

18

Define DIP (Digital Image processing)

Ans:- An image may be defined as a 2 Dimensional function $f(x, y)$ where x, y are coordinates and the amplitude of f at any pair of coordinates is called as intensity or grey level of the image at that point.

where x, y and f are all finite, discrete quantities known as digital image.

- A digital image is composed of a finite number of elements each have particular location & value. These elements are called picture elements, image elements, pixel pixels.
- Pixel is the term used to denote the element of digital image.
- There are 3 types of Computerized processes
 - (i) low level
 - (ii) mid level
 - (iii) high level

- A low level process is characterized by the fact that both its inputs and outputs are images.
- A mid level processing of images involves tasks such as Segmentation, description and classification. Mid level input are images but output are attributes extracted from those images.
- Higher level processing involves "making sense" of an ensemble of recognized objects as image is analysis, performing the cognitive function associated with human vision.

Q8 Mention or Describe the field that uses DIP with examples.

Ans: (i) Gamma Ray Imaging: Major uses of imaging based on gamma rays includes nuclear medicine and astronomical observations.

In nuclear medicine the approach

radioactive isotope that emits gamma rays as it decays. Images are produced by the emission of gamma rays detectors. With the help of gamma ray image shows tumor in the brain and other lung lumps.

(ii) X-Ray imaging :- X-rays are among the best sources of EM radiations used for imaging. The best known use of X-rays is medical diagnostics, astronomy. Contains X-ray tubes which is a vacuum tube with a cathode & anode. In digital radiography digital image are obtained by two methods.

- ① By digitizing X-ray films
- ② By having the X-ray that passes through the patient fall directly onto device that convert X-rays to light

(iii) Imaging in the Ultraviolet Band:- They include lithography, industrial inspection microscopy, lasers, biological imaging and astronomical observation.

Ultraviolet light is used in fluorescence microscopy one of the fastest growing areas of microscopy.

Fluorescence microscopy is an excellent method for studying material that can be made to fluoresce either in natural form or when treated with chemicals capable of fluorescing e.g.: normal corn, corn infected by smut, cygnus doop.

(iv) Imaging in the visible & infrared band:

The infrared band often used in conjunction with visual imaging. They are used in light microscopy, astronomy, remote sensing, industry and law enforcement.

Another major area of visual processing is remote sensing. The primary function of LANDSAT is to obtain

and transmit images of the Earth from space for purposes of monitoring environmental condition of the planet.

(v) Imaging in the microwave band:

The unique feature of imaging radar is its ability to collect data over virtually any region at any time, regardless of weather or ambient lighting conditions.

An imaging radar works like a flash camera in that it provides its own illumination.

To illuminate an area on the ground and take a snapshot image. Eg: Packaged pills, bottles, air bubbles in clear plastic product, cereal etc.

(vi) Imaging in Radio Band:

The major applications in the radio band are medicine and astronomy. In medicine radio waves are used in magnetic resonance imaging (MRI).

the location from which these signals originate and their strength are determined by a computer which produces a 2D. image of patient. Show MRI image of human knee, spine etc.

38. Describe the fundamental steps in DIP.

Ans:- Image acquisition is the first step. Acquisition could be simple as being given an image that is already in digital form.

Image enhancement is the process of manipulating an image so the result is more suitable than the original for a specific application. The word specific is important here because it establishes at the outset that enhancement techniques are problem oriented.

When an image is processed for visual interpretation the viewer is the ultimate judge of how well a particular method works. Enhancement.

techniques are so very varied & use so many different image processing approaches, that it is difficult to assemble a meaningful body of techniques suitable for enhancement without background development.

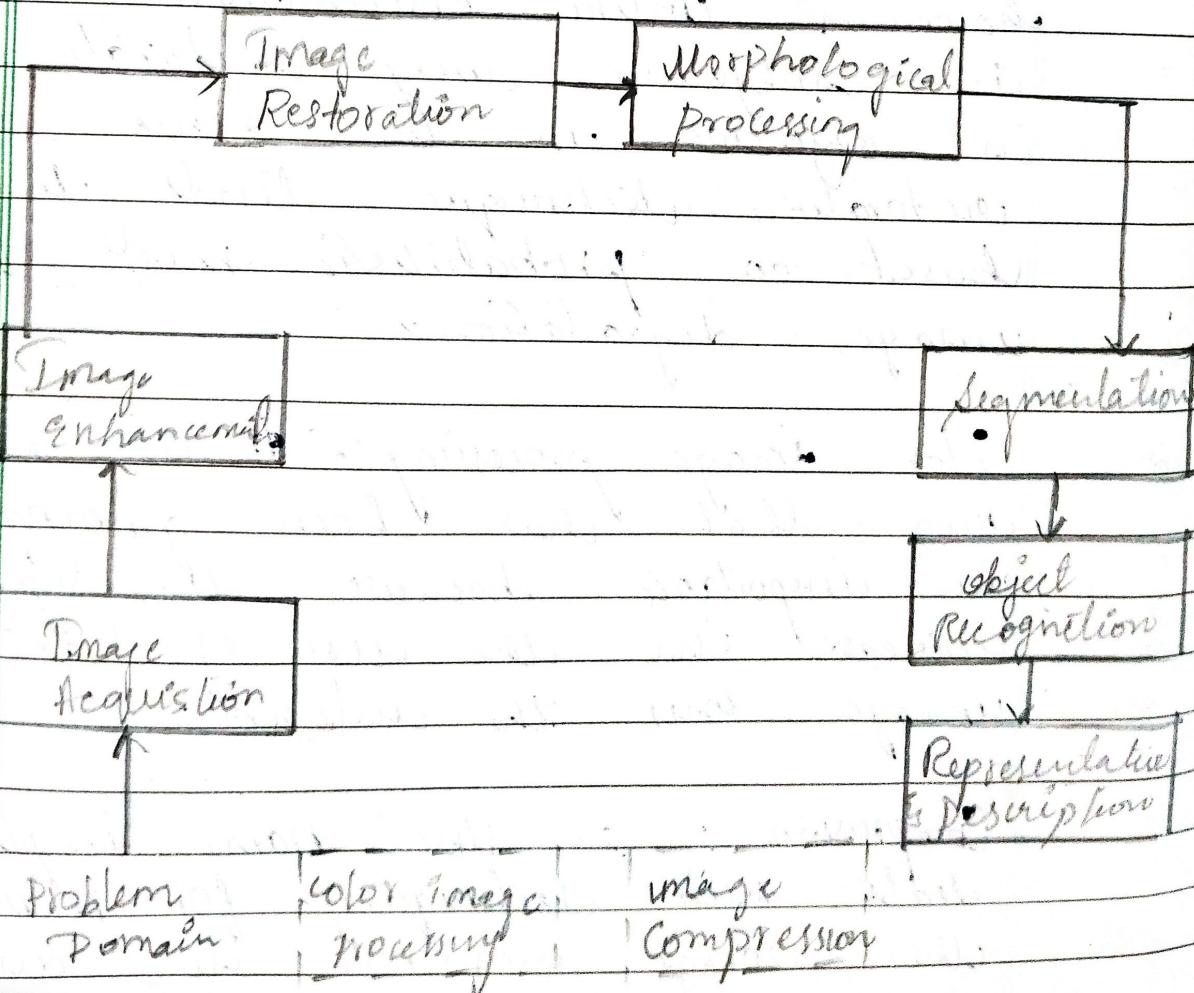
Image Restoration: It is an area that also deals with improving the appearance of the image however unlike enhancement which is subjective image restoration is objective in the sense that restoration technique tends to be based on probabilistic mode of image degradation.

Color image processing: It is an area that has been gaining in importance because the significant increase in the use of digital image over the internet.

Compression: as the name implies deals with techniques for reducing the storage required to save an image or the bandwidth required to transmit it.

Although storage technology has improved significantly over the past decade the same cannot be said for transmission capacity.

Morphological processing deals with tools for extracting image components that are useful in the representation and description of shape.



Segmentation: partitions an image into its constituent parts or object. In general autonomous segmentation is done which is one of the most difficult tasks in digital image processing.

feature extraction:- It always follows the output of a segmentation stage which usually is a raw pixel data which either contains boundary of a region of pixels separating one image region from another or all points in the region itself. Feature extraction consists of feature detection & feature description.

Image pattern classification:- It is the process that assigns a label to an object based on its feature description.