19CSE367 Digital Image Processing

SARATH TV

Last Lecture

- Components of DIP system
- Image sensing and acquisition
- Single sensing element
- In line sensor
- Sensor array
- MATLAB grader

Image model

- Representing Image as 2D function- f(x,y)
- Value of f at x,y is intensity.
- Determined by source of image.
- Special cases – Image intensities take negative value.
- Radar images – velocity .
- While storing –scale the values- smallest negative =0.
- $0 \leq f(x,y) < \infty$

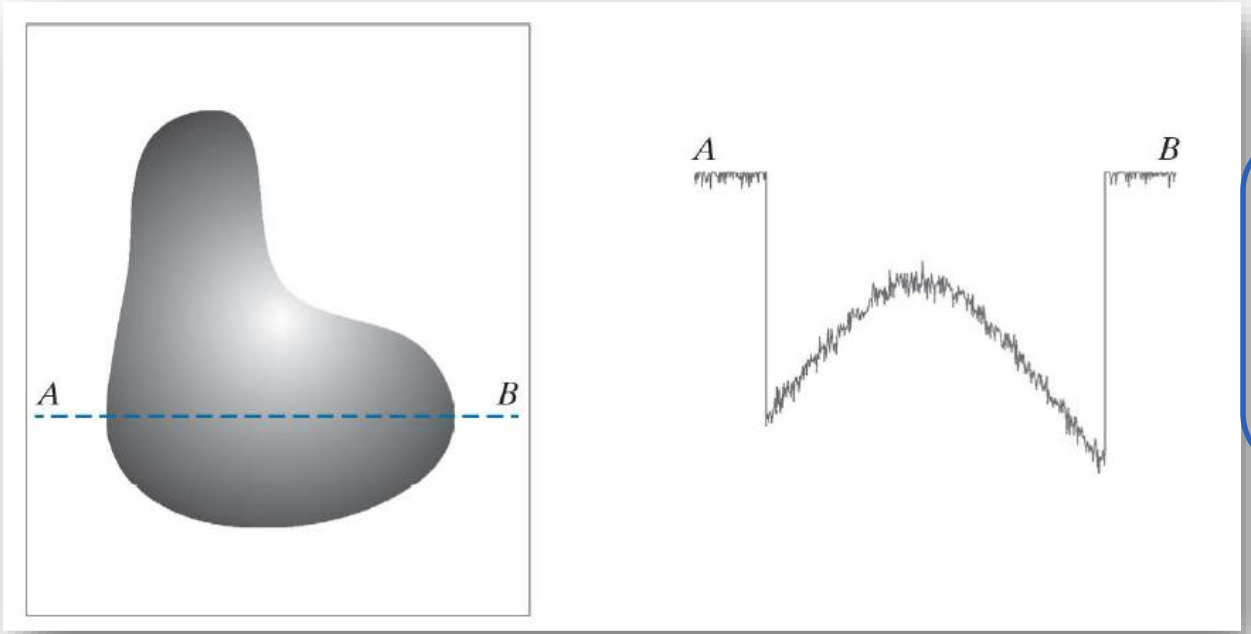
- Two components- amount of illumination
- Incident on the scene i(x,y)
- Reflected by objects in scene r(x,y)
  - $f(x,y) = i(x,y)\, r(x,y)$
- $0 \leq i(x,y) < \infty$
- $0 \leq r(x,y) < 1$

- Transmissivity

Image Sampling & Quantization

- Image acquired
- Sensor output (most) continuous voltage waveform.
- Convert the continuous sensed data into digital format.

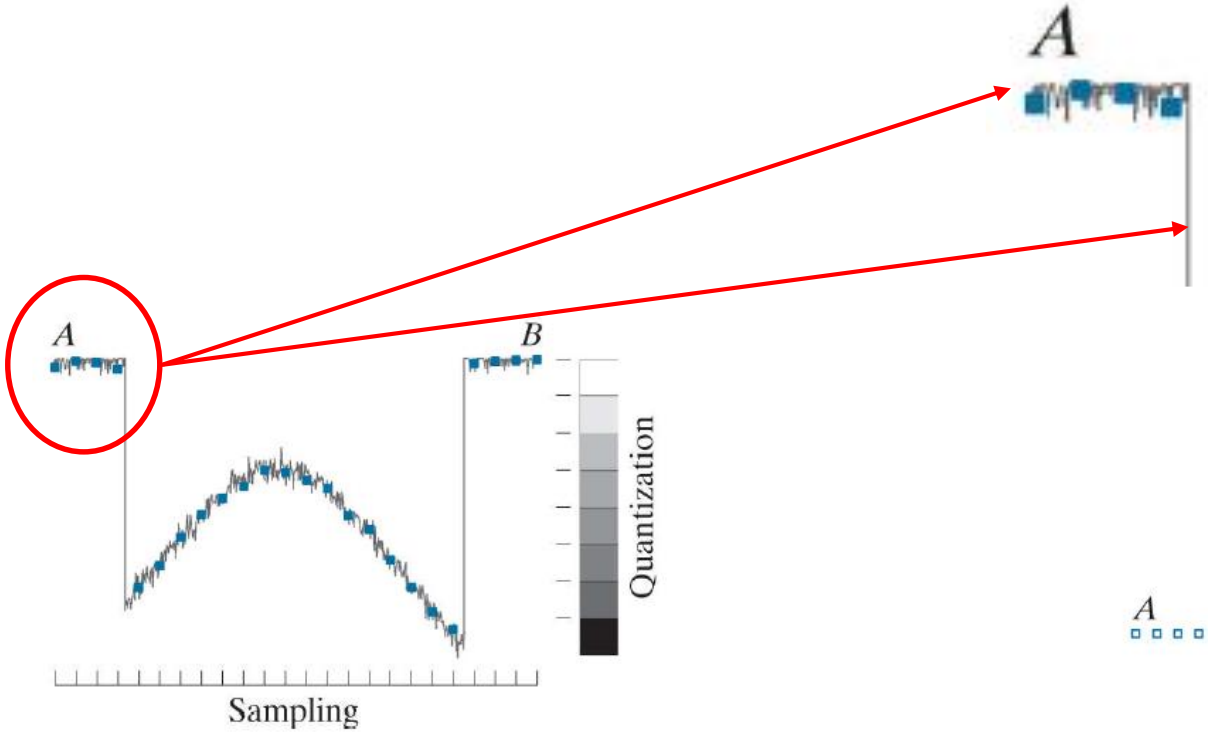
A continuous image



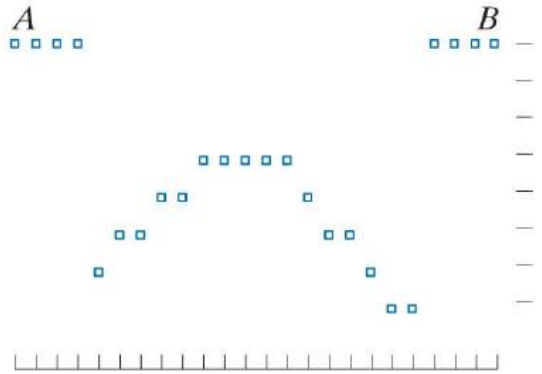
A scan line showing intensity variations along line AB in the continuous image

Digitizing

- Coordinate values –Sampling
- The amplitude - Quantization

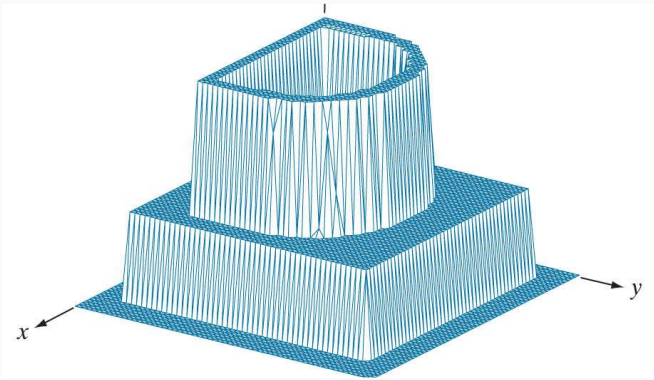


Sampling and quantization.



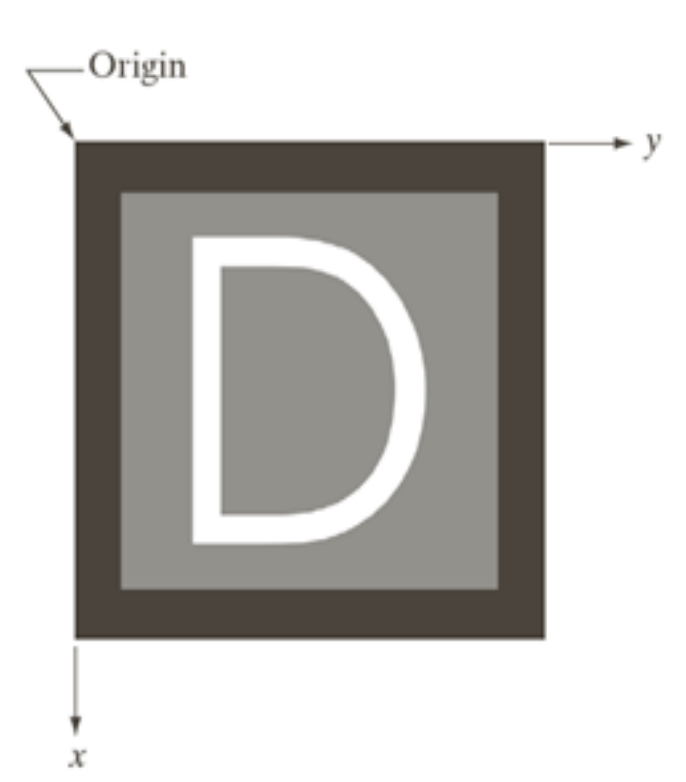
Digital scan line.

Digital image representation



- Surface plot
- As plot/graph with spatial location (x,y) as two axes and third axis being the intensities at that specific spatial coordinates.
- Easily infer the structure,
- For complex images its very difficult to interpret from such plot.

Digital image representation



- Visual Intensity array.
- more common.
- Intensity of each point is proportional to the value of f at that point.
- Eg-only three equally spaced intensity values.
- Normalized to [0,1],values can be either 0, 0.5, 1.
- A monitor /printer converts these values to either black, gray or white respectively.

Digital image representation

- Displaying the numerical values of f(x,y) as a array.
- For large images ,complete array values to be displayed is tedious and nothing much can be inferred from it.
- Only parts of the image are printed as numerical values.

$$f(x,y) = \begin{bmatrix} f(0,0) & f(0,1) & \cdots & f(0,N-1) \\ f(1,0) & f(1,1) & \cdots & f(1,N-1) \\ \vdots & \vdots & & \vdots \\ f(M-1,0) & f(M-1,1) & \cdots & f(M-1,N-1) \end{bmatrix}$$


THANK YOU!