4th Semester

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SUBJECT : CR and DR

Q:1:

Discuss the features of an active matrix liquid crystal display?

LIQUID CRYSTAL DISPLAY :

Matter takes the form of gas, liquid or solid. A liquid crystal is a material state between that of a liquid and a solid.

A liquid crystal has the properly of a highly ordered molecular structure - a crystal and the property of viscosity a fluid. Liquid crystal materials are linear organic molecules that are electrically charged, forming a natural molecular

dipole. The liquid crystals can be aligned through the action of an external electric field.
AMLCDs are superior to CRT displays.
Allow very high resolution
Each sub-pixel is individually controlled by an isolated thin-film transistor. (TFT).
It allows the electrical signal for each sub-pixel to avoid influencing adjacent elements.
The TFT is patterned into the glass layer.
An active matrix liquid crystal display is a type of flat panel display, the only viable technology for high resolution. TVs, computer monitors, notebook computer, tablet computer and smartphones with an LCD screen, due to low weight, very good image quality.

Q:2 Identify application of the picture archiving and communication system?

PICTURE ARCHIVING AND COMMUNICATION SYSTEM:

Radiology has adopted digital imaging very rapidly. Estimates of the present level of digitally acquired image range up to 95%

The digital images comes from every area of medical imaging, including nuclear medicine, diagnostic ultrasonography, radiography, fluroscopy, CT and MRI.

A picture archiving and communication system (PACS), when fully implemented, allows not only the acquistion but also the interpretation and storage of each medical image in digital form without

resorting to film (hard copy) The projected efficiencies of time and cost are enormous.

PACS improves image interpretion, processing, viewing, storage and recall.

The four principal component of a PACS are the image acquisition system, the display system, the network and the storage system. A PACS is the design for integrating medical images into the health care environment. Among other characteristic, the film file room is replaced by electronic memory devices the size of a box.

Q : 3

Discuss the three types of digital radiographic imaging artifacts and how to avoid them ?

RADIOGRAPHIC IMAGING ARTIFACTS :

When digital radiographic images are printed, processing artifacts may have to be considered, as they are with screen film radiographic images. The three digital imaging artifacts are as follows :

1. Image receptor artifacts
2. Software Artifacts
3. Object Artifacts

• IMAGE RECEPTOR ARTIFACTS:

- Dust, dirt scratches
- Pixel malfunction
- Ghost images

- **SOFTWARE ARTIFACTS:**
  - Histograms
  - Rang or scaling
  - Image compression
- **OBJECT ARTIFACTS:**
  - Patient positioning
  - Collimator or partition
  - Backscatter.

HOW TO AVOID THEM?

- **IMAGE RECEPTOR ARTIFACTS:**

Screen-film image receptors, digital image receptor. can suffer from rough handling, scratches and dust. Artifacts produced by dust can be corrected easily with proper cleaning unless the dirt is internal to the optics of a computed radiography (CR) imaging system. Scratches

or a substantial malfunction of pixels likely will require replacement of the image receptor. Appearance of the ghost image occure because of incomplete erasure of a previous image on a CR IP. Such artifacts can be corrected by additional signal erasure technology. Rough handling or faulty construction of a digital IP can result in artifacts

OBJECT ARTIFACTS :

Object artifacts can arise from the technologist's errors in patient positioning, Backscatter radiation also can be troublesome because of the sensitivity of the digital radiographic image receptor. If the x-ray exposure field is not properly collimated, sized, and positioned, exposure field recognition error may occur.

SOFTWARE ARTIFACTS:

Properly collimation and centering prevent histogram errors that can lead to artifacts.

Q: 4

Discuss the characteristics of digital imaging that should result in lower patient radiation doses?

DOSE REDUCTION WITH DIGITAL RADIOGRAPHY:

Exposures should not be repeated in digital radiography (DR) because of brightness or contrast concerns.

DR systems cannot compensate for excessive noise caused by quantum mottle.

Overexposed images do not have to be repeated and should not become a habit

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Q: 5

Describe the features of preprocessing and postprocessing?

PREPROCESSING:

A principal advantage of digital radiographic imaging over screen-film radiographic imaging is the ability to manipulate the image before and after display preprocessing and postprocessing. Preimage processing and postimage processing alter image appearance, usually for the purpose of improving image contrast.

Preprocessing of digital images is largely automatic.

POST-PROCESSING:

Postprocessing is where digital imaging shines. In contrast to preprocessing, which is largely automatic, post-Processing requires intervention by the radiologic technologist and the radiologist. Post processing refers to anything that can be done to a digital radiographic image after it is acquired by the imaging system.

Postprocessing of digital images requires operator manipulation.

Postprocessing of the digital radiographic image is performed to optimize the appearance of the image for the

purpose of better detecting pathology.
A principal advantage of digital imaging is - the ability to preprocess and post-process the image for the purpose of extracting even more information.
With screen-film radiographic images, what you see is what you get, one can not extract more information that is visible in the image.
Post-processing allows visualization of all shades of grey.

Q: 6

Distinguish between spatial resolution and contrast resolution?

Answer :

Contrast Resolution	Spatial Resolution
Contrast resolution is the ability to distinguish many shades of gray from black to white.	Spatial resolution is the ability of an imaging system to resolve and render on the image a small high contrast object.
The contrast of an image is affected by the properties of the receptor used to form the image.	Spatial resolution loses occur because of blurring caused by geometric factor The more blurring, the lower is the resolution

The principle descriptor for contrast resolution is grayscale, also called dynamic range

The dynamic range of digital imaging system is identified by the bit capacity of each pixel

Spatial resolution is described by the quantity "spatial frequency"

Spatial resolution is expressed in line pair per millimeter (lp/mm)

Q:7

Describe the basis for data compression?

DATA COMPRESSION:

Data compression, source coding, or bit-rate reduction is the process of encoding information using fewer bits than the original representation. Data compression is the process of modifying, encoding or converting the bits structure of data in such a way that it consumes less space on disk. It enables reducing the storage size of one or more data instances or element. Data compression is also known as source coding or bit rate reduction.

TYPES :

There are two types of compression
- lossless
- lossy.

DIFFERENCES B/W LOSSY AND LOSSLESS COMPRESSION

LOSSLESS COMPRESSION	LOSSY COMPRESSION
Lossless compression does not eliminate the data which is not noticeable.	Lossy compression is the method which eliminate the data which is not noticeable.
A file can be restored in its original form.	A file does not restore or rebuilt in its original form

Q: 8

Explain how digital radiography image artifacts occur because of improper collimation portion or alignment?

ANSWER:

In exposure field is not properly collimated size and positioned exposure field recognition errors may occer. These can lead to histogram analysis errors because signal outside to exposure field is included in the histogram. The result is very dark or very light or very noisy images.

Automatic radiation field recognition is essential for artifact-free images.

Digital radiographic IPs now are available in the standard sizes. The image receptor is history, it has been replaced by an image

receptor.
Collimation of the projected area x-ray beam is important for patient radiation dose reduction and for improved image constant screen-film radiography.
In DR, proper collimation has added value of defining the image histogram. If be improperly collimated, the histogram can be improperly analyzed; resulting in an artifact.
Digital image receptors normally can recognize even number. x-ray exposure fields that are centered and clearly collimated.
If images are not collimated and centered, image receptor exposure will not be accurate and can not be used for image quality evaluation.

Q: 9

Identify the difference b/w for processing images and for presenting?

ANSWER

The images are ready "for processing" For-processing images are manipulated into "for presentation" images that the radiologic technologist can use for QC and for interpretation by the radiologist. Before an image is prepared "for processing" several manipulating of the output of an image receptor may be necessary to correct for potential artifacts. Such artifacts can occur because of dead pixels or dead rows or column

of pixels.

A single pixel or a single row or column normally will not interfere with diagnosis. Many of these defects must be corrected. Correction algorithms specific to each type of digital image receptor use interpolation techniques to assign digital values to each dead pixel, row or column.