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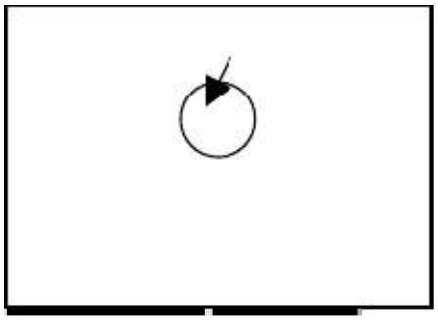
Department of Electronics and Communication Engg
First midterm question paper with answer
Session (2017-18)
Subject –circuit analysis and synthesis

Q1 Explain Brightness adaptation and Discrimination

. The digital images are displayed as a discrete set of intensities, the eye's abilityto discriminate between different intensity levels.Subjective brightness is a logarithmic function of the light intensity incident on theeye. The long solid curve represents the range of intensities t o which the visual systemcan adapt.In photopic vision alone the range is about 10^6.It accomplishes the large variation by changes in its overall sensitivity phenomenon isknown as brightness adaptation.The eye's ability to discriminate between different intensity levels at any specificadaptation.The eye is capable of detecting contouring effects in monochrome Imagewhose overall intensity is represented by fewer than approximately two dozen levels.The second phenomenon called simultaneous contrast is related to the fact that a region's perceived brightness does not depend on its intensity. They app ear to the eye becomedark eras the background gets lighter.



Q 2.Explain sampling and quantization:

For computer processing, the image function f(x,y)must be digitized both spatiallyand in amplitude. Digitization of spatial co-ordinates is called image sampling andamplitude digitization is called grey level quantization.

Sampling:

Consider a digital image of size 1024*1024,256 with a display area used for theimage being the same ,the pixels in the lower resolution images where duplicated inorder to fulfill the entire display .the pixel replication produced a checker board effect, which isvisible in the image of lower resolution .it is not possible to differentiate a 512*512images from a1024*1024 under this effect. but a slight

increase in grainess and a smalldecrease in sharpness is noted.A 256*256 image shows a fine checker board pattern in the edges and more pronounced grainess there out the image .these effect is much more visible in 128*128images and it becomes quite pronounced in 64*64 and 32*32 images.

Quantization:

It discusses the effects produced when the number of bits used to represent thegrey level in an image is decreased .this is illustrated by reducing the grey level requiredto represent a 1024*1024,512 image.The 256,128,and 64 level image are visually identical for all practical purposesthe 32 level images has developed a set of rigid like structure in areas of smooth greylines.this effect caused by the user insufficient number of grey levels in smooth areas of digital image is called a false contouring.this is visible in images displayed using 16 or lesser gray level values.

Q 3.Explain about Mach band effect?

Two phenomena demonstrate that perceived brightness is not only a function of intensity. They are mach band pattern and simultaneous contrast.

Mach band pattern:

It states that the visual system tends to undershoot or overshoot around the boundary of regions of different intensities .This is called mach band pattern. Although the width of the stripe is constant, it is perceived as if the brightness pattern is strongly scalloped near the boundaries by darker part.Simultaneous contrast is related to the fact that a regions perceived brightness does notdepend only on its intensity. In the figure all the center square have the same intensityhowever they appear to the eye as the background gets lighter.Example: A piece of paper seems white when lying on the desk but can appear whenused to shield the eyes while looking at brighter sky

Q4. Describe the fundamental steps in image processing?

Digital image processing encompasses a broad range of hardware, software andtheoretical underpinnings.The problem domain in this example consists of pieces of mail and the objective is toread the address on each piece. Thus the desired output in this case is a stream of alphanumeric characters.The first step in the process is image acquisition that is acquire a digital image .Todo so requires an imaging sensor and the capability to digitize the signal produced by thesensor.After the digital image has been obtained the next step deals with preprocessingthat image. The key function of this is to improve the image in ways that increase thechances for success of the other

processes.The next stage deals with segmentation. Broadly defined segmentation partitionsan input image into its constituent parts or objects. The key role of this is to extractindividual characters and words from the background,The output of the segmentation stage usually is raw pixel data, constituting either the boundary of a region or all the points in the region itself.Choosing a representation is only part of the solution for transforming raw datainto a form suitable for subsequent computer processing. Description also called featureselection deals with extracting features that result in some quantitative information of interest that are basic for differentiating one class of object from another.The last stage involves recognition and interpretation. Recognition is the processthat assigns a label to an object based on the information provided by its descriptors.Interpretation involves assigning meaning to an ensemble of recognized objects.Knowledge about a problem domain is coded into an image processing system inthe form of knowledge database. This knowledge may be simple as detailing regions of an image where the information of interest is known to be located thus limiting the searchthat has to be conducted in seeking that information.

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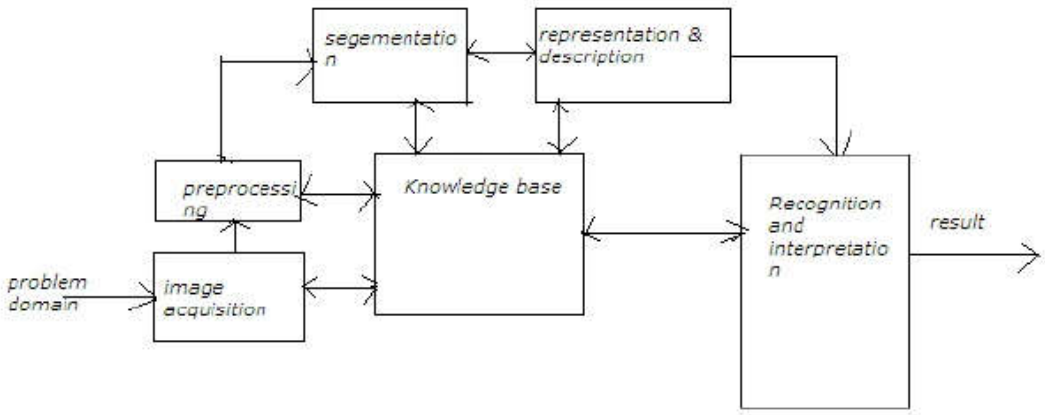


MLV TEXTILE ENGG COLLAGE BHILWARA

Department of Electronics and Communication Engg
SECOND midterm question paper with answer
Session (2017-18)
Subject –circuit analysis and synthesis

Q1. Explain the basic Elements of digital image processing:

Five elements of digital image processing,

•image acquisitions

•storage

• processing

•communication

•display

1)Image acquisition :

Two devices are required to acquire a digital image ,they are1)physical device:Produces an electric signal proportional to the amount of light energy sensed.2)a digitizer:Device for converting the electric output into a digital form.

2.storage:

An 8 bit image of size 1024*1024 requires one million bits of storage.three typesof storage:1.short term storage:It is used during processing. it is provide by computer memory. it consisits of frame buffer which can store one or more images and can be accessed quickly at thevideo rates.2.online

storage:It is used for fast recall. It normally uses the magnetic disk,Winchester disk with100s 0f megabits are commonly used .3.archival storage:They are passive storage devices and it is used for infrequent access.magnetictapes and optical disc are the media. High density magnetic tapes can store 1 megabit inabout 13 feet of tape .

3)Processing:

Processing of a digital image p involves procedures that are expressedin terms of algorithms .with the exception of image acquisition and display most image processingfunctions can be implemented in software .the need for a specialized hardware is calledincreased speed in application. Large scale image processing systems are still being usedfor massive image application .steps are being merge for general purpose small computer equipped with image processing hardware.

4)communication

:Communication in ip involves local communication between ip systems and remotecommunication from one point to another in communication with the transmission of image hardware and software are available for most of the computers .the telephone linecan transmit a max rate of 9600 bits per second.so to transmit a 512*512,8 bit image at

this rate require at last 5 mins.wireless link using intermediate stations such as satellitesare much faster but they are costly.

5)display:

Monochrome and colour tv monitors are the principal display devices used in modernips.monitors are driven by the outputs of the hardware in the display module of thecomputer.

Q2 Explain the Structure of the Human eye

The eye is early a sphere, with an average diameter of approximately 20 mm.Three membrance enclosestheeye,1.Cornea2.ScleraorCornea:3.Retina. The cornea is a tough, transparent tissue that co vers the anterior surface of the eye.

Sclera:

Sclera is an opaque membrance e that encloses the remainder of the optical globe.

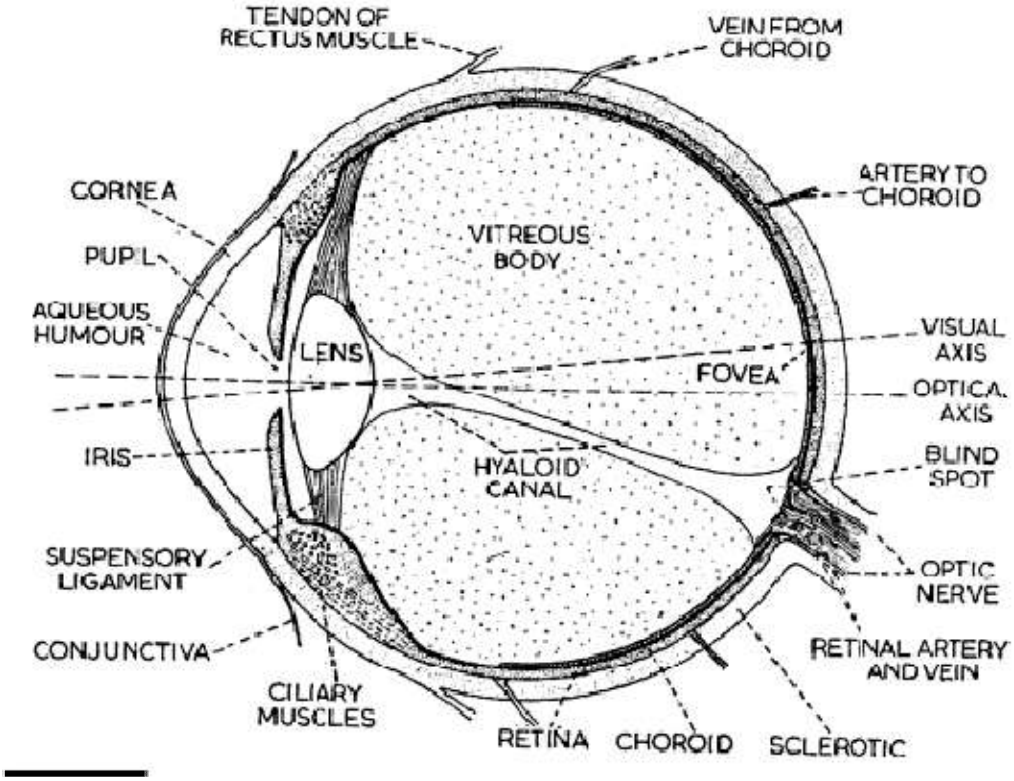
Choroid:

-Choroid directly below the sclera. This membrance contains a network of bloodvessels that serve as the major source of nutrition to the eye.-Choroid coat is heavily pigmented and helps to reduce the amount of extraneouslight entering the eye.-The choroid is divided into the ciliary body and the iris diaphragm.

Lens:

The lens is made up of concentric lay ours of fibrous cells and is suspended byfibrous that attach to the ciliary body. It contains 60to 70% of water about 60%fat and more protein than any other tissue in the eye.

Retina:



Q3 Explain the RGB model

RGB model,each color appears in its primary spectral components of red ,greenand blue.This model is based on a Cartesian coordinate system.This color subspace of interest is the cube.RGB values are at three corners cyan.magenta and yellow are at threeother corner black is at the origin and white is the at the corner farthest from theorigin this model the gray scale extends from black to white along the line joining these two points .The different colors in this model are points on or inside the cube and are defined by vectors extending from the origin.Images represented in the RGB color model consist of three componentimages,one for each primary colors.The no of bits used to represented each pixel in whicheach red,green and blue images is an 8 bit image.Each RGB color pixel of values is saidto be 24 bits .The total no of colors in a 24 bit RGB images is 92803=16777,216.The acquiring a color image is basically the process is shown in fig,. A color image can be acquired by using three filters,sensitive to red,green and blue.When we view a color scene with a monochrome camera equipped with one of these filters the result is amonochrome image whose intensity is proportional to the response of that filter.Repeating this process with each filter produces three monochrome images that are theRGB component images of the color scene.the subset of color is called the set of safeRGB colors or the set of all system safe colors. In inter net applications they are calledsafe Web colors or safe browser colors.There are 256 colors are obtained from differentcombination but we are using only 216 colors

Q4 Descibe the HSI color image modelThe HSI Color Model

The RGB,CMY and other color models are not well suited for describing colors interms that are practical for human interpretation.For eg,one does not refer to the color of an automobile by giving the percentage of each of the primaries composing its color.When humans view a color object we describe it by its hue, saturation and brightness.

•Hue is a color attribute that describes a pure color.

•Saturation gives a measure of the degree to which a pure color is diluted by whitelight.

•Brightness is a subjective descriptor that is practically impossible to measure. Itembodies the achromatic notion of intensity and is one of the key factors indescribing color sensation

•Intensity is a most useful descriptor of monochromatic images.

Converting colors from RGB to HSI

Given an image in RGB color format ,

•the H component of each RGB pixel is obtained using the equation

H = {theta if B<=G360-theta if B>Gwith

theta = cos

-1{1/2[R-G) +(R-B)/[(R-G)

2+ (R-B)(G-B)]

1/2}

•The saturation component is given by

S =1-3/(R+G+B)[min(R,G,B)]

•the intensity component is given by

I=1/3(R+G+B)

Converting colors from HSI to RGB

Given values of HSI in the interval [0,1],we now want to find the correspondingRGB values in the same range .We begin by multiplying H by 360

o,which returns the hueto its original range of [0

o,360o]

RG sector(0

o<=120o)

.when h is in this sector ,the RGB components are given by theequations

B = I (1 - S)R = I [1 + S cos H/cos(60o

- H)]G = 1 - (R + B)GB Sector(120o<= H < 240o).

If the given value of H is in this ,we first subtract 120ofrom it

H = H -120o

Then the RGB components are

B = I (1 – S)G = I [1 + S cos H/cos(60o- H)]B = 1 - (R + G)BR Sector(240o<=H<=360o).

Finally if H is in this range we subtract 240ofrom it

H = H - 240o

Then the RGB components are

G = I (1 - S)B = I [1 + S cos H/cos(60

o

- H)]R = 1 - (G + B)