26/11/2020

1. Discuss the significance of Sampling & quantization in processing of digital images.
2. Discuss the importance of image pre-processing in understanding the digital image data.
3. Justify 'Image analysis & understanding is an useful task for better society building'.
4. Discuss the importance of biometric considering the current applications.
5. Explain 'Image representation'.

1. Sampling & Quantization :-

We define image as a two dimensional intensity function, say $f(x,y)$ where x & y are the co-ordinates representing horizontally & vertically. The value of $f(x,y)$ at any point gives the pixel value at that point of an image. In order to process images, an image function $f(x,y)$ must be digitized both spatially & in amplitude.

A frame Grabber or digitizer is used to sample and quantize the analogue video signal. In order to create digital image, we need to convert continuous data into digital form. This process involves Sampling & Quantization processes.

The Sampling rate governs the spatial resolution of the digitized image, while the quantization level fixes the number of grey levels in the digitized image.

A magnitude of the sampled image is expressed as a digital value in image processing.

The changeover between continuous values of the image function & its digital equivalent is called Quantization. The number of

Quantization levels should be high enough for human perception of fine shading details in the image.

2. The digital image processing deals with developing a digital system that performs operations on a digital image. It involves Image understanding, Image analysis & computer vision which are aim to imitate the process of human vision electronically. The fundamental steps in digital image processing include image acquisition, pre-processing, segmentation, representation & description, recognition & interpretation.

Image Pre-processing involves operations on images at the lowest level of abstraction where both input and output images are intensity images. The aim of pre-processing is an improvement of the image data that eliminates distortions or enhances some images features suitable for further processing. Image enhancement is the most appealing pre-processing technique. The idea behind enhancement technique is to bring out detail that is obscured, or simply to highlight certain features of interest in an image such as, changing brightness & contrast etc.

3. The Usefulness of this Image Processing technology is seeming in many different fields covering medicine through remote sensing. The advances & wide availability of image processing hardware has further enhanced the usefulness of Image processing. Some of the fields in which digital image processing is widely used are:

→ Banking : Tasks included are → Doument verification, Person authentication, Bankers check analysis.

If we consider the importance of image processing in processing bank checks we can understand how these tasks are achieved efficiently.

The check is subjected to segmentation & subsequently subjected to automated cheque analysis for its understanding & hence validating the cheque.

→ Agriculture : The Role of Image Processing for weed detection & removed and also Image processing based system is developed to classify the fruits based on the texture properties

⇒ Autonomous Vehicle : The Role of Computer Vision in general & image processing in particular in designing an autonomous vehicle development process.

⇒ Forensic Application : Using suitable pre-processing techniques, it is possible to extract the hidden information in an image which is commonly used in forensic applications.

4- Biometrics :-

It is common to have physical & behavioral characteristics to authenticate a person. There are several sectors which adopt biometric based person authentication for secure Transactions, airport entry etc. The kind of biometrics varies from face, signature, palm-print, ear to speech & many more.

Biometrics → Authentication of a person.
→ Banking
→ Airport
→ Electronic voting
→ Defense sectors
→ Secured transactions

The most common Biometrics are
→ Fingerprint
→ Face
→ Iris
→ Voice
→ Handshape
→ 3D face
→ Retina
→ Palmprint
→ Signature
→ Ear shape
→ IR Hand
→ Dental Radiograph
→ Multibiometrics
→ IR Face

5. Image Representation

Basic steps in digital Image processing include image acquisition, pre-processing, segmentation, representation & description, Recognition & Interpretation

Image Representation: Selecting a good Representation is only part of the solution for (n/p) transforming image data into a form suitable for succeeding processing. Description also called feature extraction that deals with extracting attributes that result in some quantitative

information of interest & are basic for discriminating one class of objects from another. The feature extraction techniques are devised to extract features of an image. The feature extraction technique extracts high-level features needed in order to perform classification of objects under observation. Features are those items which uniquely describe an object such as its size, shape, composition, location etc. Measurable quantities of object features allow descriptions & classification of the image.