UNIT 5

PART A	
chromaticity	quality of a color (hue/saturation)
chromaticity diagram	visual representation of all perceivable colors; mixture of colors + comparison
RGB	additive color model; combining at full intensity produces white
YIQ	Y - luminance component; grayscale information
CMY	subtractive(from reflected white) color model; mixing inks/dyes/pigments;
HSV/HLS	H - Hue (pure color); HSV - single hexcone; HLS - double hexcone S - saturation (vibrancy) V - value(brightness)
key frame systems	important frames (keyframes); start and end; intermediate frames (tweening/in-betweening)
Bitmap animation	manipulating pixels/blocks (Frame-buffer animation)
Design of Animation Sequences	outline the storyboard or script. define motion sequence, objects, and keyframe positions.

UNIT 5 (cont)

motion specification	define how objects move and transform over time; paths, kinematics, dynamics

HSV preferred over RGB when selecting hue, brightness and vibrancy

RGB to YIQ

Y=0.299R+0.587G+0.114B

I=0.5959R−0.2746G−0.3213B

Q=0.2115R−0.5227G+0.3112B

Advantages of YIQ

1. Bandwidth efficiency	more for Y; less for I & Q
2. Monochrome compatibility	Y carries brightness
3. Perceptual separation	matches human vision
4. Reduced interference	improved signal quality (separating luminance & chrominance)

HSV

H (Hue): Base color (0°–360°)
S (Saturation): Color intensity (0–100%)
V (Value): Brightness (0–100%)

Steps for Palette Creation	Step 1 – Choose Fixed Hue Step 2 – Vary Saturation Step 3 – Vary Value Step 4 – Generate Color Grid/Matrix

CMY to RGB

Red (R) = M + Y	C absorbs Red
Green (G) = C + Y	M absorbs Green
Blue (B) = C + M	Y absorbs Blue

mixing two primary colors subtracts two wavelengths of light, leaving only the color perceived as their overlap (a secondary color: R, G, or B).

works by absorbing light

Characteristics of light

Wavelength: defines hue (color)
Intensity: defines brightness
Additive Nature: combines to form white → basis for RGB

Impact on RGB

Structure

Based on Red, Green, Blue (human cone sensitivity)

Represented as a 3D color cube

Operation

Additive mixing: R+G+B=white; (0,0,0)=black

varying intensity values (0–255)

Directly used in display devices (monitors, TVs)

Raster and Keyframe animation

Raster Animation	Key-Frame Animation
Definition: Frame-by-frame images	Definition: Store key frames, generate in-betweens
Data Structures: Bitmap frames, frame buffer	Data Structures: Key frames, control points, interpolation (linear/spline)
Process: Each frame stored and displayed sequentially	Process: Interpolate intermediate frames between key frames
Storage: high	Storage: low
Motion realism: exact	Motion realism: smooth

Raster and Keyframe animation (cont)

Editing: Difficult	Editing Easy:
Short, detailed animations	Long animations with smooth motion

Chromaticity diagram

Represents Visible Color Range

2D slice, 3D color plane; isolate hue and saturation

horseshoe-shaped boundary; pure spectral colors

line of purples: non-spectral colors (mistures; connects red + blue)

Interior = all visible color combinations

Meaning of Points

Each point = specific color (hue (angle) + saturation (distance from center)

Center → white/gray (achromatic)

Boundary points = maximum saturation for that hue

lines between points - mixture

Placement of Primary Colors

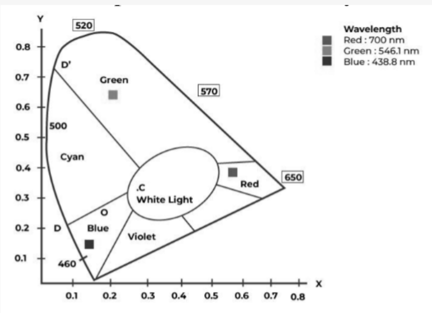
Primaries (RGB) are fixed points inside diagram (not at extremes; form a triangle)

triangle formed shows color gamut (subset colors)

Limitations:

Limited gamut (triangle ≠ full diagram)
Primaries not at extremes
Cannot represent all visible colors

fig. 1



Keyframe vs. Procedural

Keyframe	Procedural
Control: High (artistic, stylized motion)	Control: Limited (function-driven)
Realism: Depends on animator	Realism: High (follows physics)
Computation: Low runtime, high manual effort	Computation: Higher runtime, easy parameter changes
more control/style	less control/style
Best for stylized animation	Best for realistic motion

HLS vs. HSV

HLS	HSV
Uses Lightness (L)	Uses Value (V)
Pure color at L = 50%	Pure color at V = 100%
L controls brightness + contrast clearly	Less intuitive for contrast control

HLS : better for harmony (consistent palette), contrast + more reliable
HLS is more logical and error-proof for UI design due to better control over lightness and contrast

Squash & Stretch

Idea: Deform mesh based on velocity & impact, not uniform scaling

Algorithm

Step 1 – Calculate Deformation Axis	normalized velocity vector
Step 2 – Determine Deformation Magnitude:	scalar factor from object's speed (impact - sudden velocity change)

Squash & Stretch (cont)

Step 3 – Apply Volume-Preserving Deformation:	Scale along axis by k, others by 1/√k → volume preserved

At impact → use surface normal

Parameters

Mesh vertices; Velocity; Impact normal; Deformation factor (k); Damping/stiffness

Mathematical foundation

affine transformations; volume conservation

directional scaling matrix

spring-damper model