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Q1:- Describe the features of preprocessing and postprocessing.

Ans:- Preprocessing:-

A principal advantages of digital radiographic imaging over screen film radiographic imaging is to ability to manupulate to image before and after display preprocessing and post processing respectively. preimage processing and postimage processing alter image apeea appearence, usually for the purpose of improving image contrast.

preprocessing of digital image is largely automatic.

~~preprocessing action are outlined~~

preprocessing is design to produce artifact free digital imago.

It provide electronic calibration to reduce pixel-to-pixel row-to row and column to column response differenc Pixel interpoladion, lag correction, and noise correction and automa Applied with mast systems.

Offset images and gain images:-

- Automatically calibration image design to make the response of the image receptor uniform.
- Gain images are generated every few months, and offset images are generated many times each day.

Flatfielding:

- Preprocessing calibration techniques are identified as flatfielding.
- Averaging techniques also are used to reduce noise and improve contrast.

Signal interpolation:

- Digital IR and display devices have million of pixel.
- Such defects are corrected by signal interpolation.
- The response of pixels surrounding the defective pixel is averaged, and that value is assigned to the defective pixel.

- Digital IR are display devices have million of pixel
- Therefore it is responsible for to expect some individual pixel to be defective and to respond

differently are not at all.

Image lag:

Each type of digital IR generates an electronic latent image ~~receptor generates~~ that may not be made visible completly. What remain in image lag. and this can be troublesome when one is switching from high dose to low dose techiniques.

offset voltage:

A switching from digital subtraction angiography (DSA) to flurascopy. The solution is application of an offset voltage before the next image is required.

line noise:

Some voltage variations may be seen along the buses that drive each pixel. This defect called line noise.

It can cause linear artifacts to appear on the final image. The solution is to apply a voltage correction from a row or a column of pixels in a dark unirradiated area of the ima receptor.

Post processing:-

- Where digital imaging shines.
- The contrast to pre processing which is largely automatic post processing required intervation 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.
- post processing of digital imaging required operator manipulation.
- Post processing of digital radiographic image perform to optimize the appearance of the image for the better detecting purpose of pathalogy.

Annotation:-

It is the process of adding text to an image.

- In addition to patient and identification annotation is often helpful in informing the clinician about anatomy and diagnosis.

Window and level adjustment:-

The radiologic technologist can make all 65,336 shades of gray visible.
- This amplification of image contrast may be the most important feature of digital radiographic image

Magnification:-

The larger matrix size digital display devices have better spatial resolution because they have smaller pixels.
- Magnification of a region of an image to render the smallest detail visible.
- Magnification in digital imaging is smallest detail visible.
- Magnification in digital imaging is similar to using a magnifying glass with a film image.

Image flip:-

At times multiple digital image must be flipped horizontal and vertically. process know as Image flip.
It is used to bring into standard viewing order.

Image inversion:-

- Some time pathology can be more visible with image inversion.
- which result in black appearance of soft tissue.

- Image subtraction as used in DSA.
- Subtraction of digital radiographic image obtained months apart temporal subtraction. is used to amplify changes in anatomy or disease.
  The purpose of image subtraction is used to enhance contrast.

Pixel shift:-

Misregistration of a subtraction image occurs when the patient moves during serieal image acquisition. This can be corrected by reregistering the image through a techinque called pixel shift.

Region of interest:-

Greater use is being made of quantative imaging that is use of the numeric value of pixels to help in diagnosis. This required identifing a region of interest. (ROI) and computing the mean pixel value for (ROI)

Edge enhancement:-

Is effective for fracture and small high contrast tissue.

Highlighting:-

It can be effective in identifying diffused, nofocal disease.

pan, scroll:-

- Zoom allow for careful visualization of precise regions of an image.

Q8:- Distinguished between spatial and contrast resolution:

Spatial resolution	Contrast resolution.
(1) It is the ability of imaging system to resolve and reveler on the image a small high-contrast object.	The ability to distiguish may shades of grey from black and white & All digital imaging system have better contras. resolution then screen film imaging.
= Image resolution described by the Quantity of Spatial frequency. 10%	- It prsented in digital Imaging regardless of dose.
= Screen-film radiography is determined principally by focal spot size.	- limited by noise.
- Image detail is determined by system MTF	
= singl scree & smaller focal spot	

(9)

Q3:- Discus Characteristic of digital imaging that should result in lower patient radiation dose.

patient radiation dose:

With Accelaration

to all digital imaging we have three opurtunity to reduce patient dose 20% to 50%.

Depending on examination

= However quite the opposite often has occured some thing that many does deep creep.

- By not changing factor between and lateral view when taken consectively As a result possible in increase patient radiation does.
- patient radiation does reduction should possible by DQE.
- Reduction of does by exposure not repeated.

It also contral of KVP and mAs.

Radiation does decrease image quality will decrease

Q4:- Discus feacture of an active matrix Liquid crystal display:

- LCD is a materiel state between of a liquid and a solid.
- LCDs are superior to CRT displays.
- LCD has the property of a highly ordered molecular structure a crystal and the property of viscosity a fluid.
- LCD materiels are linear organic molecules that are electrically charged, forming a natural molecular dipole.
- Consequently the liquid crystals can be aligned through the action of an external electric field.

features.

- LCD are fashioned pixel by pixel.
- The LCD has a very intense white backlight that illumina- each pixel.
- Each pixel contain high polarizing filters and films to control the intensity and color of light transmitted through the pixel.
- The differences between colod and monochrom LCDs involve th design of the filters and films.

- Color LCD have red-green-blue filters on within each pixel. fashioned into subpixels, each with one of these three filters.
- Medical flate panel display devices are monochrome LCDs.
- A backlight illuminates the pixel and is blocked or transmitted by the orientation of liquid crystals.
- The pixel consist of two glass plate substrates that are separated by embedded spherical glass beads of a few microns in diameter that act as spacers.
- Spatial resolution improve with the use of higher megapixel digitaly display devices.

- Medical flate panel digital display devices are ind identified by the number of pixels in the LCD
- A 1 megapixel display will have a 1020 x 1080 pixel arrangment

Image luminance

LCD is very ineffient device. only aproxemally 10% of the backlight is trasmitted through a monochrome monitor and half of that through a color monitor.

Q5:- Identify application of the picture archeving and communication system:

Ans:- Radiology has adopted digital imaging very rapidly estimates of the present level of digitally acequired images range up to 95%.

There are four principal of a PACS.

1. a image aquisition system
2. display system
3. Network
4. storage system.

Network:

Computer scientist use the term network to describe the manner in which may computer can be connected to interact with one another.

In radiology in addition to secretarial workstations the network may consist of various types of devices that allow storage, reterieved and veiwing of images, PACS widestation remote PACS work stations, a department mainform, and a hospital mainform.

Clients are interconnected by telephone or cable television lines among bulidings, and by microwave or satalites transmission to remote facilaties Teleradiology allow for image interpreted remotely even inter continentally.

Storage system:-

One motivation for PACS are ch
achiving.
just the cost of the hospital space
to accomudate a film file room is
sufficient to justify PACS.
Image storage requirements are
determined by the number of image
and the data file size. Image
file size is the product of
the matrix size and the grayscale
bit depth.

Image Acquistion system:-

= Images are undoubtedly the
preferred method in representing concepts
of the human brain.
color shap, weight size and morsture
content and critical factors to
food production quality control.
= In contrast machine vision technology
provides significant advantages because
of its ability in processing,
analysing measuring various characteristi
of the acquire image in two or three dimen

Display system.

Most radiology modalaties today use
monitors have become integral compunen
of DR, USG, CT/MRI consoles and
workstation and PACS terminals.

Q6:- Three types of digital radiographic imaging artifacts and how to avoid them?

Ans:- Image receptor artifacts:-

As occure with screen film image receptor. digital image receptor can suffer from rough handling, scratches and dust.

- Artifact produced by dust can be corrected easily with proper cleaning
- Digital radiography including CR IPs should last for thousand of exposure.
- Enviromental radiation can contribute to ghost artifacts.

Software artifacts:-

- Digital radiographic image are obtained as raw data sets. As such, these image 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.
- Flatfielding is a software correction that is performed to equlize the response of each pixel to a uniform X-ray beam.

Image compression:

Digital Radiographic image becomes ever more robust in term of the digital data files generated. This would not represented a problem if it were not for increasing application of teleradiology. which required electronic transmission of images.

Object artifacts:

Object artifacts can arise from the technologists errors in patient positioning x-ray beam collimation and his tagram selection. Backscatter radiation also can be troublesome because of the sensetivity of the digital radiographic image receptor.

Image Histogram:

- It is very important for digital image production.
- A histogram is a graph of frequency of occurance versus digital value intervals.

Artifact produce by dust can be corrected easily with proper cleaning.

- Dust internal to the optics of con CR imaging system.
- CR imaging take with an IP coon contaminated with residual glue that could not be removed.
- Rough handling or faulty construction of a digital IP can result in artifacts. result an image from a damaged CR.
- CR cassettes are highly sensetive to back ground radiatio and scatter.
- if CR cassette has not been used for several days, it shaul be inserted into the reader for re-erasure.
- The practise of leaving cassette in a supposedly "radiation safe" area in an x-ray room during an examination must be discouraged.
- properly collimated size and positined exposure field recognitio errors may occure.

These can lead to histogram analysis errors beca

error. because signal outside the exposure field is included in histogram. The result the very dark as very light or very noisy image.

Q7:- Describe the basis for data compression and differentiate between loss less and lossy compression.

Ans. Data compression:-

- In signal processing, data compression, source coding or bit-rate reduction is the process of encoding information using fewer bits than original representation.
- Any particular compression is either lossy or lossless.
- The process of reducing the size of a data file is often referred to as data compression.
- It is useful because it reduces resources required to store and transmit data.
- Basis for compression is provided by information theory, and more specifically compression and rate-distortion theory for lossy compression. These area of study were essentially created by Claud. in 1940.

Difference b/w lossless and lossy

Lossless

= It represent data with out lossing any information.
= It is reversible process.

= lossless compression is possible because most real world data exhibits statistical redundancy.
= Compression methods are among the most popular algorithms for lossless storage.
= It can be slow.
= It reduces the data file 10% to 50% of the orignal file.
= No larg image files because transmission time and manipulation time can still be unacceptable.

Lossy.

= Data with lossing any information
= It is not reversible process
. lossy compression is impossible.
= It can be fast.
. It not reduce the data.
= Larg image file
= provide compression up to 100:1 or more can be used on images. where exact measurment or fine detail is not required.
= Video recording that are to be replayed on standard domestic vission.
= It is not acceptabele for mamography.

Q8:- Identify the different between for-processing image for presentation image.

Ans: for processing:

- Before image is prepared.
- out put of image receptor may be neccessary for to correct for potential artifacts.
- Artifact occur because of dead pixels or dead rows or columns for pixels.
- Single pixel or a single row or column normally will not interfere with diagnosis.
- defect must be correct.
- correction algorithms specific to each type of digital image receptor use interpolation techinques to assign digital value to each dead pixel, row, or column.

- Image processing is a method to some operate on an image.
- enhance image
- Automatic processing
- They are software artifacts.
- visual information
- Effectively used.

presentation image is creating as a pitch to present audience.
- One element that want to focus on to create your presentation

Q9:- Explain how digital radiographic image artifacts occure because of improper collimation partion or alignment.

ans: If exposure field is not properly collimated size and positined exposure filed recoginition errors may occure. These can lead to histogra analysis errors because signal outside to exposure field is included in the histogra The result is very dark or very light or very noisy images.
Automatic radiation feild recognition is essential for artifact-free-images.
Digital radiographic IPs now are availible in the standard sizes shown in Box 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 collimination has the added value of defining the image histogram. if improperly collimated, the histogram can be improperly analyzed, resulting in an artifact such as that shown. in
Proper collimation and centering preve histogram errors that can lead to artifacts.
Digital image receptors normally ca recognize evennumbered (ie two/four) x-ray exposure fields that are centere

and cleanly collimated. Three on one and four on one are not recommended unless the unexposed portion in shielded. A good example of reduced contrast when three on one is used. For the image histogram to be properly analyzed each collimated field should consist of four distant collimated margins. The use of three collimated margins usually works; but when fewer than three are used, artifacts may result.

If images are not collimated and centered, image receptor exposure will not be accurate and cannot be used for image quality evaluation.