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ID = 15338

paper = CR and DR

Final Exam

Radiology 4th sem

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**Q NO 1: Preprocessing Digital radiographic Image.**

Ans:- A principle ~~advantage of digital~~ advantages of digital radiographic imaging over screen-film radiographic imaging is a ability to manipulate the image befor and after to display preprocessing and post processing, respectively primary pre image processing and post image processing. Alters image apperance, usally for the purpose of improving image contrast.

preprocessing of digital image is largely automatic.

preprocessing is designed to produce artifact - free digital images.

In this regard, Preprocessing Provides electronic caliberation to reduce pixel-to-pixel, row-to-row and column-to-column response differences. The process of pixel interpolation, lag correction, and noice correction are automatically applied with most systems.

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

These processing calibration techniques are identified as flatfielding and digital image receptors and display devices have millions of pixels; therefore, it is reasonable to expect some individual pixel to be defective and to respond differently or not at all. Such defects are corrected by signals interpolation.

Digital image processing

| Problem | Solution |
| --- | --- |
| Defective pixel | interpolate adjacent pixel signals |
| image lag | offsect correction |
| Line noise | correct from dark reference zone. |

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# Post Processing the Digital Radiographic image.

⇒ Post processing is where digital imaging shines. On contrast to processing, which is largely automatic, postprocessing 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.

⇒ Digital image postprocessing.

| Process | Results |
|---|---|
| Annotation | Label the image |
| Window and level | Expand the digital grayscale to visible. |
| Magnification | Improve visualization and spatial resolution. |
| image flip image inversion | Reorient image presentation Make white – black and black – white. |
| Subtraction (DSA) | Improve image contrast. |

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| | |
|---|---|
| Pixel Shift | Reregister an image to correct for patient motion. |
| Region of interest | Determine average pixel value for use in quantitative imaging. |

Q No 2 :

Answer :

## SPATIAL RESOLUTION

⇒ Spatial Resolution (resolution in space) is the ability of an imaging system to resolve and render on the image a small high-contrast object.

Figure 17-1 shows black dots of diminishing size on a tan background.

Black on white is high contrast. If the dots were shades of gray, they would not exhibit high contrast but rather low contrast.

The dots range in size scaled from 10 mm down to 50 μm. Most people can see objects as small as 200 μm. Therefore, the spatial resolution of the eye is described

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as 200 um. If the dots were not high contrast, the spatial resolution of the eye is described as 200 um. If the dots were not high contrast, the spatial resolution of the eye would require larger dots.

⇒ Spatial resolution is the ability to render small objects on the image.

In medical imaging, spatial resolution is described by the quantity "spatial frequency." Spatial frequency was introduced in capter 15 and is discussed further here because it is an important charectristic that is used to describe medical images and medical imaging system.

## "Spatial frequency"

The fundamental concept of spatial frequency does not refer to size but to the line pair. A line pair is a black line on a light pair consists of the line and an intenspace of the same width as the line

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six line - pair patterns are shown with each line and each interspace representing the size of the dots in figure 17-1.

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

Spatial frequency relates to the number of line pairs in a given length, usually centimeter or millimeters.

## Contrast Resolution.

One hundred % contrast is black and white. the lettering on this page shows very high contrast. Contrast resolution is the ability to distinguish many shades of gray from black to white. All digital imaging systems have better contrast resolution than screen - film imaging. The principal descriptor for contrast resolution is gray scale, also called dynamic range.

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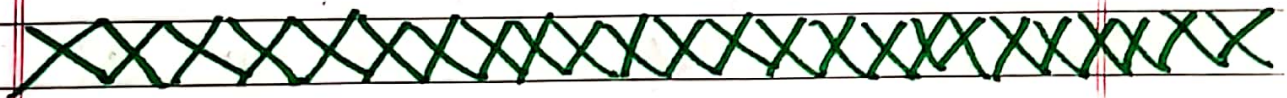
# Dynamic range

The dynamic range of a screen-film radiograph is essentially three orders of magnitude, from an optical density (OD) of near 0 to 3.0 (Figure 17-11) This represents a dynamic range of 1000, but the viewer can visualize only about 30 shades of gray.

The grayscale can be made more visible with the use of specific radiographic techniques designed to increase image latitude; however, still no more than 30 shades of gray will be viewed because of the limitations of the human visual system.

Dynmic range is the number of gray shades that an image system can reproduce.



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Q.NO 3:-

Answer: Dose reduction with Digital Radiography :-

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

(2) DR systems cannot compete for excessive noise caused by quantum mottle.

(3) Overexposed images do not have to be repeated and should not become a habit.

(4) Digital imaging techniques must be approached differently. instead of "dose creep". "technique creep" should be used with each of the various digital imaging systems.

(5) Because digital image contrast is unrelated to dose, KUP becomes less important. when digital examination of specific anatomy is conducted. the KUP should start to be increased, and an accompanying reduction in mAs should be noted with successive examination.

(6) The patient radiation dose reduction that is possible

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is limited.

(7) The Problem with very low technique for digital imaging is low SNR. Noise can predominates and compromise the interpretation of soft tissue anatomy.

Qno 4:

Answer: "Liquid Cristal Display"

we all know that matter takes the form of gas, liquid or solid. A liquid crystal is a material states between that of a liquid and a solid.

LCD are superior to CRT displays. A liquid crystal has the property of a highly ordered molecular structure — a crystal — and the property of viscosity — a fluid. liquid crystal materials are linear organic molecules (Figure 18.3) that are electrically charged, forming a natural molecular dipole. consequently, the liquid crystals can be aligned through the

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action of an external electric field.

## "Display charectristics"

Liquid crystals displays are fashioned pixel by pixel. The LCD has a very intense white blacklight that illuminates each pixel. Each pixel contains light-polarizing filters and film to control the intensity and color of light transmitted through the pixel.

The difference between color and monochrome LCDs involve the design of the filters and film. Color LCDs have red-green-blue filters within each pixel fashioned into subpixels, each with one of these three filters.

The pixel consists of two glass plate substrates that are separated by embeded spherical glass beads of a few microns in diameters that acts as spacers. Additionally, bus lines-conductors-control each pixel with a thin-film transistor (TFT).

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## Qno 5:-

## Answer:-

**Picture archiving and communication system (PACS):-**

⇒ A picture archiving and communication system. (PACS), when fully implemented, allows not only the acquisition but also the interpretation and storage of each medical image in digital form without resorting to film (hard copy). The projected effeciencies of time and cost are enormous. PACS improves image interpretation, processing, viewing, storage, and recall.

* The four principal components of a PACS are the image acquisition system, the display system, the network, and the storage system.

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Q No 6:
Answer:

## (i) "Acquisition Artifacts"

* Object in beam - CR/DR
* Backscatter - CR/DR.
* Grid issue - CR/DR.
* over / underexposure - CR/DR.

## (ii) "Detection Artifacts"

* Dirt and dust in reader - CR
* imaging plate damage - CR
* Dead lines / pixels / detector - CR/DR.

## (iii) "Signal Processing Artifacts"

* Bad plate erasure - CR
* DR lag - DR
* Saturation - CR/DR.
* Flawed or limited flat-field compensation.
* Or shading correction - CR/DR.

[illegible]

⇒

Q No 6

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## QNO 7:
## Answer:

### Data compression:-

⇒ In signal Processing, data compression, source coding OR bit rate reduction is the process of encoding information using fewer bits than the original representation

⇒ Any particular compression is either lossy or losseless. Losseless compression reduces bits by identifying and eliminating statistical redundancy. No information is lost in lossless compression. Lossy compression reduces bits by removing unnecessary reduces bits by removing unnecessary or less important information.

Typically, a device that performs data compression is referred to as an encoder, and one that performs the reversal of the process (decompression) as a decoder.

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| S/No | Lossy Compression | Lossless Compression |
|---|---|---|
| (1) | Lossy compression is the method which eliminate the data which is not noticeable | while losseless compression does not eliminate The data which is not ~~di~~ noticeable. |
| (2) | On lossy compression A file does not restore or rebuilt in its original form | while lossless compression A file can be restore in its original form. |
| (3) | On lossy compression Data's equality is compromised | But lossless compression does not compoise the data's equality. |
| (4) | Lossy compression ~~reduces~~ reduces the size of data | But lossless compression does not reduced the size of data. |
| (5) | Algorithms used in lossy compression are ~~transformtag~~ transform coding Discrete cosine transform Discrete wavelet transforms | Algorithms used in lossless compression are Run length Encoding, ~~lempl~~ Lempel - zivwelch, Huffman coding |

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| | | |
|---|---|---|
| | Fractal compression etc. | Arithmetic coding etc. |
| (6) | Lossy compression is used in images, audio, video | Lossless compression is used in text, images, sound |
| (7) | Lossy compression has more data holding capacity | Lossless compression has less data-holding capacity than lossy compression. |

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QNO 8:-
Answer:-

## "For Processing"

For processing images are manipulated into "For Presentation" images that the radiologic technologist can use for interpretation by the radiologist.

## "Preprocessing"

Before an image is prepared "For Processing" several manipulations of the output of an image receptor may be necessary to correct for potential artifacts. Such artifacts can occur because of dead pixel or dead rows or column of pixel (Figure 21-7).

## "For Presentation"

⇒ These images are used for QC by the ~~rate~~ rad tech and are interpreted by the radiologist.

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QNO 9:-
Answer:-

If exposure field is not properly collimated size and position exposure field recognition errors may occur. These can lead to histogram ~~anyl~~ analysis errors because signals 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 artifacts- free- images.

Digital radiographics IPs now are available in the standerd sizes shown is in the image receptor is history; it has been replaced by an image receptor.

Collimation of the projected area x-ray beam is impotent for patient radiation dose. reduction and for improved image constant

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Screen—Film radiography.
On DR, proper ~~collimati~~ 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.

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

A digital image receptors normally can recognize evennumbered (i.e two/four).

x-ray exposure fields that are centered and cleanly collimated. Three on one and four on one are not recomended. 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. Usually works, but when fewer than three are used, Artifacts

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may results.
Of images are not collimated and concerned, image receptor exposure will not be accurate and cannot be used for image quality evolution.

⇒ The End

# Remaining Part of Quality

## Avoidance

* Try to keep the exposure time less as possible and carefully handled the IR.
* Moreover try to manage proper possition of patient, Alignment and beam collimation we may decreased these artifact upto some extent.
* in short we have to ~~the~~ take a careful examination to a possible extent.
* Try to normalize the environmental factors by enclosing the examination room.