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II Msc (Computer Science)

Image Processing

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classmate

Date

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

1) In order to become suitable for digital processing an image function $f(x, y)$ must be digitized both spatially and in amplitude. Typically a frame grabber or digitizer is used to sample and quantize the analogue video signal. Hence in order to create an image which is digital, we need to convert continuous data into digital form. There are two steps in which it is done:

- Sampling

- Quantization

The sampling rate determines the spatial resolution of the digitized image, while the quantization level determines 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 transition between continuous values of the image function and its digital equivalent is called quantization.

The number of quantization levels should

should be high enough for human perception of fine shading details in the image. The occurrence of false contours is the main problem in image which has been quantized with insufficient brightness levels.

2) 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, the elimination of distortions or enhances some image features suitable for further processing. Image enhancement is the most appealing pre-processing technique. Basically, the idea behind enhancement techniques 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) Image analysis is the extraction of meaningful information from images; 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 cannot 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.

- 4) It is common to have physical and 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 and 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
- Earshape

- IR hand
- Dental Radiograph
- Multibiometrics
- IR face

5) Image Representation:

Selecting a good representation is only part of the solution for transforming image data into form suitable for succeeding processing. Description also called feature extraction that deals with extracting attributes that result in some quantitative information of interest and are basic for discriminating one class of object from another. 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 description and classification of the image.