

Number of principle vanishing point in a projection
is determined by the no. of principle axis
intersecting the view plane.

8:02:2018

VISIBLE SURFACE ~~REDUCTION~~ METHOD:

Visible surface reduction algorithm is broadly classified into whether they deal with object definition directly or their projected images. These two approaches are called object-space methods and image-space methods.

NOTE:

Major consideration in generation of realistic graphic display is identifying those parts of a scene that are visible from a chosen viewing position.

^{2m} Object space method compares the objects and the parts of the object to each other within the scene definition to determine which surfaces as a whole, we should label as visible.

^{2m} In a image space algorithm, the visibility is decided point by point in each pixel position on the projection plane.

Most visible surface algorithms use image-space method although object space method can be used to locate the visible surface in some cases.

line display algorithms use object space methods to identify visible lines in wireframe display but many image space visible surface algorithms can be adopted easily to visible line reduction.

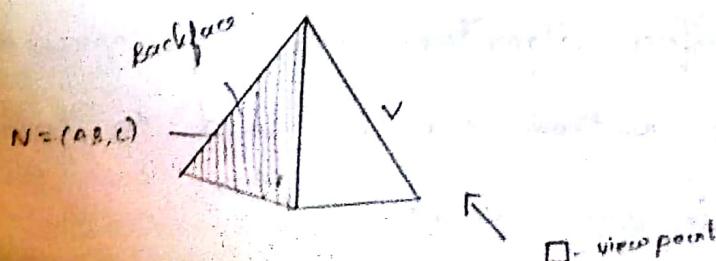
2) // There are major differences in the basic approach taken by various visible surface reduction algorithm. Most used sorting and coherence methods to improve performance.

Sorting is used to facilitate depth comparisons by ordering the individual surfaces in a scene according to the distance from the view plane. Coherence methods are used to take advantages of regularities in a scene.

BACKFACE REDUCTION: 8m

A fast and simple object-space method for identifying the backfaces of polyhedron is based on the "inside-outside Test". A point (x, y, z) is inside a polygon surface with a plain parameters A, B, C, D if

$$ax + by + cz + d < 0 \rightarrow \text{①}$$

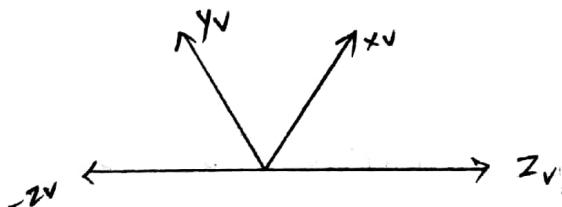


When an inside point is along the line of sight to the surface, the polygon must be a backface, we are inside that face and cannot see the front of it from our viewing position.

If V is a vector in the viewing direction from the eye (camera) position as shown in the above diagram, then this polygon is a backface if $V \cdot N > 0$, where N is normal vector.

If object description have been converted to projection coordinates and our viewing direction is parallel to Z_v axis then $V = (0, 0, V_z)$ and $V \cdot N = V_z c$.

In a right handed viewing system with viewing direction along negative Z_v axis as shown in



the diagram. The polygon is a backface if $c < 0$ we cannot see any face whose normal has Z -component $C = 0$.

In general we can label any polygon as a backface if its normal vector as a Z component value, $C \leq 0$

Left handed viewing system uses clockwise direction,
Right handed viewing system uses counterclockwise
direction.

By examining the parameter c for different
planes defining an object, we can easily identify
all the backfaces.

A general scene can be expected to contain
overlapping objects along the line of sight. We then
need to determine whether the obscured objects
are partially or completely hidden by other
objects. In general backface removal can be
expected to eliminate about half of the polygon
surfaces in a scene for further visibility test.
Two methods:

Scan Line Method:

This image space method is used for
removing image surfaces is an extension
of scan line algorithm. For filling polygon
interiors instead of filling just one surface we
deal with multiple surfaces. As each scanline
is processed all polygon surfaces intersecting
that lines are examined to determine

which are visible. Across each scan line depth calculations are made for each overlapping surface to determine which is nearest to the view plane. When the visible surface has been determined, the intensity value for that position is entered into the refresh buffer.

Edge table contains coordinate end points for each line in the scene, inverse slope of each line and pointers into the polygon table to identify the surfaces bounded by each line. Polygon table contains coefficients of the plane equation for each surface, intensity information for the surfaces and possibly pointers into the edge table.

To facilitate the search for surfaces processing, the given scan line, the active list of edges is introduced, this active list will contain only the edges that cross the current scan line, sorted in order of increasing ∞ .

We define a flag for each surface, that is set on or off to indicate a position along a scan line ^{whether} inside or outside the surface. Scan lines are processed from left to right, at the left most boundary of the scan line the flag is turned on and on the right most boundary it is turned off.

UNIT-IV MULTIMEDIA

Define multimedia and components of multimedia.
Components of multimedia are

- * Video teleconferencing
- * cooperative work environment.
- * distributed lecture
- * Tele medicine
- * Searching
- * Augmented reality
- * Audio clues
- * Searchable new videos
- * Story boarding
- * Voice recognition.

Hypermedia-links

History - Learn the years not examples.

linear & Non-linear.

Ex: Book Ex: Hyperfest, HyperMedia.

WWW is used for hyperMedia (W3 consortium).

Goals: (3)

TIM BERNESLY

Whom ever from where ever they can access.

Navigation should be proper and effective.

Only respective people should respond to particular post.

1960 - GML (Generalized Markup Language)

SGML (Standard GML)

HTML

XML

HTTP : stateless. because of request response protocol.
No information will be carried to next request.

URI & URL : Uniform Resource Identifiers
Uniform Resource Locator.

Methods : get(), post().

Version status - code status - phrase.

http /1.1 200 ok server

XML : DTD, XSL

User defined tags.

SMIL : Synchronized Multimedia Integration language.
Based on XML.

<SMIL xmlns> </SMIL>

Three types of resources : (1) seq. (2) par. (3) excl.
used in synchronization

(1) seq. - sequence <seq> </seq>

(2) par. - parallel <par> </par>

(3) excl. - exclusive. <excl> </excl>.

Overview of hypermedia

Music sequencing, (Cube base, Macromedia)

Digital Audio

Graphics & Image editing

Video Editing

Animation

// Multimedia authoring & Tools (13 m)

(i) Multimedia authoring Metaphor

Authoring - (6m) Process of creating multimedia app.

Types - Scripting language Metaphor.

Slide show Metaphor.

Hierarchical Metaphor

Ionic/flow control.

Frame Metaphor.

Card/ splitting Metaphor.

Cast/ Core splitting Metaphor

(ii) Multimedia Production :

Graphic designer, music director, artist, scripting, programmer.

Alpha version → Programming (10% important) →

Story boarding → key frame → Prototype →

(iii)

Multimedia Presentations :

Font → color → background, styles.

Not to use too many colors.

Color Contrast Program (RGB)

01/03/2018

VIDEO TRANSITION :

Mainly used for seeing changes, replacing the pixel which is called as wipes.

disolve, - dissolution of pixels.

fade in, replacement of picture by B&W.

fade out.

Technical design issues - Computer platform, portability, video format NTSC, PAL, SECAM; graphics card, memory and space requirements, delivery methods. Labelling is very important.

(N)

Automatic Authoring:

Automatically creating multimedia document from the existing source is called automatic authoring.

(i) HyperMedia.

Externalization & linearization

(ii) HyperImage.

Editing & Authoring Tools:

See examples no need of explanation in details.

Ex: Flash, Adobe, Macromedia director.

Shape Tween & Movement Tweening

Action script - It is used to trigger an event.

VR Modelling language //

MULTIMEDIA NETWORKS:

LAN, WAN

OSI layers - 8 m.

TCP/IP Protocol

N/w layer - IP protocol (connection less).

NAT, IPv4

Multiplexing

FDM, TDM, SDM

Frequency Division Multiplexing

Time Division Multiplexing

Space Division Multiplexing

Port Division Multiplexing

ISDN

POTS

SONET

ADSL \rightarrow FDM

// 8M

802.1 LAN protocol

802.2 LLC

802.3 Ethernet

802.10 Security

* 802.11 Wireless

802.14 Cable TV

* 802.15 Wireless PAN (distance 10 meters)

802.16 Broadband wireless

CSMA/CD

- CSMA/CA

Token ring : ring topology

FDDI - Fibre Distributed Data Interface

Dual ring topology.

Wireless

- Switching : Packet switching (Data N/W) Ex: Airtel,

Circuit switching (PSTN)

PSTN - Public Switched Telephone N/W.

Datagram and Virtual Circuit - To transmit the packets.

REQUEST

ACCEPT

FRAME RELAY. (Packet Switching).

CELL RELAY (Asynchronous Transfer Mode).

ATM cell structure - 2 Interface.

- UNI
- NNI

Access N/W - We can connect to the end user.
used to access the core user.

Access N/W Types:

Hybrid

Fibre.

Coaxial cable N/W

Fibre to the curb

Fibre to the home

Terrestrial distribution

Satellite distribution.

Multimedia N/W Communication & Applications:

Challenges, characteristics: Quality of service.

- Continuous media
 - Speed (data rate) Mbps, kbps.
 - Latency.
 - Packet loss or error.
- Volume
- Realtime
 - Jitter. (Measure used for audio playback & video playback).
 - Sync Skew.
- Interactive.

Multimedia Service Clash:

Realtime - two way traffic.

Priority data.

Silver. - Moderate latency,

Best effort

Bronze

Persued QoS :

QoS for IP protocols.

differential service

Multiprotocol label switching

Prioritized delivery :

- Priority for types of media.
Audio has higher priority than video.
- Prioritization for uncompressed audio.
- PCM (Pulse Code Modulation)
- Priority for JPEG
- Priority for compressed video MPEG.
- Multimedia over IP.
Unicast.
Multicast.

IGMP

Internet Group Management Protocol

Multicast - Query Message

Report Message

Reliable Multicast Transport Protocol.

RTP (Realtime Transport Protocol).

↳ Audio stream; Video stream

RTCP (RealTime Control Protocol):

5 types of Packet
↳ Receiver report

↳ Sender report.

↳ Source description

↳ Bye.

↳ Application Specific Function.

RSVP - Resource Reservation Protocol.

M - senders N - receivers

Protocol

- RESV message
- PATH message

Challenge - Sender & receiver will compete for the resource. (deadlock)

Creates only "soft states".

Real Time Streaming Protocol: (RTSP)

Get Request 6m * IMP

Respond

Option Request

Setup Request

Play request

Pause request

Teardown request

Internet Telephony Public Switched Telephone Network:

VOIP - Voice Over Internet Protocol.

Difference Internet Telephony & POTS:

- Flexibility, extensibility.
- Switching
- Multicast
- Advance Multimedia compression techniques.

Session Initiation Protocol (SIP)

It is an application layer protocol.

3 types of server

- Proxy Server
- Redirect Server
- Location Server.

Session Announcement Protocol (SAP)

Invite, Ack, Option, cancel, bye, register.

Session Description Protocol (SDP)

• to gather information of caller media capabilities.

Types of media sessions.

Multicast or unicast.

Multimedia over ATM networks

ATM adaptation layers - 5 layers.

5 Types

Video Bit rates (cbr)

constant bit rate

(vbr) variable

(abr) available

(ubr) unspecified

MPEGI Convergence to ATM

AAL5 - ATM Adaptation layer - 5.

It is mainly for multimedia transmission.

MPEGI convergence to ATM

DMIF - Delivery Multimedia Integration Framework.

- It has inbuilt quality of servicing.
- Continuous monitoring.
- Specific QoS queries.
- QoS violation notification.

MPEG14 Over IP :

MPEG14 IETF
Session carried over RTP, RTSP, HTTP.

Media On Demand:

Handling many multimedia issues.

1. Interactive TV and Setup Box.

- M/W interface & communication unit.
- Processing Unit.
- Audio, Video unit.
- Peripheral Control Unit.

2. Content delivery network.

- Infrastructure supporting content delivery.

- Content delivery network (CDN).

- Efficient distribution of content.

- Reduces latency and improves user experience.

- Utilizes various technologies like edge computing.

- Provides fast access to content from multiple locations.

- Reduces bandwidth requirements and costs.

- Improves scalability and reliability of content delivery.

- Utilizes various protocols like HTTP, HTTPS, and TCP.

- Provides efficient content delivery for various media types.

Broadcast Scheme for Video On Demand :

Important quality of Measure - MOD.

Waiting Time - latency.

Access Time.

Upper Bound.

(1) Staggered Broadcasting

cBR encoding - measured in time bits.

(2) Pyramid Broadcasting:

dividing into segments of increasing size.

drawback - client side needed more space.

SkyScraper broadcasting - series of segment size.

GEBB - Greedy Equal Bandwidth broadcasting

Series of segment.

(3) Harmonic Broadcasting:

All segment size remains constant.

(i) Cautious Harmonic Broadcasting.

(ii) Quasi Harmonic Broadcasting.

(iii) PolyHarmonic Broadcasting.

(4) Pagoda Broadcasting:

Combines the advantages of Harmonic & Pyramid

Drawback: Bandwidth inefficiency.

- 4. Jitter - Maximum ~ 200 msec.
- 5. Error rate - Frame error should be minimized.

Problems with wireless device:

Handle size.

Processing power.

Memory size. (wireless device).

Batter power. (wireless device).

- * Synchronization loss.
- * Loss of decoder synchronization - Invalid port symbol.
 - ↳ Algorithm.
 - ↳ Synchronization of every single macro block.
- * Error concealment - Approx loss data at decoder side used in spatial domain
 - 1. Dealing with nested macro blocks.
 - 2. Combining the temporal spatial frequency coherence.
 - 3. Frequency smoothing for high frequency coefficient.
- * Estimation of loss of decoded blocks - Prevents the decoding entire predicted blocks.
- * Forward Error Corrections - Hamming code.
- * Block Codes - will be added by space primitive value coded streams.

Stream Merging: (2m).

Used for dynamic user interaction.

Multicast session.

Technique used - (HMSM)

Piggy Backing:

Slightly and dynamically adjusting the streams.

WIRELESS NETWORK:

PDA, Videophones

Pico cell - It covers 100 meters.

Microcell - It covers, about 1000 meters.

Cell - It covers 10000 meters coverage.

Macro cell - Satellite phones.

RSS - Received signal strength.

Hand Over - signal gets transferred to nearby tower.

Multipath Fading - Signals may reach directly or get traversed through different disturbances.

TDM, FDM, GSM // not for exam.

MULTIMEDIA OVER WIRELESS NETWORKS:

Requirements for Multimedia Transmission - 3GPPQoS.

- (i) Synchronization - Audio & Video should be synchronized with \approx 20 seconds.
- (ii) Throughput - Minimum video bit supported will be 32 kbps.
- (iii) Delay - Maximum end to end transmission delay is said to be 400 msec. (millisecond).

* Convolution code - defined using polynomials.

11/03/2018

UNIT - V

chapter - 2, 3, 4, 5, and

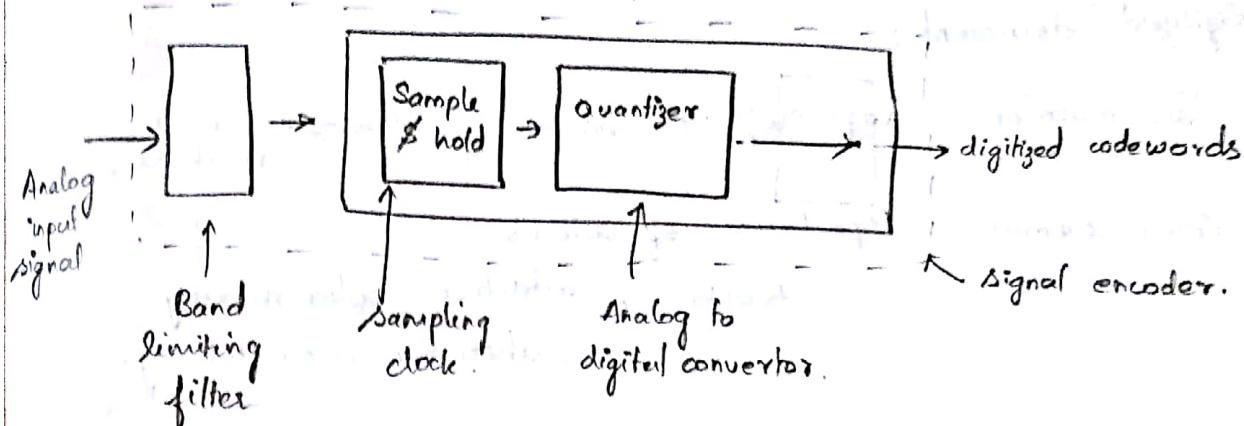
Television broadcast

PSPN.

Multimedia information presentation. (8m)

- * Signal encoder.
- * Signal decoder.

ENCODER DESIGN.



codeword - unique combination strings.

ENCODE DESIGN / DECODE DESIGN (8 m).

Nyquist : (2).

Time varying analog signal.

Decoder design



low pass filter - To reproduce the original signal.

(or) recovery (or)

recovery construction filter.

Text :

Three types of text available.

1. unformated Text (Plain Text). (asci characters)
2. Formated Text (Rich Text).
3. Hyper Text

Images :

Represented as pixels.

graphics - arts, line, rectangle + square

Digitized document :

Fax machine - page will be scanned \rightarrow N/W \rightarrow receiver machine.

Color sensor - spectrum of colors

RGB , additive color mixing
subtractive color mixing.

Digitized camera & scanners

device - image scanner.

Image capture \rightarrow silicon chip \rightarrow image sensor \rightarrow photo sites (CCD)

Charge Couple Device.

Analog to digital converter - To edit the images.

AUDIO :

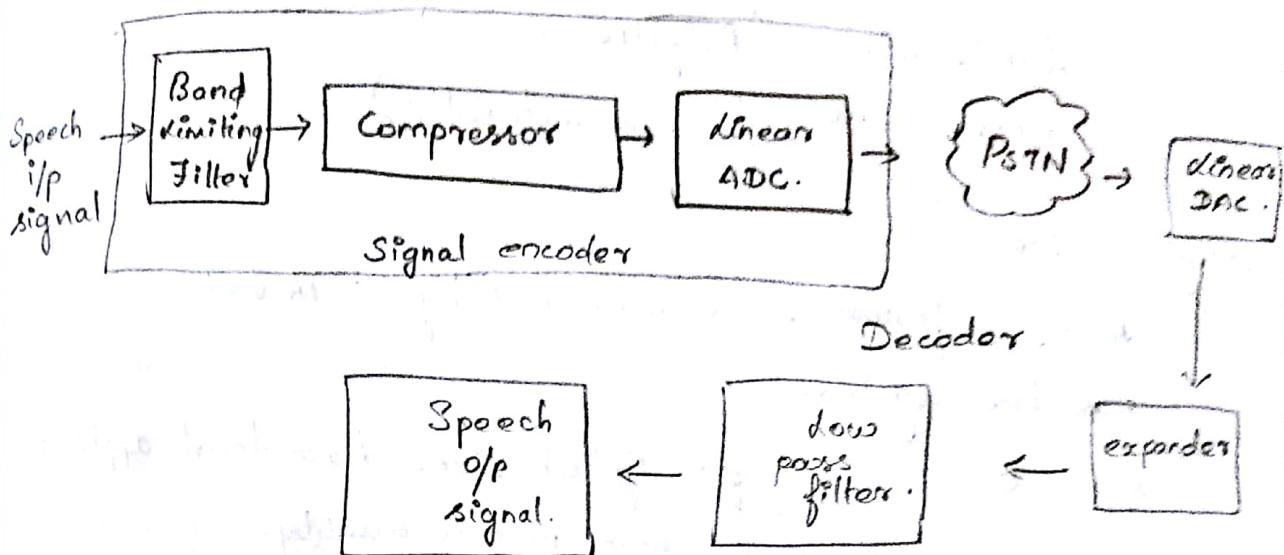
Speech Signal (used in interpersonal application)

Time varying analog signal.

Loud speakers - to output the audio signals.

PCM speech : (8m)

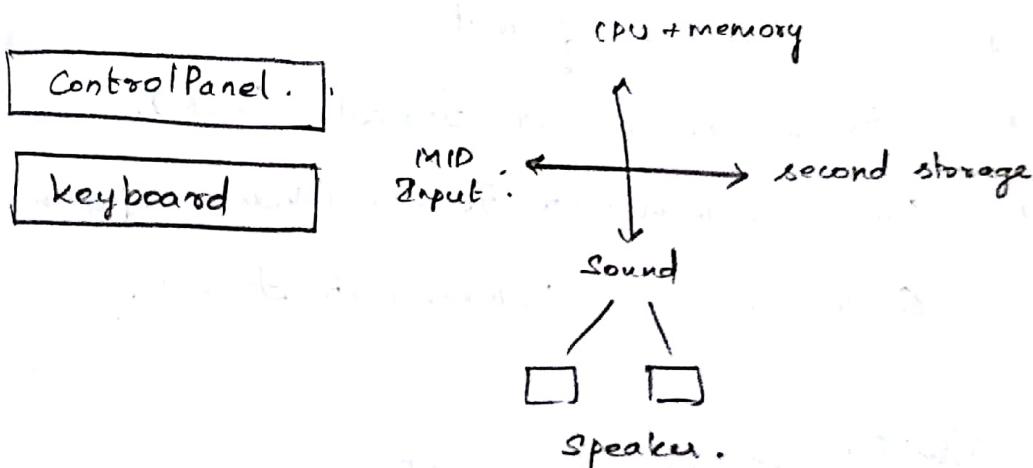
PCM - Pulse Code Modulation



CD Quality Audio :

Digital storage unit , bit rate .

Synthesized Audio :



Musical instrument keyboard Interface .

VIDEO:

Entertainment

Interpersonal video conferencing .

Broadcast television - NTSC
PAL
SECAM

COLOR SIGNAL - Brightness , Hue (actual color source)
saturation (no white light).

Luminance - (Brightness source)

Chrominance (color characteristics)

Digital video : (8m)

4:2:2 format - recommended by CCIR 601

525 line system

4:2:0 - used for digital video broadcast applications.
Gives the best picture quality.

525 - 625 line system.

no need of resolutions .

HDTV : High definition TV.

4:2:2 or 4:2:0 format.

SIF : Source Intermediate Format. (VCR).

CIF : Common Intermediate Format (Video Conference)

QCIF : Quarter Common Intermediate Format.

PC VIDEO : (MP Table 2m or 8m.)

Digitization Format System Spatial Temporal
 resolution resolution

H:2:0

525-line
625-line

$$Y = 640 \times 480$$

$$cb = cr =$$

60 + 12.

Text & Image Compression:

Compression Principles No calculation, no problems.

Source encoders & destination decoders.

loss less & lossy compression.

Entropy Encoding (loss less), (Independent of Info).

Source Encoding.

Application of Compression algorithm, is the main function of source encoders and decompression is carried out by destination decoders.

Entropy Encoding \rightarrow Run length encoding

Some encoding \rightarrow Alternate form \rightarrow differential encoding

Transform encoding \rightarrow Changing from one form to another \rightarrow spatial frequency \rightarrow Horizontal frequency \rightarrow DCT (Discrete Cosine Transform).

Text Compression : (8m)

Algorithms: Static Huffman Coding

Dynamic Huffman Coding

Arithmetic coding

Lempel-Zip Coding (LZ)

Lempel-Zip Welch Coding (LZW)

21/03/2018

Huffman coding

Static - codeword will remain the same.

Dynamic

Static:

Root node RN



A = 1

B = 01

C = 001

D = 000

$A_4 \rightarrow A_4 \rightarrow A_4(1)$

$B_2 \rightarrow B_2(1) \rightarrow 4(0)$

$(1) \rightarrow ?$
 $D, (0) \rightarrow \{ 20 \}$

Other name for dynamic is adaptive.

Basic huffman coding requires transmitter, receiver for knowing the code.

Arithmetic coding:

Probabilities for string of characters,
e = 0.3
n = 0.3
t = 0.2
w = 0.1
. = 0.1

decompel - Zip Coding :

Dictionary based compression algorithm. (LZ coding)

Dynamically text is transferred to the dictionary.

Image Compression:

In internet to compress the graphic images we use GIF.

GIF Compression :

Color dictionary R G B
8 8 8 (bits) Total (On 256)
values

2 - TIFF (Tagged Image File Format),
16 bits, RGB.

Digitized document :

Fax.

↳ Table of code words

EOL - End of line code.

Three possibilities

Pass Mode

Vertical Mode.

Horizontal Mode.

Digitized Picture :

JPEG - Joint Photographic Export Group.

Video compression & Picture compression.

IS 10918 - International Standard.

Lossy.

Five main stages : JPEG Encoding.

1. Image / Block preparation.

2. Forward DCT.

$$F[i, j] = \frac{1}{4} c(i)c(j).$$

3. Quantization.

4. Entropy encoding.

↳ Vectoring

Zig Zag scan.

↳ Differential encoding.

5. Run length encoding.

JPEG decoding:

Frame decoder.

Image Builder.

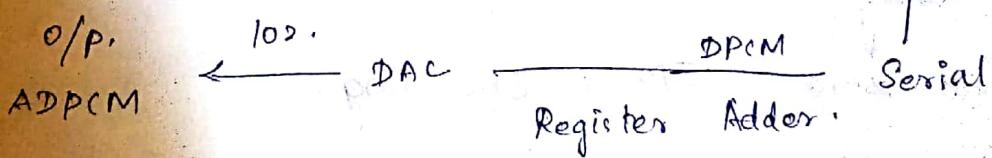
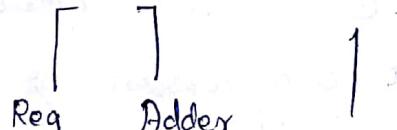
Progressive mode.

Hierarchical mode.

AUDIO & VIDEO COMPRESSION:

DPCM - Digitized Pulse Code Modulation - It is used to compress audio signal derived from PCM. It also consists of encoder, decoder. It uses bandlimiting filter.

Speech I/P \rightarrow B \rightarrow ADC \rightarrow Subtr — Parallel



Adaptive differential PCM.

Adaptive Predictive coding.

Linear Predictive Coding.

Pitch / Period / Loudness)

node - excited LPC.

Vocal tract.

Enhanced excitation.

LPC

Speech

Processing delay

Algorithmic delay.

Perceptual coding

Psycho acoustic.

Model

Frequency Masking

Temporal Masking.

MPEG Audio loaders:

Motion picture expert groups (especially for audio).

Frequency Subbands.

DFT (Discrete Fourier Transform).

SMR (Signal Mask Ratio).

PCM, masking —  — DC + PCM — %.

Dolby audio Coders:

Fixed bit strategy.

Forward adaptive.

Dolby AC-1 (Satellite)

VIDEO COMPRESSION: (MJPEG)

Inter personal

Video - Sequence of digitized picture.

Motion estimation

Motion Compensation.

There are 2 compressed frames encoded
Predictive.

1st frame is called as i-frame
another one is called p-frame.

GOP - Group of Picture.

B-frame, D-frame also available.
(5th)

Only the address of macro block will be encoded.

Performance:

H.261, CIF, QCIF

CIF - Common Intermediate Format.

H.263 - Used for wireless, Public Switched telephone network.

Error tracking:

Invalid variable length code.

DCT - coefficient out of range.

Independent segment decoding:

It is used to perform error tracking.

Acknowledgement Message.

AK, NAK,

MPEG 1, 2, 3, 4

MPEG 4 - VOP

Standards for Multimedia Communication:

Interpersonal (Audio, Video)

Intranet, Internet. (Internet Interactive).

Entertainment (Satellite, cable tv).

Application Standard - Appropriate user gets the standardization.

Standards used for Circuit Network

H . 320

H . 324 - Multipoint Conferencing.

H . 321

H . 310

H . 322

Packet Switched Network - H . 323.

Call settee.

RASP (Resource Access Service Protocol),

IETF (Internet Engineering Task Force).

MIME (Multipurpose Internet Mail Extension).

Standards for Entertainment Application:

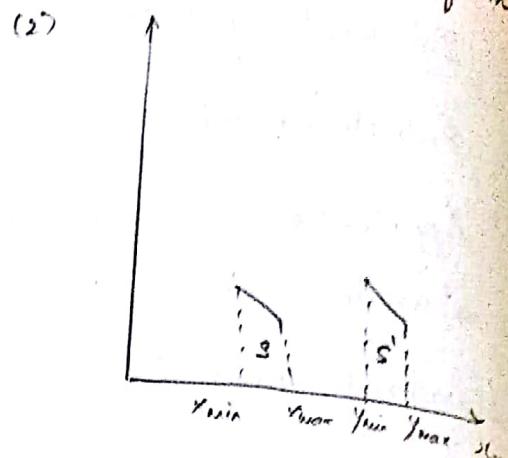
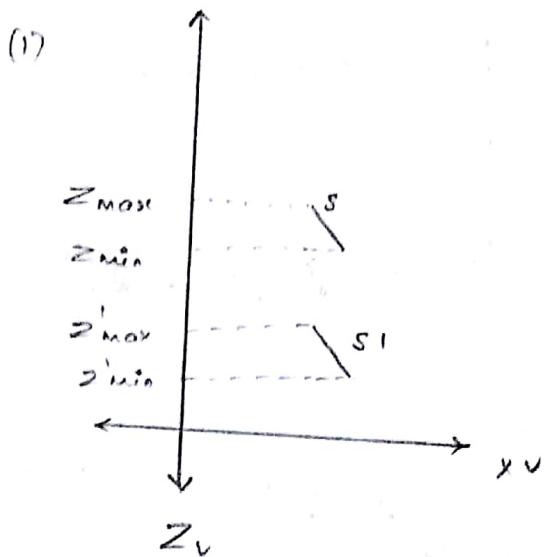
Movie on Demand.

ADSL.

Interactive Television.

DEPTH - SORTING METHOD : 8M. (PAINTER'S ALGORITHM)

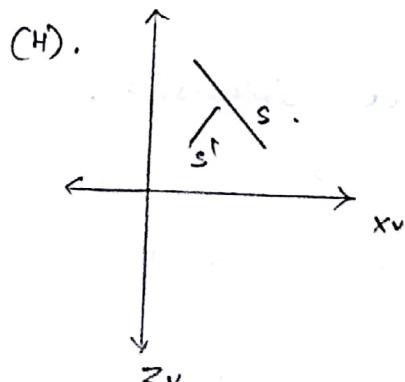
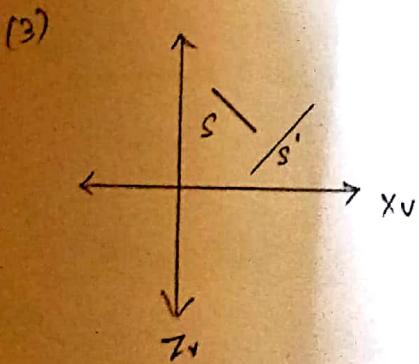
- 1st paragraph, w/ test condition
explain ⑥ diagrams



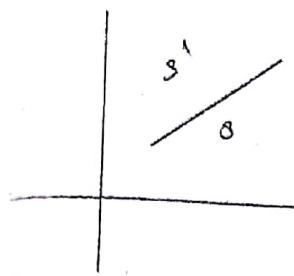
- Surface will be sorted with decreasing depth.
- Greatest depth.

Distance from the view plane considering for sorting.
Test - 4 conditions

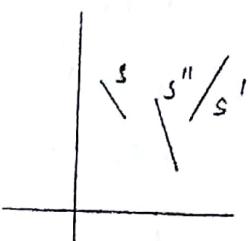
- Bounding the rectangle xy-plane.
↳ Do not overlap
- Surface air.
- Overlapping surface is in front of f.
- Projection do not overlap.



(5)



(6)



Infinite loop - If 2 or more surfaces alternatively obscure each other (asm).

To avoid infinite loop - set flag for each surface.

Fractal drawing : (UNIT-1).

Fractal geometric method -

Previously we will be using euclidian geometry method with equations. If the object is shapeless we go for fractal drawing.

Fractal drawing - different levels of magnification.

Natural objects can be realistically described with fractal geometry method

In computer graphics, natural object display, mathematical system & physical system visualized.

Fractal drawing has two characteristics.

1. Infinite detail
2. Self similarity

Fractal Dimension - amount of variation.

Fractal dimension - is sometimes referred to as fractional dimension.

Fractal Procedure:

$$P_1 = F(P_0)$$

$$P_2 = F(P_1)$$

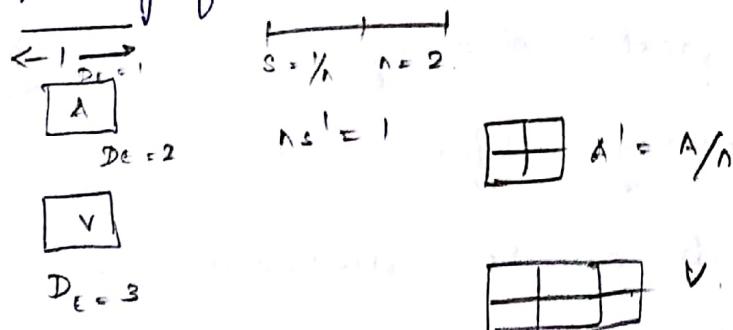
$$P_3 = F(P_2).$$

Classification of fractal:

1. Self-similar \rightarrow statistical self-similar \rightarrow tree
2. Self-affine \rightarrow found with different scaling parameters
3. Invariant \rightarrow statistical self-affine
4. Fractal sets.

Invariant - Non linear transformation.

Self-squaring of fractal, self-inverse fractal.



Fractal dimension

Scaling factor = $1/2$.

Topological covering concepts were originally used to extend the meaning of non-geometric properties.

Hausdorff - Besicovitch dimension or fractional dimension.

Box-Covering Method



Initiator



Generator



Snowflake Pattern or Koch curve (5 iterations)

Segment length = 1

$\frac{1}{3}$ $\frac{1}{3}$

length = 1

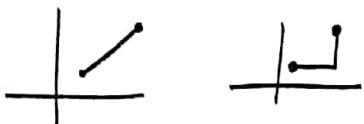


Affine fractal construction method

Brownian motion or random walk:

FFT - Random midpoint displacement Method.

(Fast Fourier Transform)



Self-squaring fractal:

$Z = x + iy$ Transform portion can converge to infinity.

Attractor - Finite limit point

$$z' = f(z)$$

$$z \mapsto (1-z).$$

Self-Inverse fractal:

$$(\overline{P_0 P})(\overline{P_0 P'}) = r^2.$$

Shape Grammars:

Rules tell how to draw the shape.

Computer Animation :

Time sequence - visual scene .

Design of Animation sequence . (8 m) .

- (1) Storyboard layout
- (2) Object definition
- (3) Keyframe Specification
- (4) Generation of - in - frames .

Anime Morphing (2 m)

Motion Specification :

1. Direct Motion
2. Goal directed
3. Kinematics