

(1)

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Q.1:

Ans: Features of pre-processing digital image:

- It is designed to produce artifact-free digital image.
- pre-processing of digital image is largely automatic.
- preprocessing provide electronic calibration to reduce pixel-to-pixel, row-to-row and column to column response differences.
- the processes of lag correction, and noise correction are automatically applied with most systems.
- Digital image receptor generates an electronic latent image that may be visible, what remain is image lag. offset voltage corrects the image lag while switching from high dose to low-dose.
- By pre-processing the line noise which effect the output quality of image are resolved by applying voltage to row or column of pixel in dark.

Post-processing radiographic digital images

- It is performed to optimize the appearance of the image for the purpose of better detecting pathology.
- Digital image shines in post-processing.
- It requires operator manipulation.
- Useful post-processing functions are:

- (1) Annotation: Annotation allow you to label the output image.
- (2) Image Inversion: By this feature you can invert the white into black and black into white.
- (3) Pixel Shift: Mis-registration can occur when the patient moves during image acquisition, which can be corrected by re-registration of pixels.
- (4) EDGE-Enhancement: It is important for high, small contrast tissues, and also fractures visualization.
- (5) Subtraction: Enhancing the image quality by amplifying the change in anatomy.
- (6) Highlighting: for non-focal disease and diffuse areas identification.

(3)

Q: 2:3

Ans:3

Spatial resolution: It is the ability of an imaging system to differentiate between two near by objects.

- In digital imaging it depends on the size of the pixel used.
- A large pixel size will be unable to resolve two near-by structures as compared to a small pixel size.
- Spatial resolution is measured in line-pairs per millimeters.
- Higher spatial frequency indicates better spatial resolution.
- Spatial resolution in digital imaging is limited by pixel size.

(4)

- Contrast resolution: It is ability of an imaging system to distinguish between multiple densities in the radiographic image.
- The inherent contrast resolution of digital image is given by the number of possible pixel values, and is defined as the number of bits per value.
- An 8-bit system can show only 256 gray values as opposed to a 12-bit system, which shows 4096 gray values.

Q: 3:

Ans: Dose reduction in digital radiography:

- High kVp lower the patient radiation dose.
- Exposure should not be repeated, if you repeat patient will get high radiation dose.
- Technique creep are used instead with each of the various digital imaging system, this result reduce patient radiation dose.
- Blanced voltage and lower current in x-ray tube ~~can~~ may reduced patient dose.
- high kVp and low mAs ~~results in~~ lead to constant spatial resolution adequate contrast resolution and reduce patient radiation dose.

Q.4.3
Ans.3

feature of an active matrix liquid crystal display:

- Active matrix liquid crystal display are superior to CRT display.
- AMOLED are fashioned pixel by pixel.
- it has very intense white backlight that illuminates each pixel.
- Spatial resolution improves with the use of higher megapixel digital display devices.
- Aperture ration is a measure of image luminance of AMOLED's.
- It have better grayscale definition than cathode ray tubes.
- AMOLEDs are not limited by veiling glare or reflections in the glass faceplate thus, better resolution is attained.
- Intrinsic noise of an AMOLED is less than that of a CRT this also results in better contrast resolution.
- AMOLED are designed to better reduce the influence of ambient light on image contrast.

Q.5.3
Ans.3

Application of picture archiving and communication system

→ PACS system are a medical imaging technology which provides economical storage, retrieval, management, distribution of medical images.

PACS have four main applications:

★ Hard copy replacement. PACS replaces hard copy based means of managing medical images, such as film archives. Low price of digital storage, they provide a growing cost and space advantage over film archives in addition to the instant access to prior images at same institution.

★ Remote access: It enables practitioners in different physical location to access the same information simultaneously for teleradiology.

★ Electronic image integration platform:

It provides the electronic platform for radiology images interfacing with other medical automation system.

★ Radiology workflow management PACS

(7)

is used by radiology personnel to manage the workflow of patient exams.

The use of PACS system is beneficial to the diagnostician, the referring physician, the patient, as well as the hospital. These

~~benefits~~ ~~might~~
Benefits to patient:

- Reduced radiation exposure.
- Shorter examination times
- Reduced radiation exposure as a result of less need for retakes of images
- Reduced chance of adverse reaction to contrast agents

Q:6:

Types of digital radiographic artifacts:

- (1) Image receptor artifacts.
- (2) Software artifacts.
- (3) Object artifacts.

(1) Image receptor artifacts:

Digital image receptor can suffer from rough handling, scratches and dust.

- * Dust or dirt: usually removed easily by cleaning by technologist.
- Scratches: appear as an image of

(8)

Lucency (black appearance)
Improper set

Pixel malfunctions

Scratches of malfunctions of individual pixels is possible and cause artifact.

Ghost images

- Occur because of incomplete erasure of a previous image
- Image plate should be erased after each exposure automatically

(2) Software Artifacts

Preprocessing: the step before for preprocess.

- Interpolation would be used for preprocessing in case of defective pixels
- Flat fielding is used to equalize the response of each pixel to a uniform x-ray beam

Histogram: is a graph of the frequency of digital values

- The y axis is the number or amount.
- The x axis is the digital value
- The shape of the histogram part
- Done preprocessing

- Selection of the wrong histogram will result in image represented wrong.

3) Object artifacts

It can arise from the technologist's error in patient positioning, X-ray beam collimation and histogram selection.

Positioning object artifacts

- body part should to the IR
- Image should be aligned to the image plate

Q.7

Ans.

Data compression the process of squeezing digital content into a smaller electronic space.

- used to reduce the number of bytes required to store certain kinds of data and used to permit faster transmission of data between computers.

Bit each 1 or 0 that the computer reads

Binary system only has two values

Difference between lossless and lossy compression:

The major difference between lossy and lossless compression is that lossy compression produce a close match of the data after decompression where as lossless creates exact original data.

→ Lossy compression have more data holding capacity of the channel while lossless have less as compared to lossy method.

Lossy compression are used in images audio and video.

Lossless compression are used in text or program, images and sound.

Q:8
Ans:

Difference between "for-processing" and "for-presentation" images.

→ For-processing images are used for CAD purposes and any other processing needing to be done.

→ "for-presentation" images are what the radiologist reads and cannot

(10)

be unprocessed back to "for-processing".

The for processing image should be saved if radiologists wants to go back and re-process image.

Q. 9

Ans: Image artifact because of improper collimation and partition.

If the x-ray exposure field is not properly collimated, sized and positioned errors may occur

⇒ Histogram analysis error can occur

⇒ The result is very dark or very light or very noisy images.

⇒ Collimation is important for radiation dose reduction and for improved image contrast.

⇒ If improperly collimated the histogram can be improperly analyzed resulting in an artifact.

(11)

Improper Alignment:

- ⇒ Alignment of the exposure field on the IP is important in the same way and for the same reason as collimation.
- ⇒ When an image field is not oriented with the size and dimensions of the IP, image artifacts occur.
- ⇒ Improperly collimated multiple fields not aligned with the imaging plate edge result in overexposure and the artifact seen.