

①

Name	→	Muhammad Faizan
Instructor	→	Miss Maheen
ID no#	→	14651
Paper	→	CR Eq DR
Exam	→	final

\* \* \*

Question no# 1 :-

Describe the features of Preprocessing and Postprocessing.

Features of Preprocessing :-

- \* Preimage Processing is usually done for improving the image contrast.
- \* Preprocessing of digital images is almost automatic.
- \* Preprocessing is usually designed to produce artifacts free digital image.
- \* It provides electronic calibration to reduce pixel-to-pixel, row-to-row and column-to-column response differences.
- \* offset images and gain images are automatic calibration images designed.

(2)

to make the response of the image receptor uniform.

- \* This process is also helpful in fixing the problems like Defective Pixel, Image lag, line noise.

### Features of Post Processing:-

- \* Due to Post Processing of digital images they will shine.
- \* It refers to anything that can be done to a digital radiographs after it's acquired by the imaging systems.
- \* It often requires operator manipulation and allow visualization of all shades of grey.
- \* It is usually perform to optimize the appearance of the image for the purpose of better detecting pathology.
- \* It often do Annotation means addition text to an image.
- \* It plays a role in the amplification of image contrast and magnification.

(3)

\* it expands the digital grayscale to visible (window & level).

\* it often determines average pixel value for use in quantitative imaging region of interest

x ————— x

Question no 2.

Distinguish between contrast resolution and spatial resolution?

Spatial resolution:-

it is the ability of an imaging system to resolve and give on the image a small high contrast object.

\* It is determined by spatial frequency.

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

\* Low spatial frequency shows large objects while high spatial frequency shows small objects.

\* An imaging system with high spatial frequency has better spatial resolution means a smaller details will be

Seen on a radiograph (e.g. microcalcification of breast)  
~~same~~ opposite situations for large objects

\* Spatial frequency of conventional radiography is depend on focal spot size, while in digital it's limited to the pixel size.

\* Large numbers of pixel means high spatial resolution in digital imaging while in conventional smaller the focal spot size larger will be spatial resolution

### Contrast resolution:-

The ability to distinguish the shades of gray from black to white is known Contrast resolution.

\* It is determined by dynamic range.

\* Dynamic range is the number of gray shades that an imaging system can reproduce

\* The dynamic range of conventional radiography is determined by OD (optical density) almost 0-30

\* while in digital radiography it's determined by bit capacity of each pixel.

A The CT and MRI having 12 bit (4096 shades of gray)

A In mammography it's having 16 bit dynamic range to get better contrast resolution.



Q no # 3:-

Discuss the characteristics of digital imaging that should result in lower pt radiation dose?

following are the features of DR that helpful in reduced patient dose :-

\* Repetition of the examination will not occur in digital radiography that concerns to brightness or contrast.

\* Digital radiography cannot compensate for excessive noise caused by quantum mottle.

\* Overexposed images don't have to be repeated and should not become a habit.

\* Digital imaging techniques must be approached differently, instead of "dose creep" "technique creep" should be used with each of the various digital imaging systems. The result will be patient radiation dose reduction.

\* With different anatomies the kVp will be changed but mAs will remain constantly in DR hence their ~~value~~ will be decreased in patient radiation dose.



Q no 4:

Discuss the features of an active matrix liquid crystal display.

features of AMLCD Display :-

(Active matrix liquid crystal devices)

(7)

\* Medical flat panel digital display devices are monochrome AMLEDs.

A Spatial resolution improves with the use of higher megapixel digital display devices.

A it allow very high resolution.

A 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.

\* A 1-megapixel display will have a  $1000 \times 1000$  pixel arrangement.

\* Medical flat panel digital display devices are identified by the number of pixels in the AMLED.

x ————— x

Q-no. 15.

8

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

## Types of digital radiographic imaging Artifacts:

### Artifacts:

Any false visual feature on a medical image that stimulates tissue when it interfere with diagnosis it must be avoided.

### Types:

- \* Image receptor Artifacts
- \* Software artifacts
- \* Object artifacts

## 1. IR Artifacts:

- \* Digital image receptor can suffer from rough handling, scratches and dust
- \* Environmental radiation can contribute to ghost artifacts
- \* The imaging plate may have some time residual glue that couldn't be

removed.

## 2. Software Artifacts:-

- \* Irradiation of DR image receptor by the raw x-ray beam may show variation over the image, producing irregular pattern that could interfere with diagnosis.
- \* CR cassettes are highly sensitive to background and scatter radiation.
- \* The practice of leaving cassettes in a supposedly "radiation safe" area in x-ray room during an examination must be discouraged.

## 3. Object Artifacts:-

- \* These artifacts arise due to carelessness of radiologists e.g. x-ray beam collimation, patient positioning etc.
- \* If the x-ray exposure field is not properly collimated, sized & positioned field recognition errors may occur.
- \* ~~Proper~~ Proper collimation and centering prevent histogram errors that can lead to artifacts.

## Avoidance:

- \* Try to keep the exposure time less as possible and carefully handled the IP.
- \* Moreover try to manage proper position of patient, alignment and beam collimation. We may decrease these artifacts upto some extent.
- \* In short we have to take a careful examination to a possible extent.
- \* Try to normalize the environmental factors by enclosing the examination room.
- \* Automatic radiation field recognition is essential for artifacts free images.

Q. no 52

Identify the application of the picture archiving and communication system.

Ans:-

PACS System:- it is a medical imaging system.

(11)

which provides economical storage, retrieval, management, distribution and presentation of medical images. Electronic images are transmitted via PACS system to digital.

A This eliminates the need to manually file, retrieve or transport film jackets.

A Most PACS (Picture Archiving and Communication System) handle images from various medical imaging instruments like MRI, CT, PET, etc.

### Components:

- \* Imaging modalities:
- \* Secured network for the transmission of pt information:
- \* Workstations for interpretations and reviewing images.
- \* Archives for the storage and retrieval of images and reports

### Advantages:-

- \* Hardcopy replacement
- \* Remote access
- \* Electronic image integration platform
- \* Radiology workflow management

Benefits:

- \* To the diagnostician
- \* To the referring physician
- \* Benefit to the patient
- \* To the hospital.

\* ————— \*

Q no: 7.

Describe the basis for data Compression and the difference b/w Lossless and loss compression.

Data Compression:

it is a technique in which the size of the data is reduced without the loss of essential information. The compression may be known as the lossless compression and lossy compression. This process is often helpful in delivering a large file in a compressed form carrying important information to their desired site.

In lossy compression almost all contents or information are delivered while in lossless compression some of contents may remain.

Difference b/w Loosy &

Lossless Compression.

Loosy Compression

Lossless Compression

\* In Loosy Compression, a file doesn't restored or rebuilt.

In Lossless compression a file can be restored in its original form.

\* it reduced the file upto 90% of its original form

It reduced the file (data) to 10% to 50% of the original form.

\* In loosy compression, data quality is compromised.

\* It doesn't compromise the data quality

\* Compression ratio to original form is

\* Compression ratio

10 : 1

3 : 1

Q no # 9a: Explain the digital radiographic image artifacts due to poor collimation?

- Artifacts due to improper collimation, partition or alignment:-

Collimation and Partitions

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

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

A Collimation is very essential for reduced patient dose and to improve image contrast in screen film radiography.

A Proper collimation and centering prevent histogram errors that lead to artifacts.

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

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

## 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 can appear.

---

### Q no. p.

Identify the difference b/w for-processing and for presentation images?

Digital radiographic images are obtained as raw data sets, such - these 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.

End