Engineering

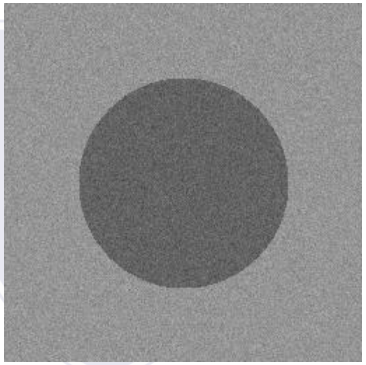
OUTLINE

- ❖Greylevel histogram-based segmentation
- ❖Greylevel thresholding
- ❖MCQ
- ❖References

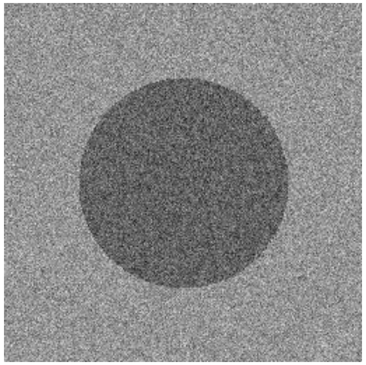
Greylevel histogram-based segmentation



Noise free



Low noise

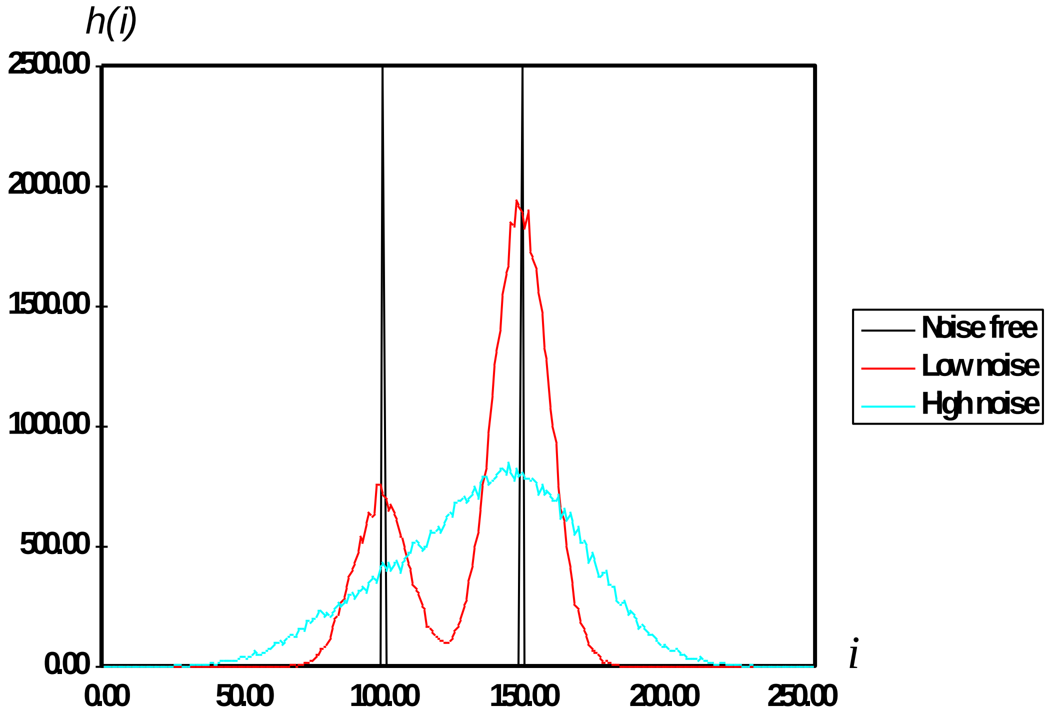


High noise

Greylevel histogram-based segmentation

- How do we characterise low noise and high noise?
- We can consider the histograms of our images
    - For the noise free image, its simply two spikes at i=100, i=150
    - For the low noise image, there are two clear peaks centred on i=100, i=150
    - For the high noise image, there is a single peak – two greylevel populations corresponding to object and background have merged

Greylevel histogram-based segmentation



Greylevel histogram-based segmentation

We can define the input image signal-to-noise ratio in terms of the mean greylevel value of the object pixels and background pixels and the additive noise standard deviation

$$S/N = \frac{|\mu_b - \mu_o|}{\sigma}$$

Greylevel histogram-based segmentation

For our test images :

S/N (noise free) = ∞

S/N (low noise) = 5

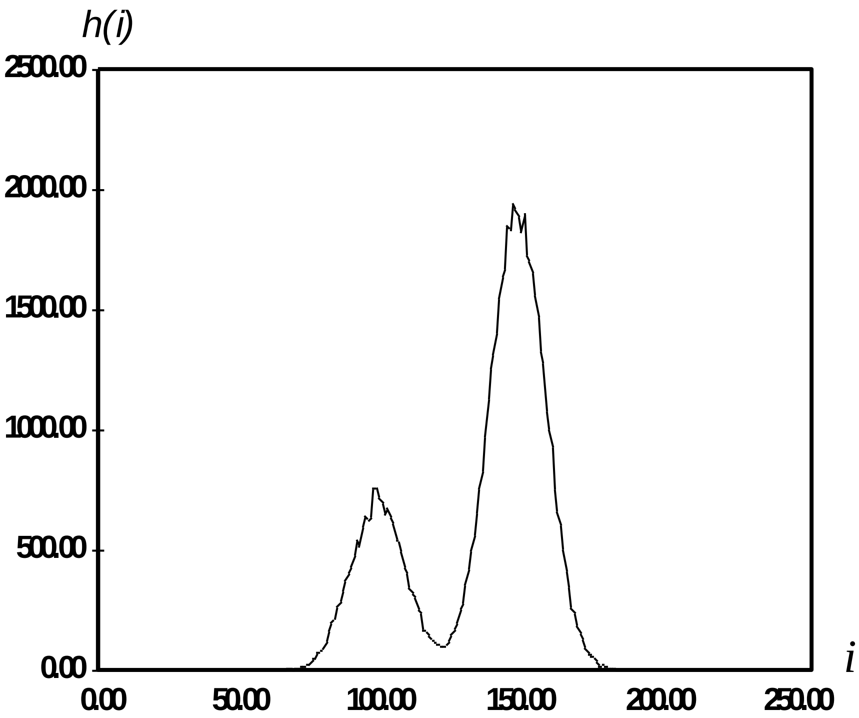
S/N (high noise) = 2

Greylevel thresholding

We can easily understand segmentation based on thresholding by looking at the histogram of the low noise object/background image

There is a clear ‘valley’ between to two peaks

Greylevel thresholding



MCQ

1. The histogram of a digital image with gray levels in the range [0, L-1] is represented by a discrete function:

   a) $h(r_k)=n_k$

   b) $h(r_k)=n/n_k$

   c) $p(r_k)=n_k$

   d) $h(r_k)=n_k/n$

2. How is the expression represented for the normalized histogram?

   a) $p(r_k)=n_k$

   b) $p(r_k)=n_k/n$

   c) $p(r_k)=nn_k$

   d) $p(r_k)=n/n_k$

3. Which of the following conditions does the T(r) must satisfy?

   a) T(r) is double-valued and monotonically decreasing in the interval $0 \le r \le 1$; and $0 \le T(r) \le 1$ for $0 \le r \le 1$

   b) T(r) is double-valued and monotonically increasing in the interval $0 \le r \le 1$; and $0 \le T(r) \le 1$ for $0 \le r \le 1$

   c) T(r) is single-valued and monotonically decreasing in the interval $0 \le r \le 1$; and $0 \le T(r) \le 1$ for $0 \le r \le 1$

   d) T(r) is single-valued and monotonically increasing in the interval $0 \le r \le 1$; and $0 \le T(r) \le 1$ for $0 \le r \le 1$

MCQ

4. The inverse transformation from s back to r is denoted as:

    a) $s=T-1(r)$ for $0 \le s \le 1$

    b) $r=T-1(s)$ for $0 \le r \le 1$

    c) $r=T-1(s)$ for $0 \le s \le 1$

    d) $r=T-1(s)$ for $0 \ge s \ge 1$

5. The probability density function $p_s(s)$ of the transformed variable s can be obtained by using which of the following formula?

    a) $p_s(s)=p_r(r)|dr/ds|$

    b) $p_s(s)=p_r(r)|ds/dr|$

    c) $p_r(r)=p_s(s)|dr/ds|$

    d) $p_s(s)=p_r(r)|dr/dr|$

References

- Dr. Mike Spann m.spann@bham.ac.uk http://www.eee.bham.ac.uk/spannm
- https://www.javatpoint.com/digital-image-processing-tutorial
- Henry Sambrooke Leigh, Carols of Cockayne, The Twins Morphological Image Processing (Digital Image Processing – Gonzalez/Woods)
- 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.