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Q1) Explain in brief the concept of brightness adaptation and Discrimination.

Ans :- As a Digital images are displayed as sets of discrete intensities, the eye's ability to discriminate between different intensity levels is an important consideration in presenting Image processing results.

The range of light levels to which the human visual system can adapt is enormous - on the order of 10^{10} - from the scotopic threshold to the glare limit.

Experimental evidance indicates that subjective brightness is a logarithmic function of the light intensity incident on the eye.

The Transition from Scotopic to photopic vision is gradual over the approximate range from 0.001 to 0.1 millilambert (-3, -1 as the double branches of the adaption curve

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Digital Images are displayed are discrete and of intensities. The eyes ability to discriminate black and white at different intensity level is an important consideration in presenting image processing result.

The Range of light intensity level to which the human visual system can adapt is of the order of 10^{10} from the Scotopic threshold to the glare limit. In photopic vision, the range is about 10^6.

The key point in interpreting the impressive dynamic range depicted is that the visual system cannot operate over ~~the~~ such a range ~~simultane~~ simultaneously.

The total range of distinct intensity levels the eye can discriminate simulatenosly is rather small when compared with the total adaption range.

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Q5] Discuss the concept of Gamma-Ray Imaging

Ans Major uses of imaging based on gamma rays include nuclear medicine and astronomical observation. In nuclear medicine - The approach is to inject a patient with a radioactive isotope that emits gamma rays as it decays. Images are produced from the emissions collected by gamma-ray detectors. Images of this sort are used to locate sites of bone pathology, such as infection or tumors.

Another major modality of nuclear imaging called position emission tomograpmphy (PET). The principle is the same as with X-ray tomography. ~~mention~~

However instead of using an external source of X-ray energy, the patient is given a radioactive isotope that emits positrons as it decays. When a positron meets an electron, both are annihilated and two gamma rays are given off tomography.

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A stor in the constkllction of cygnus exploded about 15000 year's ago, generating a superhecked. Stationary gas cloud that that glows in a spectacular array of colon.

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Q 3] Explain the output and application of image averaging.

Ans :- Suppose that $g(x,y)$ is a corrupted image formed by the addition of noise, $n(x,y)$ to a noiseless image $f(x,y)$, that is

$$g(x,y) = f(x,y) + n(x,y)$$

where the assumption is that at every pair of co-ordinate (x,y) the is uncorrelated, and has zero average value. We assume also that the noise and image value are uncorrelated. The objective of the following procedure is to reduce the noise content of the ~~input~~ output image by adding a set of noisy input image $\{g(x,y)\}$.

If the noise satisfies the constraints just stated, it can be shown that if an image $\bar{g}(x,y)$ is formed by average K different noisy image.

$$\bar{g}(x,y) = \frac{1}{K} \sum_{i=1}^{K} g_i(x,y)$$

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then it follows that

$$\Sigma\{\bar{g}(x,y)\} = f(x,y)$$

and

$$\sigma^2_{\bar{g}(x,y)} = \frac{1}{K}\sigma^2 n(x,y)$$

where $\Sigma\{\bar{g}(x,y)\}$ is the expected value of $\bar{g}(x,y)$ and ~~σ^2~~

$\sigma^2_{\bar{g}}(x,y)$ and $\sigma^2_{n(x,y)}$ are the variance of $\bar{g}(x,y)$ and $n(x,y)$ respectively, all at coordinates (x,y).

The standard deviation in the average image is

$$\sigma_{\bar{g}(x,y)} = \frac{1}{\sqrt{K}}\sigma_{n}(x,y)$$

An important application of image averaging is in the field of astronomy, where imaging under very low light levels often cause sensor noise to render individual image virtually useless for analysis.

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Q5] Describe the ~~image~~ process of converting a continuous image to digital form.

Ans - ~~Converting a conti~~

The process of converting a continuous image into digital form is called as Sampling and Quantization.

The Sampling rate determines the spatial resolution of a digitized image, while the quantization level determine the number of grey levels in the digitized image.
A magnitude of the sampled image is expressed as a digital value in image processing.

Suppose we have a image f that we have to convert to digital form.
An image may be continuous with respect to the x and y coordinates and also in amplitude. To digitize it we have to sample the function in both co-ordinates and also in amplitude. Digitizing the co-ordinate values is called sampling. Digitizing the amplitude value is called Quantization.

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Inorder to form a ~~get~~ digital function, the Intensity values also must be converted (quantized) scale divided into eight discrete intervals ranging from black to white. The vertical tick marks indicate the specific value assigned to each of the eight intensity intervals. The continuous intensity level are quantized by assigning one of the eight value to each sample, depending on the vertical proximity of a sample to a vertical tick mark. The digital sample resulting from both sampling and quantization are shown as white square.

The quality of a digital image is determined to a large degree by the number of sample and discrete Intensity levels used in sampling and quantization. However ~~a~~ in this section image content also plays an important role in the choice of these parameters.