NAME AQSA NASIR

ID 15097

PAPER CR & DR

SUBMITTED TO MAM MAHEEN

QUESTION NO 1

Desclibe the features of preprocessing and post-processing ?

ANSWER 1

PREPROCESSING

refers to the initial steps that are applied to the raw imaging data and is generally out of the hands of the imaging device

NAME AQSA NASIR

ID 15097

PAPER CB & DR

SUBMITTED TO MAM MAHEEN

QUESTION NO 1

Desclibe the features of preprocessing and post-processing ?

ANSWER 1

PREPROCESSING

refers to the initial steps that are applied to the raw imaging data and is generally out of the hands of the imaging device

operator or the end-user the radiologist

PREPROCESSING FEATURES

→ A principal Advantage of digital radiographic imaging over screen film radio-graphic imaging is the ability to manipulate the image before and after display - preprocessing and postprocessing.

→ preprocessing of digital images is largely automatic.

→ Processing and postimage processing alter image appearance usually for improving image contrast

→ Preprocessing is designed artifact free digital image.

→ Preprocessing provides electronic calibration to reduce pixel to pixel raw to row and column to column differences.

→ The processes of pixel interpolation, lag-correction and noise correction are automatically applied with most systems.

→ offset images and gain images are automatic calibration image designed to make the response of the image receptor uniform.

→ These preprocessing calibration techniques are identified as flatfielding.

→ Digital image receptor and display devices have millions of pixels,

to be defective and to respond diff-elently or not all all.

→ 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.

→ Each type of digital image receptor an electronic latent image that may not be visible completely

→ Some voltage variation may be seen along the buses that drive each pixel.

→ The defect is called line noise cause liner artifacts

to appear on final image.

POSTPROCESSING

- Post-processing describes the manipulation of radiographic images to derive additional qualitative or quantitative data.
- Modern imaging devices and protocols whenever in CT and MRI or ultrasound generate large volumes of information that enhances not only our diagnostic roles but treatment planning as well.

FEATURES OF POSTPROCESSING

→ Post-processing is where digital image shines.

→ Postprocessing of digital images requires operator manipulation

→ 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 radio-graphic image after it is acquired by imaging system.

→ Postprocessing detect the better pathology.

→ Digital Images have dynamic ranges up to 16-bit 65,536 gray levels

→ The larger matrix size digital display have better spatial resolution.

→ Sometimes pathology can be more visible with image inversion.

digital

→ Image Post Processing

→ • Annotation,
• window and level
• magnification,
• Image flip Image
• inversion, Subtraction
• Pixel shift, Region
• of Interest.

→ Edge enhancement is effective for fractures and small high contrast tissue.

→ Panscroll and zoom allow careful visualization of image.

QUESTION No 2

Qa Distinguish between spatial resolution and contrast resolution.

ANSWERD

SPATIAL RESOLUTION

- Spatial resolution is the ability of an imaging system to allow two adjacent structures to be visualized as being separate

-) Spatial resolution refers to the ability of imaging instruments to provide the sharpness or detail of images.

→ factors affecting spatial resolution include collimator resolution. (The main factor in nuclear medicine.)

→ System sensitivity requires certain diameter of the collimator holes etc. dots range 1mm as 250 u.m.

CONTRAST RESOLUTION

- Contrast resolution is the ability to distinguish structures with similar objects contrast such as liver-spleen, fat muscle.

→ computed tomography and MRI have excellent contrast resolution.

→ contrast to distinguish shades of gray from black to

white.

→ digital imaging system have better contrast then screen film imaging.

QUESTION NO 3

Discuss the characteristic of digital imaging that should result in lower patient radiation dose?

ANSWER 3

patient radiation dose:-

→ with acceleration to all digital imaging we have the opportunity to reduce patient doses 20% to 50%.

depending on the examination

→ however quite the opposite often has occured - Something that many call dose creep.

→ by not changing factors between a lateral view and anteroposterior view when taken consecutively. As a result possible in increase patient radiation dose.

→ Patient radiation dose reduction should by possible by DQE.

→ Reduction of dose by exposure not to repeated,

DR- System cannot compensate for excessive noise caused by quantum mottle.
- overexposed image not to repeated.

QUESTION NO 4

Discuss the features of an active matrix liquid crystal display

ANSWER

→ Current display system for medical imaging are based on cathode ray tubes or active matrix liquid displays (AMLCDS)

→ Allow very high resolution
→ Each sub pixel is individually controlled by an Isolated thin film transistor
→ It allows the electrical signals for each sub-pixel to avoid influencing adjacent elements

→ Fast response time
→ good image quality

→ A liquid crystals material are threw organic molecules that are electrically charge forming a natural molecular dipole.
→ liquid crystals can be aligned by applying external electric field.

→ liquid crystals displays by pixel by pixel.

QUESTION NO 5

ANSWER NO 5

PICTURE ARCHIVING AND COMMUNICATION SYSTEM

- Picture Archiving and communication system improves image interpretation, processing viewing, storage and recall.
- The four principal component of a PACS are the image acquisition

System, display system the network and Storage system

→ When a radiologist is not available for image interpretation, then Image can transfer to a PACs workstation in the radiologist room.

→ PACs is the radiologist data base system

→ Jus the cost of the hospital space to accommodate a film file room is sufficient to justify PACs.

→ PACs Store electronically Images and reports instead of using old method of manually filing retrieving and transporting file jackets.

QUESTION NO 6

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

ARTIFACTS

- Incorrect detector orientation
- backscatter
- stitching artifact
  over exposure etc.

IMAGE RECEPTOR ARTIFACTS

- As can occur with screen film image receptors digital image receptors can suffer from rough handling scraches and dust.
- Artifacts produced by dust can be corrected easily with proper cleaning unless the dust is internal to the optics of a computed radiography imaging system.

→ dust dirt
- Scraches
- Pixel
- malfunction
  Ghost image
  all are the artifacts in image receptor.

→ Debris on image receptor can be confused with foreign bodies

SOFTWARE ARTIFACTS

- Digital radiographic images are obtained as a raw data sets.
- As such these images are ready for processing for processing images are manipulated into for presentation images that the radiologic technologist can use for dc and for interpretation by the radiologist.

→ histograms
- Range/scaling
- Image compression

all are altifact in software.

OBJECT ARTIFACT

object artifacts can arise from the technologists errors in patient positioning x-ray beam collimation and histogram selection.

→ If alot of scatteling matelial is present behind the image receptor backscatter radiation can cause a phantom image.

→ Patient positioning
- Collimator partition
- Backscatter

↓ artifacts in object.

AVOID THESE ARTIFACTS

- We can avoid altifact in image receptor by erased the image plate propelly
- or to remove metal objects from patient body for cleal image.

→ form for routine documentation of Imaging plate re cluce altifact

→

→ In Software artifacts avoid the dead pixels or dead rows or column of pixels because most artifact occur by the dead pixels.

- Algorithms are use for correction
→ FlatFielding software also use for equalization of pixel to uniform x-ray beam.
→ Object artifact can be avoid by technologist errors
→ Correct patient position
→ Avoid Backscatteling.

QUESTION NO 7

Describe the basis for data compression and the differences between lossless lossy compression

DATA COMP-RESSION

- It is the process of encoding information using fewer bits than the original representation

- Data compression either lossy or lossless.
- Data compression is particularly useful in communications because it edbles devices to transmitt or store the same amount of data in few bits.

→ The Process of reducing the size of a data file is often referred to as data compression.

Data compression is a subject to a space-time complexity trade-off

→ The data transmission it is the called source coding - encoding done at the source of data before it is stored or transmitted.

→ compression is useful because it reduces resources required to store and transmit data.

DIFFERENCE BETWEEN LOSSY AND LOSSLESS

LOSSELESS

→ losseless compression reduces bits by identifying and eliminating statistical redundancy

→ No information is lost

→ compression use / compression prediction by partial matching, finite state machine arithmetic coding etc

→ lossless compression restores and rebuilt in its original form

→ without loss of information.

→ No large transmission time manipulation time can still be acceptable

LOSSY

→ Lossy compression reduces bits by removing unnecessary or less important information

→ Just important information

→ compression based on ~~discrete cosine transform~~ transform coding. methods of audio compression, speech coding audio signal etc.

→ lossy compression does not restored by data in its original form after decomposition

→ No acceptable for mamography.

QUESTION 8

ANSWER

FOR PROCESSING AND FOR PRESENTATION OF AN IMAGE

→ For processing images are manipulated 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 manipulation of the output of an image receptor may be necessary to correct for potential artifacts.

→ Such artifacts can occur because of dead pixels/dead rows/columns

QUESTION NO 9

ANSWER

Artifact → most artifact radiology occur because we seen in image is not present in reality but appear due to quirk of the modility itself.

→ The structure appear on the radiograph artifically that means something technecal processing occur be there.

→ artifact cause because of improper colimation

partition or alignment is objective artifacts.

IMPROPER COLLIMATION ARTIFACTS :-

An exposure field recognation error may occur due to the x-ray exposure field is not propelly collimated or sized and positioned.

- The Improper collimation are results in a very noisy or very light or very dark image.
- For an artifact free Images there should be automatic radiation field recognition is essential.
- For improve contrast and patient dose

Collimation projected area x-ray beam is important.

due to improper collimation the histogram can be improperly analyzed which results in an artifact.

PARTITION ARTIFACT

→ The partioning of the multiple digital images on a sing IP results in a proper separation and collimation of each image.

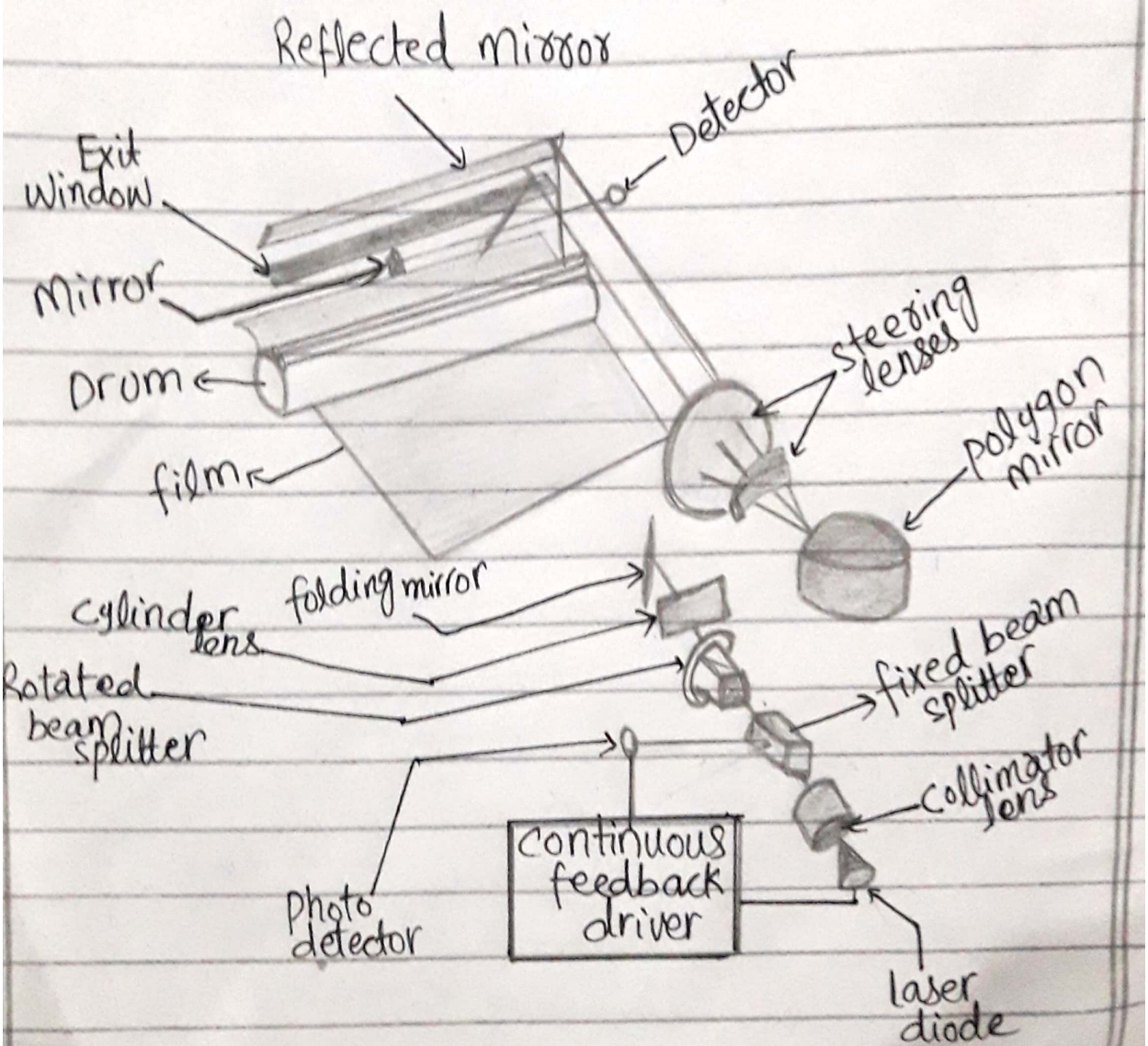
→ partition is a process which allow two or more images to be projected on single IP.

ALIGMENT ARTIFACT

→ An Image artifact can appear when an image field is not oriented with the size and dimension of the IP

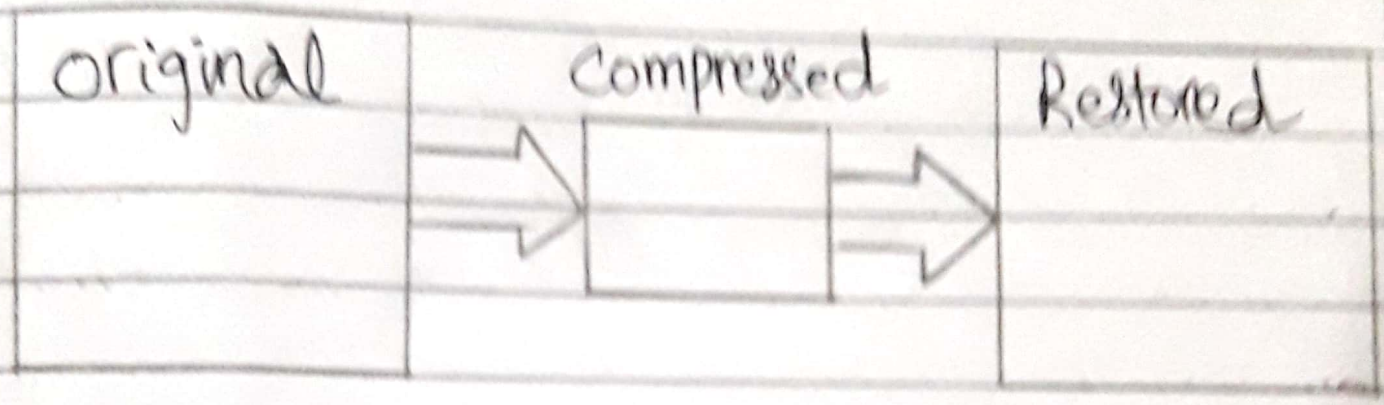
→ In the same way and for the same reason like collimation & alignment of the exposure field is important for reducing artifact. on the exposure field of the IP

Question #5



QUESTION 7

LOSSLESS



LOSSY