Ms. Alisa Chandala (Msc)

Image Processing Test

=> Questions

1. Discuss the significance of sampling and quantization in processing of digital images. (4)

2. Discuss the importance of image pre-process in understanding the digital image data. (4)

3. Justify image analysis and understanding in an useful task for better society building. (4)

4. Discuss the importance of biometric technology considering the current applications (4)

5. Explain Image representation

=> Answer

5.

Image Representation: In computer science, we can represent an image in various forms. Most of the time, it refers to the way that brings information, such as color is coded digitally, and how the image is stored, ie, how an image file is structured.

Several open standards were recommended to create, manipulate, store, and exchange digital images. The rules described the format of image of image file, the algorithms of image encoding, the form of additional information often named as metadata.

A digital image is the composition of individual pixels or picture elements. The pixels are arranged in the form of row and column to form a picture area. The number of pixels in an image is a function of the size of the image and number of pixels per unit length (e.g. inch) in horizontal as well as vertical direction.

Ex: Two Dimensional Representation of an image

one pixel $f(m, y)$
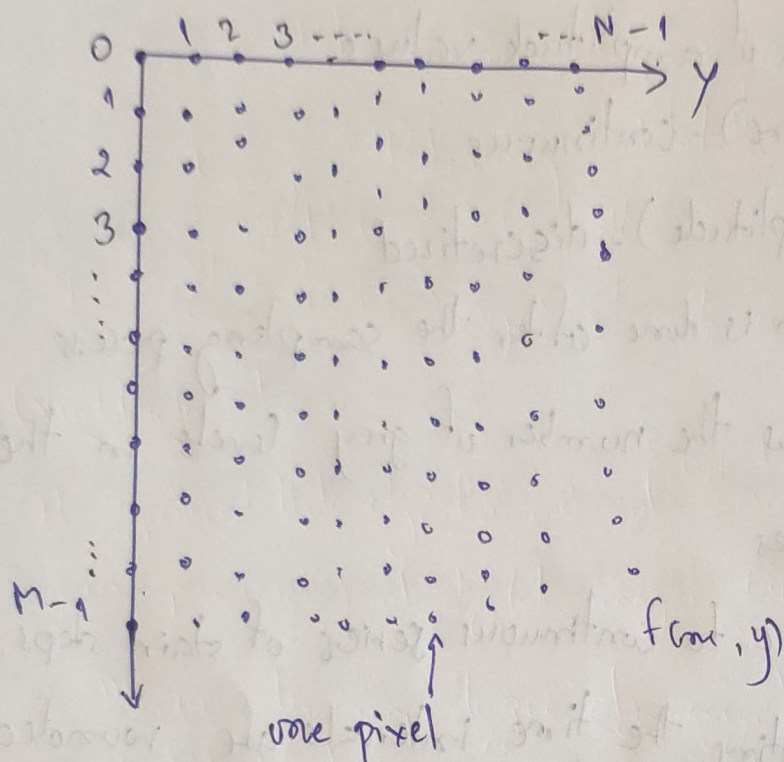
1. The significance of sampling and quantization

* **Sampling**

  - Digitization of co-ordinate values.

  - x-axis (time) – discretized

  - y-axis (amplitude) – continuous

  - Sampling is done prior to the quantization process.

  - It determines the spatial resolution of the digitized images.

  - It reduces c.-c.. to a series of tent poles over a time

  - A single amplitude value is selected from different values of time interval to represent it.

* Quantization

- Digitization of amplitude values.
- x-axis (time) - continuous.
- y-axis (amplitude) - discretized
- Quantization is done after the sampling process
- It determines the number of grey levels in the digitized images
- It reduces c.c. to continuous series of stair steps.
- Values representing the time intervals are rounded off to create a defined set of possible amplitude values.

2. Important of Pre-Processing image

○ Preprocessing is a common name for operations with images at the lowest level of abstraction both input and output are intensity images.

○ The aim of pre-processing is an improvement of the image data that suppresses unwanted distortions or enhances some image features important for further processing.

• Four categories of image pre-processing methods according to the size of the pixel neighborhood that is used for the calculation of a new pixel brightness:

4

- Pixel brightness transformations,
- geometric transformations,
- Pre-processing methods that use a local neighborhood of the processed pixel, and
- image restoration that requires knowledge about the entire image.
- Other classifications of image pre-processing method exist.
- Image pre-processing methods use the considerable redundancy in images.
- If pre-processing aims to correct some degradation in the image, the nature of a priori information is important:
    - Knowledge about the nature of the degradation; only very general properties of the degradation are assumed.
    - Knowledge about the properties of the image acquisition device, and conditions under which the image was obtained. The nature of noise is sometimes known.
    - Knowledge about object that are search for in the image, which may simplify the pre-processing very considerably.

5

4. Biometric technology

Biometric technology can provide a means for uniquely recognizing humans based upon one or more physical or behavioral characteristics and can be used to establish or vertify personal identity of individuals previously enrolled. Example of physical characteristics include face photos, fingerprints, and iris images. An example of behavioral characteristic is an individual's signature.

Used with other authentication technologies, such as tokens, biometric technologies can provide their higher degrees of security than other technologies employed alone. For decades, biometric technologies were used primary in law enforcement applications, and they are still a key component of these important application. Over the past several year, the marketplace for biometrics solutions has widened significantly and today includes public and private sector applications worldwide.

...

3. Image analysis is the extraction of meaningful information from image; mainly from digital images by means of digital image processing techniques. Image analysis tasks can be as simple as reading bar coded tags or as sophisticated as identifying a person from their face.

⇒ Computers are indispensable for the analysis of large amounts of data, for tasks that require complex computation, or for the extraction of quantitative information. on the other hand, the human visual cortex is an excellent image analysis apparatus, especially for extracting higher-level information, and for many applications including medicine, security, and remote sensing human analysts still can not be replaced by computers. For this reason, many important image analysis tools such as edge detectors and neural networks are inspired by human visual perception models.