

# Mid Exam

## Digital Image

1. What is a digital image?

A digital image is a discrete representation of data processing both spatial and intensity.

• Discrete ~~discrete~~ separate

• Spatial  $\Rightarrow$  Layout

• Intensity  $\Rightarrow$  color

2. Image  $\Rightarrow$  2D plane  
 $\hookrightarrow$  combination of pixels

3. Pixel  $\Rightarrow$  Combination of pel or picture elements  
 $\hookrightarrow$  Each pixel has some intensity/shade/color

4. Raster  $\Rightarrow$  Image through camera any other devices. (Scanners & digital camera)

5. Vector  $\Rightarrow$  Through computer & Using matrix.

6. Basic color  $\Rightarrow$  RGB  $\Rightarrow$  (Red, Green, Blue)  
Other colors  $\Rightarrow$  CMYK  
 $\hookrightarrow$  Binary color



• CMYK  $\Rightarrow$  Cyan magenta yellow and key.

• Digital Image  $\Rightarrow$  Gray Scale processing

• Binary color  $\rightarrow$  0 & 1 (Black & white)

7. Camera through pixel  
 $\hookrightarrow$  single scalar element or a multiple component representation.

8. Raster;

A finite set of digital value.  
Image  $\hookrightarrow$  pixel position  
or pixel  $\hookrightarrow$  Intensity

9. Digital Image processing

• First  $\Rightarrow$  Digital signal processing

• Now  $\Rightarrow$  Digital image processing

10. Raster file formats;

$\hookrightarrow$  through digital cameras

- Lossless
- 1. TIFF (Tagged Image File Format)
  - 2. GIF (Graphics Interchange Format)
  - 3. BMP (Windows bitmap)
  - 4. JPEG



∴ Mathematically an image is a matrix.

$$\begin{matrix} & \begin{matrix} 1 & 2 & \dots & n \end{matrix} \\ \begin{matrix} 1 \\ \vdots \\ m \end{matrix} & \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix} \end{matrix}$$

∴  $m$  = no of rows  
∴  $n$  = no of columns

Digital image  $I(m, n)$

↓  
name of Image

∴ Raw image format ⇒ <sup>positive</sup> (1) TIFF (Tagged Image File Format)  
(2) JPEG (Joint photographic experts groups) for storage, printing & manipulate.

∴ Raster graphics ⇒

∴ Digital Negative ⇒ is based on TIFF/EP (Electronic photography)  
Graph

⇒ 2 standard formats

(i) TIFF  
(ii) EP ] ⇒ Both are lossless



## Vector:

A vector consists (Both magnitude, or length and a direction).

Types of vector  $\Rightarrow$  EPS (Encapsulated PostScript)

2) PDF (Portable Document Format)

3) AI (Adobe Illustrator Artwork)

## Image viewing: General, web browser slideshow

• PNG (Portable Network Graphics) is a raster, lossless data compression graphics

• SVG (Scalable Vector Graphics) is an Extensible Markup language XML based vector image.

• JPEG  $\Rightarrow$  lossy

• GIF  $\Rightarrow$  lossless  
are W3S format.

• Scientific image very large.

Milky way  $\Rightarrow$  194Gb in size.



## Digital Image Sensors;

↳ MOS technology.

MOS  $\Rightarrow$  Metal - oxide - semiconductor  
Field effect transistor.

- Invention  $\Rightarrow$  Mohammad M. Atalla &  
 $\Rightarrow$  Dowon Kahng  
Bell Labs in 1959

## Digital Image Processing;

Is the use of a digital computer to process digital images through an Algorithm.

- Data can be represent in two types
  1. Analog
  2. Digital

• Distortion  $\Rightarrow$  alteration of the original shape of something

• Noise  $\Rightarrow$  General term for unwanted modifications  
capture, storage, transmission, processing  
or conversion.