UNIT IV

Images: Making Still Images – Color - Image File Formats. Animation: The Power of Motion - Principles of Animation - Making Animation That Work - Video: Using Video How Video Works - Broadcast Video Standards - Integrating Computers and Television – Shooting And Editing Videos –Video Tips - Recording Formats - Digital Video.

Making Still Images

Introduction

A **still image** is a non-moving visual representation used in multimedia applications, websites, presentations, digital publications, advertisements, and educational content. Still images help communicate information quickly and effectively by combining visual appeal with meaningful content.

Types of Still Images

1. Bitmap (Raster) Images

- Made up of tiny picture elements called **pixels**.
- Quality depends on resolution.
- Enlarging may cause image distortion (pixelation).

Examples: JPEG, PNG, GIF, BMP, TIFF

2. Vector Images

- Created using mathematical formulas, lines, curves, and shapes.
- Can be resized without losing quality.
- Suitable for logos and illustrations.

Examples: SVG, AI, EPS, CDR

Common Image Formats

Format	Description	Usage
JPEG/JPG	Compressed image format	Photographs
PNG	Supports transparency	Web graphics
GIF	Supports animation	Icons, simple animations
BMP	Uncompressed bitmap image	Windows applications
TIFF	High-quality image format	Publishing and printing
SVG	Vector image format	Logos and web graphics

Steps in Making Still Images

Step 1: Image Acquisition

Obtain images through:

- Digital cameras
- Scanners
- Smartphones
- Graphic design software

Step 2: Image Editing

Modify images using software tools:

- Cropping
- Resizing
- Rotating
- Color correction
- Brightness adjustment

Step 3: Image Compression

Reduce file size for efficient storage and transmission.

Step 4: Image Storage

Save images in suitable file formats based on application requirements.

Step 5: Integration

Insert images into multimedia projects, websites, presentations, or documents.

Image Resolution

Resolution determines image quality and is measured in:

- **Pixels (px)**
- **Dots Per Inch (DPI)**

Higher resolution provides:

- Better clarity
- More detail
- Larger file size

Resolution Example

Resolution	Quality
640 × 480	Low

Resolution	Quality
1280 × 720	Medium
1920 × 1080	High
3840 × 2160	Ultra HD

Basic Image Editing Operations

- Cropping
- Scaling
- Rotation
- Flipping
- Sharpening
- Blurring
- Color Enhancement
- Background Removal

Popular Image Creation and Editing Software

Raster Graphics Editors

- Adobe Photoshop
- GIMP
- Paint.NET
- Corel PHOTO-PAINT

Vector Graphics Editors

- Adobe Illustrator
- CorelDRAW
- Inkscape

Advantages of Still Images

- Easy to create and edit
- Enhances visual communication
- Improves user engagement
- Supports learning and understanding
- Requires less storage than videos

Color in Multimedia

Introduction

Color is one of the most important elements in multimedia. It enhances the visual appearance of images, graphics, videos, animations, and user interfaces. Colors help attract attention, convey emotions, improve readability, and communicate information effectively.

What is Color?

Color is the visual perception produced when light of different wavelengths reaches the human eye.

Components of Color

1. **Hue** – The actual color (Red, Green, Blue, etc.)
2. **Saturation** – The intensity or purity of a color.
3. **Brightness (Value)** – The lightness or darkness of a color.

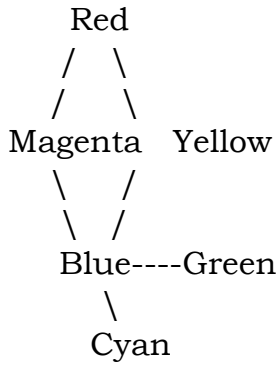
Color Model

A color model is a method of representing colors numerically.

1. RGB Color Model

- Used in computer monitors, televisions, and digital displays.
- Based on three primary colors:
    - Red (R)
    - Green (G)
    - Blue (B)

RGB Color Mixing



Examples

Color	RGB Value
Red	(255,0,0)

Color	RGB Value
Green	(0,255,0)
Blue	(0,0,255)
White	(255,255,255)
Black	(0,0,0)

2. CMYK Color Model

- Used in printing.
- Consists of:
  - Cyan (C)
  - Magenta (M)
  - Yellow (Y)
  - Black (K)

3. HSB/HSV Color Model

- H = Hue
- S = Saturation
- B/V = Brightness (Value)

Used extensively in graphics and image editing software.

Color Depth

Color depth determines the number of colors that can be displayed.

Color Depth	Number of Colors
1-bit	2 Colors
8-bit	256 Colors
16-bit	65,536 Colors
24-bit	16.7 Million Colors
32-bit	16.7 Million + Transparency

Color Wheel

Primary Colors

- Red
- Green

- Blue

Secondary Colors

- Cyan
- Magenta
- Yellow

Importance of Color in Multimedia

1. Visual Appeal

- Makes multimedia content attractive.

2. Communication

- Helps convey messages quickly.

3. Branding

- Organizations use specific colors for identity.

4. User Experience

- Improves navigation and readability.

5. Emotional Impact

Color	Emotion
Red	Energy, Danger
Blue	Trust, Calm
Green	Nature, Growth
Yellow	Happiness
Black	Power, Elegance
White	Purity, Simplicity

Applications of Color in Multimedia

- Website Design
- Graphic Design
- Video Production
- Animation
- Digital Marketing
- Gaming
- Mobile Applications
- Educational Content

Advantages of Proper Color Usage

- Improves user engagement.
- Enhances readability.
- Strengthens branding.
- Creates emotional connections.
- Highlights important information.

Image File Formats

Introduction

An **image file format** is a standardized method for organizing and storing digital images. Different formats are designed for specific purposes such as web publishing, photography, printing, graphic design, and multimedia applications. The choice of image format affects image quality, file size, compression, and compatibility.

Types of Image File Formats

Image formats are generally classified into:

1. Raster (Bitmap) Formats

Raster images consist of a grid of pixels. Each pixel stores color information.

Examples:

- JPEG/JPG
- PNG
- GIF
- BMP
- TIFF

2. Vector Formats

Vector images are created using mathematical equations, lines, curves, and shapes.

Examples:

- SVG
- EPS
- AI
- CDR

Common Image File Formats

1. JPEG (Joint Photographic Experts Group)

Extension: .jpg, .jpeg

Features:

- Uses lossy compression.
- Produces smaller file sizes.
- Suitable for photographs and realistic images.
- Widely supported across platforms.

Advantages:

- High compression ratio.
- Reduced storage requirements.
- Fast transmission over networks.

Disadvantages:

- Some image quality is lost during compression.
- Not suitable for images requiring transparency.

Applications:

- Digital photography
- Websites
- Social media images

2. PNG (Portable Network Graphics)

Extension: .png

Features:

- Uses lossless compression.
- Supports transparent backgrounds.
- Maintains high image quality.

Advantages:

- Excellent image quality.
- Transparency support.
- Suitable for web graphics.

Disadvantages:

- Larger file size than JPEG.

Applications:

- Logos
- Icons
- Website graphics

3. GIF (Graphics Interchange Format)

Extension: .gif

Features:

- Supports animation.
- Limited to 256 colors.
- Uses lossless compression.

Advantages:

- Supports simple animations.
- Small file size.

Disadvantages:

- Limited color range.
- Not suitable for high-quality photographs.

Applications:

- Animated images
- Banners
- Simple web graphics

4. BMP (Bitmap)

Extension: .bmp

Features:

- Developed by Microsoft.
- Stores images with minimal compression.
- High-quality image storage.

Advantages:

- Simple format.
- Good image quality.

Disadvantages:

- Very large file sizes.

Applications:

- Windows applications
- Image editing

5. TIFF (Tagged Image File Format)

Extension: .tif, .tiff

Features:

- Supports lossless compression.
- High image quality.
- Widely used in professional publishing.

Advantages:

- Excellent image preservation.
- Supports multiple layers and metadata.

Disadvantages:

- Large file sizes.

Applications:

- Professional photography
- Printing and publishing
- Archiving

6. SVG (Scalable Vector Graphics)

Extension: .svg

Features:

- Vector-based format.
- Can be scaled without quality loss.
- Supports animation and interactivity.

Advantages:

- Resolution independent.
- Small file size.
- Ideal for responsive web design.

Disadvantages:

- Not suitable for complex photographs.

Applications:

- Logos
- Icons
- Web graphics

7. RAW Image Format

Extensions: .raw, .cr2, .nef, .arw

Features:

- Stores unprocessed image data from digital cameras.
- Provides maximum editing flexibility.

Advantages:

- Highest image quality.
- Greater control during editing.

Disadvantages:

- Very large file sizes.
- Requires specialized software.

Applications:

- Professional photography
- Image post-processing

Animation: The Power of Motion

Introduction

Animation is the process of creating the illusion of movement by displaying a sequence of images or frames in rapid succession. In multimedia, animation brings static objects to life, making content more engaging, interactive, and visually appealing.

Animation is widely used in:

- Films and cartoons
- Video games
- Multimedia presentations
- Educational software
- Websites and mobile applications
- Advertising and marketing

The Power of Motion

Motion is one of the most effective ways to capture human attention. Animation transforms static content into dynamic experiences that can communicate ideas more clearly and memorably.

Why Motion is Powerful

1. Attracts Attention

Moving objects naturally draw the viewer's eye more effectively than static images.

2. Enhances Communication

Complex concepts can be explained more easily through movement and visual demonstration.

3. Improves Learning

Animations help learners understand processes, sequences, and changes over time.

4. Creates Emotional Impact

Motion can express emotions, moods, and personality, making content more engaging.

5. Simulates Reality

Animation can imitate real-world movement, making virtual environments more realistic.

Applications of Motion in Multimedia

- Animated logos
- Educational tutorials
- Scientific simulations
- Product demonstrations
- User interface effects
- Character animation
- Virtual reality experiences

Principles of Animation

The principles of animation were developed by Disney animators to create realistic and appealing motion. These principles remain fundamental in modern animation.

1. Squash and Stretch

Objects change shape during movement while maintaining their volume.

Purpose:

- Creates flexibility and realism.
- Gives objects a sense of weight.

Example:
A bouncing ball squashes when it hits the ground and stretches while moving upward.

2. Anticipation

A preparatory movement that signals an upcoming action.

Purpose:

- Helps viewers understand what will happen next.

Example:
A person bends their knees before jumping.

3. Staging

Presenting an action clearly so that the audience understands its purpose.

Purpose:

- Directs viewer attention to important elements.

4. Straight Ahead Action and Pose-to-Pose

Straight Ahead Action

Animation is created frame by frame from beginning to end.

Pose-to-Pose

Key poses are created first, and intermediate frames are added later.

Purpose:

- Provides control and consistency.

5. Follow Through and Overlapping Action

Different parts of an object continue moving after the main body stops.

Example:
Hair or clothing continues to move after a character stops running.

6. Slow In and Slow Out

Objects gradually accelerate and decelerate.

Purpose:

- Creates natural movement.

7. Arc

Most natural movements follow curved paths rather than straight lines.

Example:
The movement of a swinging arm.

8. Secondary Action

Additional movements that support the main action.

Example:
A character walking while simultaneously waving.

9. Timing

The number of frames used for an action determines its speed and weight.

Purpose:

- Creates realistic motion.
- Conveys emotion and energy.

10. Exaggeration

Amplifying actions for dramatic effect.

Purpose:

- Makes animation more appealing and expressive.

11. Solid Drawing

Creating characters and objects with proper volume, balance, and perspective.

12. Appeal

Characters and objects should be visually attractive and interesting.

Purpose:

- Maintains audience engagement.

Making Animation That Works

Creating effective animation requires both technical skills and artistic understanding.

1. Define the Objective

Before creating animation, determine:

- What message needs to be communicated?
- Who is the target audience?
- What style is appropriate?

2. Create a Storyboard

A storyboard is a sequence of sketches showing major scenes and actions.

Benefits:

- Organizes ideas.
- Identifies potential problems early.
- Saves production time.

3. Design Characters and Objects

Important considerations:

- Visual consistency
- Appropriate proportions
- Attractive appearance

4. Plan Motion Carefully

Consider:

- Speed
- Direction
- Timing
- Weight
- Acceleration

Natural movement improves realism.

5. Use Appropriate Frame Rates

Common frame rates:

Frame Rate	Application
12 fps	Basic animation
24 fps	Film animation
30 fps	Television and multimedia
60 fps	High-quality gaming

6. Maintain Consistency

Ensure:

- Uniform character appearance
- Consistent lighting
- Smooth movement
- Stable proportions

7. Keep Animations Meaningful

Avoid unnecessary motion.

Good animation should:

- Support the message.
- Guide attention.

- Enhance understanding.

8. Test and Refine

Review animations repeatedly to identify:

- Jerky motion
- Timing issues
- Visual errors
- Audience comprehension problems

Video in Multimedia

Introduction

Video is one of the most powerful multimedia elements that combines moving images, sound, text, graphics, and animation to communicate information effectively. It provides a realistic representation of events and enhances user engagement through visual storytelling.

Videos are extensively used in:

- Education and E-learning
- Entertainment
- Advertising and Marketing
- Video Conferencing
- Social Media
- Scientific Visualization
- Medical Applications

1. Using Video

Definition

Video is the electronic recording, storage, processing, transmission, and display of moving visual media.

In multimedia applications, video enhances communication by presenting information in a dynamic and realistic manner.

Importance of Video

Visual Communication

- Conveys information quickly and effectively.

Demonstration of Processes

- Explains complex procedures and operations.

Realism

- Provides a lifelike representation of events.

Engagement

- Captures audience attention better than text or images.

Storytelling

- Creates emotional and memorable experiences.

Applications of Video

- Online learning platforms
- Product demonstrations
- Corporate training
- Digital marketing
- News broadcasting
- Medical training
- Virtual tours

2. How Video Works

Basic Principle

Video works by displaying a rapid sequence of still images called **frames**.

When these frames are displayed quickly, the human eye perceives continuous motion due to the **Persistence of Vision** phenomenon.

Persistence of Vision

The human eye retains an image for approximately 1/16th of a second after it disappears.

When multiple images are shown rapidly:

- The brain combines them.
- Motion appears smooth and continuous.

Frame Rate

Frame rate represents the number of frames displayed per second (fps).

Frame Rate	**Application**
24 fps	Cinema Films
25 fps	PAL Television

Frame Rate	Application
30 fps	NTSC Television
60 fps	High-definition Gaming

Components of Video

Frames

Individual images forming the video.

Resolution

Number of pixels in each frame.

Examples:

- 1280 × 720 (HD)
- 1920 × 1080 (Full HD)
- 3840 × 2160 (4K)

Color Depth

Determines color quality.

Audio Track

Provides synchronized sound.

3. Broadcast Video Standards

Broadcast standards ensure compatibility among television systems worldwide.

NTSC (National Television Standards Committee)

Features

- Developed in the United States.
- Used in North America and Japan.
- 525 scan lines.
- 30 frames per second.

Advantages

- Smooth motion.
- Widely adopted.

Limitations

- Lower resolution compared to PAL.

PAL (Phase Alternating Line)

Features

- Used in Europe, Asia, Africa, and Australia.
- 625 scan lines.
- 25 frames per second.

Advantages

- Better color accuracy.
- Higher image quality.

Limitations

- Slightly lower motion smoothness.

SECAM (Sequential Color and Memory)

Features

- Developed in France.
- Used in parts of Europe and Africa.
- 625 scan lines.
- 25 frames per second.

Advantages

- Stable color transmission.

Limitations

- More complex technology.

Comparison of Standards

Feature	**NTSC**	**PAL**	**SECAM**
Scan Lines	525	625	625
Frame Rate	30 fps	25 fps	25 fps
Color Quality	Good	Excellent	Excellent
Regions	USA, Japan	Europe, Asia	France, Russia

4. Integrating Computers and Television

Introduction

The convergence of computers and television has created powerful multimedia systems capable of displaying, editing, streaming, and transmitting video content.

Methods of Integration

TV Tuner Cards

Allow computers to receive television signals.

Smart TVs

Combine television functionality with computer networking features.

Streaming Technologies

Enable video delivery through the Internet.

Video Capture Devices

Convert television signals into digital formats.

Benefits

- Interactive multimedia.
- Digital broadcasting.
- Video-on-demand services.
- Online streaming platforms.
- Enhanced communication.

Applications

- IPTV
- Video conferencing
- Online education
- Smart homes
- Interactive entertainment

5. Shooting and Editing Videos

Shooting Videos

Video shooting refers to capturing video footage using cameras or recording devices.

Pre-Production

Planning stage involving:

- Script writing
- Storyboarding

- Location selection
- Equipment preparation

Production

Actual recording process involving:

- Camera setup
- Lighting
- Audio recording
- Scene capture

Post-Production

Activities performed after recording:

- Editing
- Effects addition
- Audio enhancement
- Rendering

Video Shooting Techniques

Proper Lighting

Ensures visibility and quality.

Stable Camera Position

Use tripods or stabilizers.

Correct Framing

Apply the rule of thirds.

Appropriate Audio Recording

Use quality microphones.

Multiple Shots

Capture scenes from different angles.

Video Editing

Editing involves arranging and modifying video clips.

Common Editing Operations

Trimming

Removing unwanted footage.

Cutting

Deleting unnecessary sections.

Transitions

Connecting scenes smoothly.

Effects

Adding visual enhancements.

Audio Synchronization

Aligning audio with video.

Titles and Captions

Adding textual information.

Popular Video Editing Software

- Adobe Premiere Pro
- Final Cut Pro
- DaVinci Resolve
- Camtasia
- Filmora
- OpenShot

6. Video Tips

Planning

- Define objectives clearly.
- Prepare a shooting schedule.

Lighting

- Use sufficient lighting.
- Avoid strong backlighting.

Audio Quality

- Record clear sound.
- Minimize background noise.

Camera Stability

- Use tripods whenever possible.
- Avoid excessive camera movement.

Composition

- Apply the rule of thirds.
- Maintain proper headroom.

Recording Extra Footage

- Capture additional shots for flexibility during editing.

Backup

- Store copies of recordings immediately.

Compression Balance

- Maintain quality while reducing file size.

7. Recording Formats

Recording formats determine how video data is stored.

Analog Formats

VHS (Video Home System)

Features:

- Magnetic tape storage.
- Used in home video systems.

Betamax

Features:

- Better quality than VHS.
- Limited market adoption.

Digital Formats

DV (Digital Video)

- High-quality digital recording.
- Widely used in camcorders.

HDV

- High-definition recording.
- Improved image quality.

AVCHD

- Efficient HD video format.
- Used in modern camcorders.

MP4

- Popular compressed format.

- Supports high-quality streaming.

MOV

- Developed by Apple.
- Common in professional editing.

MKV

- Supports multiple audio and subtitle tracks.

Comparison of Recording Formats

Format	Type	Quality	File Size
VHS	Analog	Low	Large
DV	Digital	High	Moderate
HDV	Digital	Very High	Large
AVCHD	Digital	High	Small
MP4	Digital	High	Small
MOV	Digital	Very High	Moderate
MKV	Digital	High	Large

8. Digital Video

Definition

Digital video is video represented and stored as binary data that can be processed by computers.

Characteristics of Digital Video

High Quality

Provides superior image and audio quality.

Easy Editing

Supports non-linear editing.

Efficient Storage

Uses compression techniques.

Easy Transmission

Suitable for Internet streaming.

Multimedia Integration

Can combine text, graphics, and animation.

Digital Video Components

Resolution

Examples:

- HD (1280 × 720)
- Full HD (1920 × 1080)
- 4K (3840 × 2160)
- 8K (7680 × 4320)

Frame Rate

Determines smoothness of motion.

Bit Rate

Amount of data processed per second.

Codec

Compresses and decompresses video.

Examples:

- H.264
- H.265 (HEVC)
- VP9
- AV1