Supreetha.K
MSC computer
science

1. Discuss the significance of sampling and quantization in processing digital image(4)
2. Discuss the importance of image preprocessing in understanding the digital Image datata(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 application(4)
5. Explain Image representation.

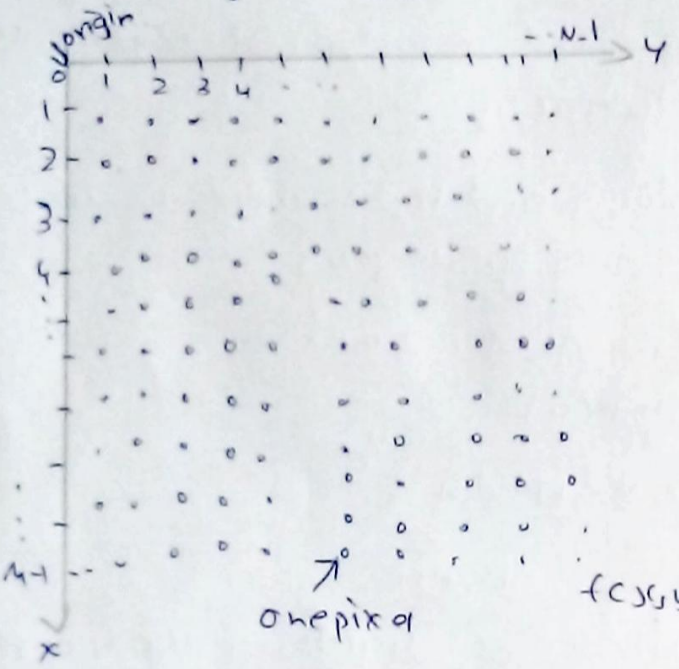
Answers

(1) Sampling is the process of digitizing the coordinate value of image and quantization is the process of digitizing the amplitude value. Hence in order to create digital image, we need to convert continous data into digital form. This process involves sampling and Quantization processes.

The sampling rate govers 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 continous values of the image function and 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

For example, the below figure explains the coordinate conventions used in a digital image processing text books to represent digital images



2-D Representation of an Image

The representation of digital image using array data structure is shown here. We can notice here the reason to perform sampling and quantization processes on a given analog image to digital image. In order to perform operations on an analog signal with a digital computer, you have to store that analog signal in the computer. And in order to store an analog signal, infinite memory is required to store it. Here we convert that signal into digital format and then store it in computer and then performs operations on it

3. In order to justify this statement we need to tell about application of DI. The field of digital image processing has seen continuous and significant expansion in recent years. The usefulness of this technology is seeming in many different fields covering medicine through remote sensing. The advances and wide availability of image processing hardware has further enhanced the usefulness of image processing. Some of the major fields in which digital image processing is widely used are mentioned below

① Agriculture
② Augmented reality
③ Autonomous vehicles
④ Biometrics
⑤ Character recognition
⑥ Forensics
⑦ Face recognition
⑧ Medical image analysis
⑨ Image restoration
⑩ Gesture analysis
⑪ Robotic
⑫ Remote sensing
⑬ process control
⑭ pollution monitoring
⑮ Security and surveillance
⑯ Medical field
⑰ Pattern recognition
⑱ Video processing
⑲ Color processing

Here is some of the application which justify the statement Image analysis and understanding is an useful task for better society building. Let us explain application which helps society building

Remote Sensing

It is useful when we are not made any physical contact but we can get information about it i.e It is the acquisition of information about an objector phenomenon without making physical contact with the object. Remote sensing based technology has been explored extensively to perform various operation for better forming. It is used in farming for rice yield Estimation.

Security and Surveillance

Surveillance cameras are installed by the millions countries, and are monitored by automated computer programs instead of humans and in sense of Security we can used fingerprint. By these application we can detect the robery and also we can protect the data by fingerprint

4. Biometric technology play a major role in our society. Every fields in our society uses this technology. Biometric is used for authentication of a person in various areas such as Banking, airport, electronic voting, and secured transcation. Biometric includes fingerprint, face, iris, voice, Retina, signature, palmprint etc for authentication of a person. Basically it scans

the fingerprint, iris etc to identify the person. how-a days the famous companies like wipro, infosys etc uses this Biometric to identify the staff of their and etc.. the image of user's biometric is stored into the biometric system. The system is programmed to manipulate the image using equations and then store the results of the each pixel. For example, in voting system we use our fingerprint to cast our vote such that the voter machine identify our fingerprint and cast our vote for which we voted and another example, consider the hospital where staff of them want to enter their biometric by fingerprint while they join the duty and also while returning they need to logout. the details of login and logout of staff are automatically stored there.

2 Digital image processing or image pre-processing is a multidisciplinary science that makes us to employ the principles from various field such as artificial intelligence, Robotics etc. and image processing is a procedure of converting an image into digital form and carry out some operation on it.

Digital image processing is better than any other information form for human being to perceive. Digital image processing is used to improve the visual quality of an image for human interpretation. we need to process digital images for quality enhancement which means improvement of image

information for human interpretation. This process helps in designing an accurate digital image processing system. The digital Image processing involves

1. Image understanding
2. Image analysis
3. Computer vision etc

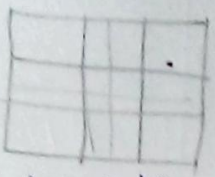
which is used to imitate the process of human vision electronically. The fundamental steps in digital Image processing include image acquisition, pre-processing, segmentation, representation and description and recognition and interpretation.

---

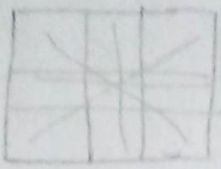
5. Image representation of the image can take many forms. It refers to the way of information about image such as color, is coded digitally and how the Image is stored and also they describe the format of image files, the algorithms of the image encoding etc.. Selecting a good representation is only part of the solution for transforming image data into a form suitable for subsedding processing. Image can also be represented as pixels.
we are classified pixels into different categories

1. Neighbourhoods
2. Adjacency

Neighbourhoods

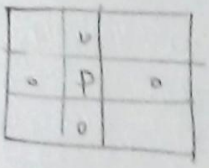


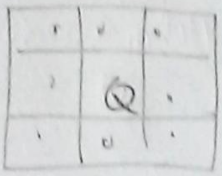
4 neighbour



8-neighbour

Adjacency





They are two pixels P an Q are 4-adjacent and 8-adjacent.

- If they are 4 neighbours of one another, then they are 4 adjacent
- If they are 8 neighbours of one another, then they are 8 adjacent