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Paper #

CR And

DR

Submitted to # madam

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Q No 1Pre Processing:-

- (1) Pre Processing is designed to produce artifact free digital image.
- (2) Pre Processing of digital images is largely automatic.
- (3) Pre Processing provides electronic calibration to reduce pixel-to-pixel, row-to-row, and column-to-column response differences.
- (4) Offset images and gain images are automatic calibration images designed to make the response of the image receptor uniform.

(5) Average Techniques are also used to reduce noise and improve contrast.

(6) Signal Interpolation:-

Digital image receptor and display devices have millions of pixels, so it is expected that some pixels to be detected and not work properly to remove this defect signal interpolation is used.

→ Signal interpolation correct this defect. And it is also the feature of preprocessing.

1) Line Noise:-

There are some variations seen in the voltage along the buses that drive each pixel. Such defect is called line noise.

which cause linear artifacts on final image. To remove this defect apply a voltage correction from a row or column of pixels in a dark, unirradiated area of image receptor.

Post Processing

Post

processing refers to any thing that can be done to a digital radiographic image after it is acquired by the image system.

2) Post processing of digital images require operator manipulation

3) For the purposes of better detecting pathology Post Processing is optimize-

Annotation:-

It is the process of "Adding text to an image."

→ It + Label the image which help to +A Provide information for the +the clinician about anatomy and diagnosis.

Window and level:-

Radiological technologists Adjust the window and level which can expand the digital Gray scale to visible that improve contrast which is the important feature of Digital radiographic image.

→ Technologists can make all 65,536 shades of Gray visible

Magnification:-

= To Show the smallest detail visible

→ Magnification of digital image is same as magnifying glass.

→ It improve visualization and spatial resolution.

→ To show the smallest object visible magnification is used in Digital radiography.

→ It improve image quality and pathology will be seen clearly.

Image Flip:-

= To Bring images into standard viewing flipped multiple image to horizontal or vertically, this process is called image flip.

→ it Reorient the image Presentation-

image Inversion:-

As we know that in radiographic image the contrast of Bone is white and soft tissue is black.

→ But in Digital Radiography we can change the contrast to the pathology visible by changing the bone to black and soft tissue to white. this process is called image inversion.

→ make white-to-black and black to white.

subtraction:-

It is a process
→ To improve image contrast subtraction is used

Temporal Subtraction is used to amplify changes in anatomy or disease -
↳ its Purposes is to enhance Contrast.

Pixel Shift:-

When a Patient moves during serial image acquisition misregistration of a subtraction occur, To correct this re-registration of the image occur by a technique called Pixel Shift.

↳ Register an image to correct for Patient motion.

Region of interest:-

To Determine average Pixel Value for use in Quantitative image Region of interest is important

→ This is an area of digital imaging that has been identified as Quantitative Technology.

→ To help in diagnosis, numerical value of pixel is required for this region of interest is required and computed the mean pixel value for that region of interest.

→ it is used to identify bone mineral assay, calcified lung nodule detection and renal stone identification.

Edge Enhancement:-

it is effective for fractures and small, high contrast tissue.

Highlighting:

To identify diffuse and non focal disease highlighting ~~is~~ can be an effective.

Scroll and Zoom:

For careful visualization of precise regions of an image "scroll and zoom it".

That these are the feature of Pre and Post Processing.

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Q NO2

To distinguish between

Spatial resolution and

Contrast resolution:-

Spatial

Contrast

Resolution:-

Resolution:-

→ Spatial resolution refers to the ability to differentiate between two near by objects.

Contrast resolution refers to the ability to distinguish between multiple densities in the radiograph.

→ Spatial resolution is limited by Pixel size

Contrast Resolution is limited by Noise SNR

3)

In digital imaging it depends on size of pixel

In case of Digital imaging it depends on the basis of system.

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It measure in line pair per millimeter lp/mm

It is measure in number of bit per pixel value.

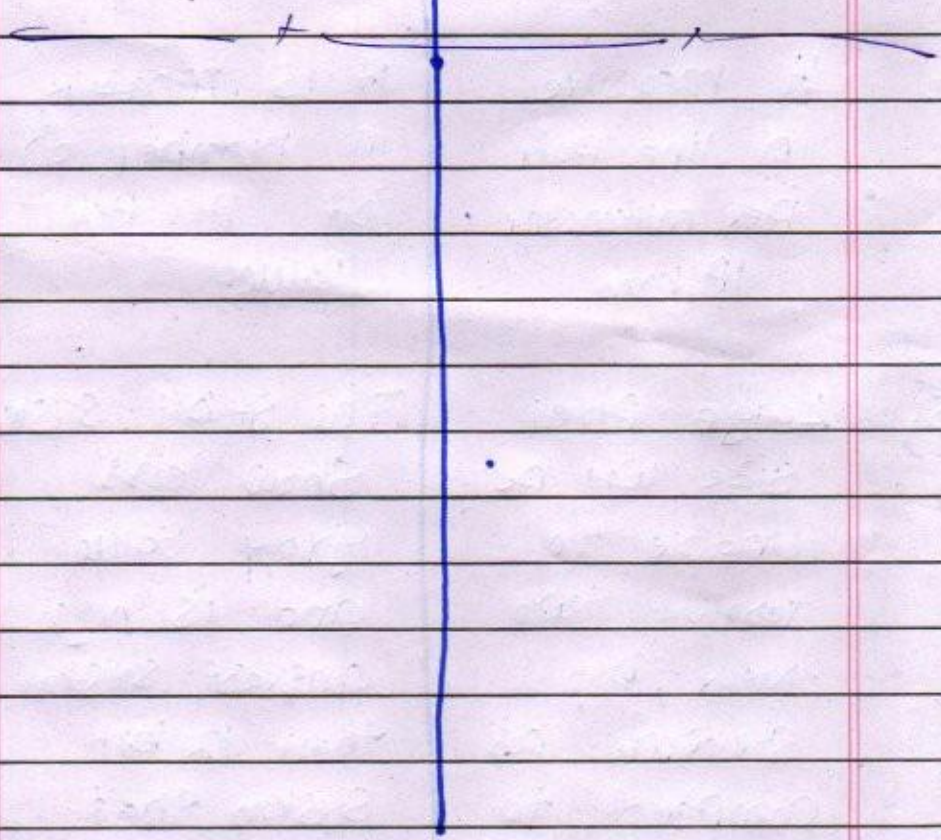
(5)

Large pixel size will be unable to resolve two near by structure as compared to a small pixel size

The 8-bit system show less gray value and is high contrast system than 12 bit system that shows more grey values and is low in contrast

in digital imaging
it depends on
the size of the
pixel

in case of
digital imaging
it depends upon
the bit-depth
of the system.



Q No 3

ANS:-

The following are the characteristics of digital image that lower the Patient radiation dose.

- There are number of factor associated Patient radiation dose
- Digital Radiographic technique especially selection of kVp and MAS can result to reduce dose
- When MAS decrease the SNR also decrease with towards Patient dose
- The Property of digital image receptor called DQE

Can reduce Patient radiation dose due to its high response to x-ray.

→ KVP is Not associated with Patient dose but Constant Spatial Resolution and Proper focal spot size result in lowering Patient dose.

→ Technique creep should replace dose creep.

→ Exposure should not be repeated in digital radiography because of brightness or contrast concern.

→ Over exposure image do not to be repeated here and should not become a habit.

→ With digital radiography

20-50% Patient dose
decreases -

In short KVP, mAs, focus
size, distance focus, detector
detector ~~and~~ anode and
filter selection, manual
or automatic exposure mode
compression force, Compressor
Position -

Other factors are

Filtration

Grid

- Protective Shielding
- focal spot size
- Collimation
- Exposure time accuracy



$$\underline{\underline{QNO}} \Rightarrow \underline{\underline{4}}$$

Feature of Active

Matrix Liquid Crystal
Display:-

→ The following are
the feature of Active
Matrix Liquid Crystal
Display. (AMLCD)

(1) Low Power Consumption
Because of low Power
Consumption little heat
emitted during operation

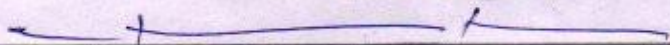
(2) AMLCD have No
geometric distortion

(3) It can be made almost
any size and shape

(4) It is designed to better reduce the influence of ambient light on image contrast-resolution.

(5) AMOLED have better Contrast resolution.

(6) AMOLED has better gray scale than other like CRT's.



Q No 5

Picture Archiving And Communication System (PACS)

PACS is a medical imaging technology which provide economical storage and convenient access to image.

PACS is becoming more common place because administrator serve the beneficial of having system to serve physicians and patient even though the cost is high.

It consist of the following.

- Digital acquisition
- Display workstation

→ Storage Device

→ Component is interconnected through an intricate network

DICom:-

First version was completed in 1985

→ DICom is digital imaging and communication in medicine-

→ Universal acceptance standard.

→ Now every modality and PACS communicate via DICom

Display work station has some sort of PACS application software.

21 Day 11, 12, 13, 14, 15, 16

→ Application Software allow manipulation.

→ Some have advanced Software with more complex image processing capabilities.

→ Archi Server

→ Client or Server Base System.

→ Distributed System

→ Web base System



Q No 6

Three Types of

Digital Radiological

Artifacts:-

→ There are three types of Digital Radiological Artifacts which are as follow -

- (1) Image Receptor artifacts
- (2) Software artifacts-
- (3) object artifacts-

(1) Image Receptor

Artifacts:-

Image Receptor Artifacts can occur when digital receptor

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is suffering from rough handling, scratching or dust particle.

→ Artifacts produce is corrected easily with proper cleaning unless the dust is internal to optics of a CR imaging system.

→ Dust on any section of CR optical path cannot be corrected by technologists, and will require professional service.

How to Avoid it:-

→ To avoid the image receptor artifacts the following things may done.

→ Avoid the IR from dust

→ Avoid from worse
Handling means handle
it with care -

Software artifacts:-

→ Digital Radiographic
image obtain as raw
data set.

→ For processing image
are manipulated into
for presentation.

→ Image that the radiologic
technologists can use
for QC and for
interpretation by radiologists

→ Before image is prepared
for processing several
manipulation is necessary
to correct potential artifacts
because of dead pixels

Date _____ 20 _____ Day M T W T F S S
or dead rows or column
of Pixel-

How to Avoid it

Avoid dead Pixel

Avoid rows and column
of Pixel

→ it can be corrected by
flat fielding.

it is a software correction
which is used to equalized
the response of each pixel
to a uniform x-ray
beam.

→ Interpolation.

(3) Object artifacts!

This
type of error ~~error~~ arise
from the technologists in
Patient positioning, x-ray

Beam and histogram Selection.

→ Lots of scattering material present behind image receptor, so back scatter radiation can cause a phantom image.

⇒ Image Histogram:

→ It is very important for digital image production.

→ A histogram is a graph of frequency of occurrence versus digital value intervals.

How to Avoid object Artifact:

→ The most important things to avoid ~~the~~ ^{the} object artifacts

Those technologists which
is not professional -

→ The technologists must
correct the position of Patient

→ To correctly using x-ray
Beam

→ Correctly Selection of
kVp histogram will
be required

→ All this should be
avoided by technologists

→ technologists should
be avoid their error -

————— ✂ ————— ✂ —————

to do work of work

efficiency

Lossless:-

An image file that is compressed in a lossless is one that can be reconstructed to be exactly the same as the original image.

→ It compresses the data file to 10% (10:1) to 50% (2:1) of the original file.

→ This compression is not satisfactory for large image file because transmission time and data manipulation time can still be unacceptable.

Lossy Compression:-

A Lossy Compression is one that can provide compression factor up to 100:1 or greater.

→ It can be used in which fine detail is not required.

→ Lossy compression is that in which is something greater than an order of magnitude compression less than 10:1.

Difference:

Lossless

It compresses the data file to 10:1 (10:1) to 500:1 (2:1) up to original value

It allow the exact image contents to be restored upon decompression

Lossy

It compresses the data file up to 100:1 or greater.

It change the image contents even though the image matrix and image depth remain same.

Q It is acceptable up to 3:1 and helpful in digital radiographic image management.

Lossy Compression is that which is something greater than an order of magnitude compression less than 10:1.

Lossy Compression is not acceptable for archiving mammography images because its quality does not remain same.

4 in Lossy
Compression
A file does not
restore or
rebuilt in its
original form.

while in Lossless
Compression, A
file can be
restored in its
original form

(5) Lossy Compression
reduce the
size of data

But Lossless
Compression
does not reduce
the size of
data Algorithms

(6) Lossy Compression
is used in images,
audio, video

Lossless Compression
is used in text
images, sound

(7) it is termed
as irreversible
Compression

it is termed
as reversible
compression

→ Data Compression is important
to ensure the Radiation
Protection for Physician

So to select the Compression
technique and archive system
used will adequate to Preserve
the diagnostic image
Quality.

Q No 8

**For Processing
image.**

1. The image that are manipulated into for Presentation that can there be used by radiological technologists for QC (Quality Control)

2. it is a Process to Perform same operation on an image

3. Automatic Process

**For Presentation
image**

These image are used for QC by radiological technologists and are interpreted by the Radiologists

Presentation image is creating aspect of a Pitch to present to an audience one element that you escaping want to focus on to Great Your Presentation

4) it is not
optimize for
human inter-
pretation-

13) it is perfectly
reasonable for
products to
display for
processing image
But some products
offer intelligent
feature for
gray scale-

5) image is
optimize for
human
interpretation
one can

transfer for
presentation image
by changing
geometric transfer
motion, reordering
of pixel value

6) The artifacts
should be
corrected during
viewing, flipping,
inversion, and
magnification-

Q No 9

Ans:- The digital Radiographic image artifacts occur because of improper Collimation Partition or Alignment.

Collimation:-

If the Collimation is not in proper size and position, of the x-ray exposure field the recognition error of the x-ray exposure field may occur.

Because Collimation of x-ray beam are important for patient radiation dose reduction and for improve image contrast in screen film radiography.

→ The result will be very dark or very noisy image.

In digital Radiography
Proper Collimation has
added value of defining
the image histogram

→ If Not Properly Collimated
the histogram can be
improperly analyzed

→ which result in artifacts

→ Proper Collimation and
centering prevent-

→ Histogram error that can
lead to artifacts APRA

Partition:-

If multiple
fields are projected onto
a single IP, each must
have clear, collimated
edges and margin between
each field. This process
is called Partition-

Which Allows two or more images to be projected on a single IP.

→ Positioning of multiple digital images on a single IP results in proper separation and collimation of each image.

→ The exposure field recognition algorithm is based on edge detection or Area detection.

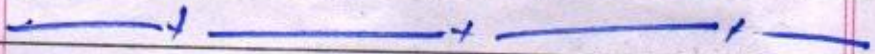
Alignment:-

The Alignment of the exposure field (beam) on the IP is in the same way and same for the reason as collimation.

→ When the image field is not oriented (align) with the size and dimension

ob the IP, the image artifacts appear

→ The ~~proper~~ improperly collimated multiple fields not aligned with the imaging plate edge results into over exposure which lead to image artifacts.



The end
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