



**IM3026**

# **Current Issues in Multimedia**

Chapter 2

Multimedia Data Basics

# Topics

- Multimedia System Technology
- Digitizing
- Input, Output and Storage Device
- Multimedia data
- Calculate file size

# Multimedia System Technology

## Discrete vs. Continuous Media

- Multimedia systems deal with the generation, manipulation, storage, presentation, and communication of information in digital form.
- The data may be in a variety of formats: text, graphics, images, audio, video.

# Multimedia System Technology

## Discrete vs. Continuous Media

- Two types of media:
  - Discrete or Static Media
  - Continuous Media

# Multimedia System Technology

## Discrete vs. Continuous Media

### Discrete or Static Media

- Examples:
  - Text
  - Still images
  - Graphics

# Multimedia System Technology

## Discrete vs. Continuous Media

### Continuous Media

- Examples:
  - Animation
  - Video
  - Sound

# Multimedia System Technology

## Analog and Digital Signals

- Continuous media can be represent in two form:
  - Analog signal
  - Digital signal

# Multimedia System Technology

## Analog and Digital Signals

- Continuous media can be represent in two form:
  - Analog signal
  - Digital signal
- **Analog signals** must be converted or **digitized** into **discrete digital signals** that computer can readily deal with.



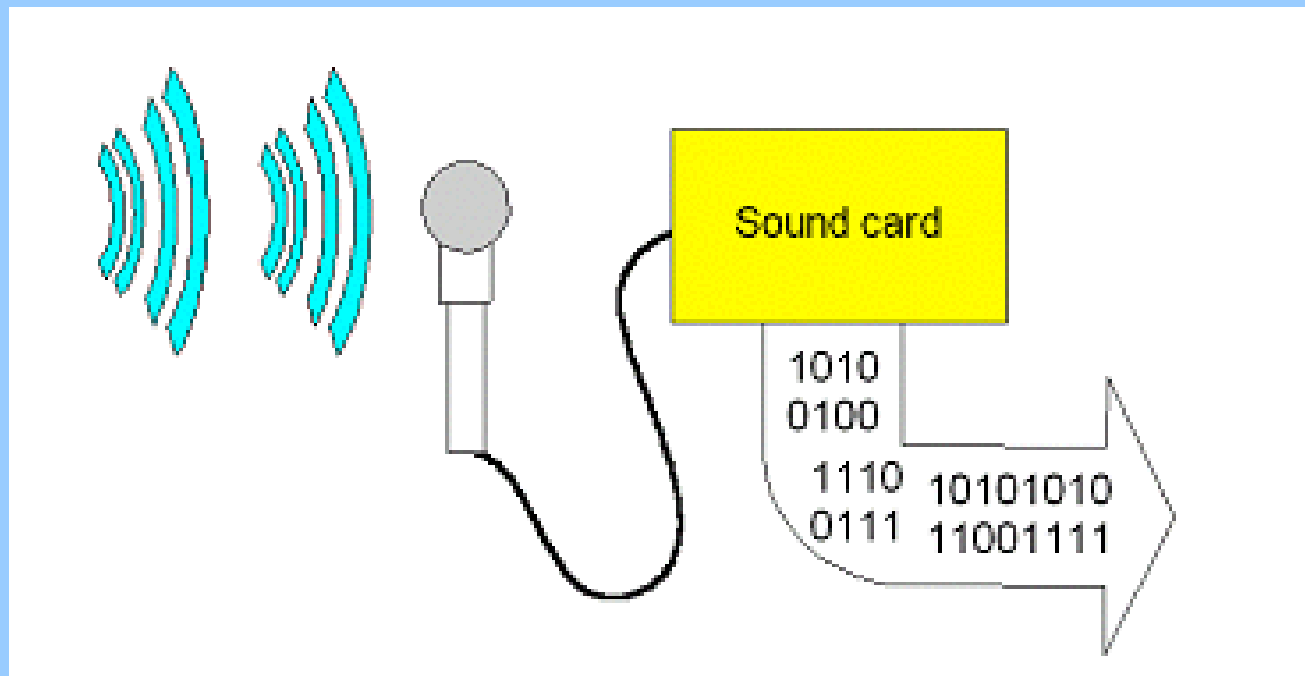
# Multimedia System Technology

## Analog and Digital Signals

- To convert analog signal to digital signal:
  - Use **Analog-to-Digital** Converters
- To convert digital signal to analog signal:
  - Use **Digital-to-Analog** Converters

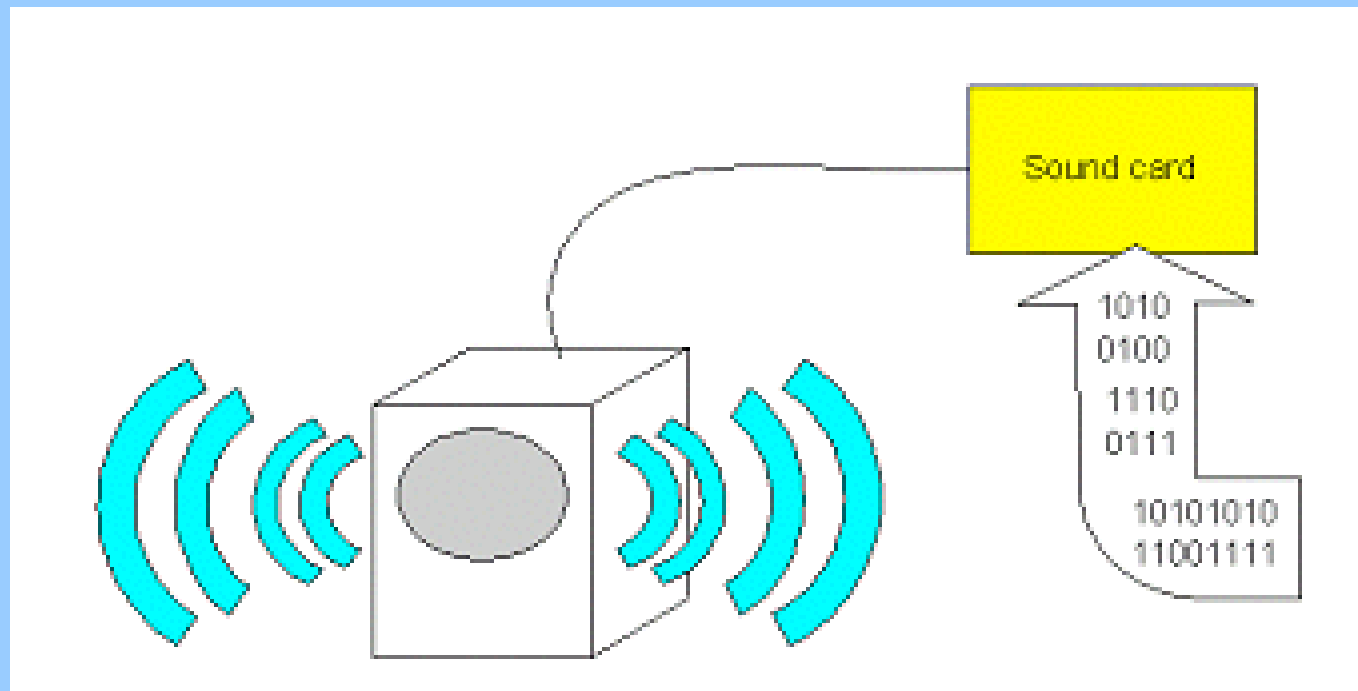
# Multimedia System Technology

## Analog to Digital Signal



# Multimedia System Technology

## Digital to Analog Signal



# Digitizing

## Digitize

- To translate into a digital form.
- For example, optical scanners digitize images by translating them into bit maps.
- It is also possible to digitize sound, video, and any type of movement.

# Class Exercise

## Exercise 1:

- Find out how can we digitize these media.
  - Text
  - Photo
  - Sound
  - Video
- Explain the digitizing process for each media.

# Input, Output and Storage Device

- How each media be input to a Multimedia system?
- File compression.
- Storage requirement for many form of media.

# Input, Output and Storage Device

- Input device – any computer components used to send data into the computer.
- Output device – any computer component used to display the result from the computer.
- Storage device – any computer component used to store data.

# Input Devices

- The input devices for a basic multimedia system include
  - Keyboard
  - Scanner
  - Webcam
  - Graphic tablet
  - Microphone



# Output Devices

- The output devices for a basic multimedia system include
  - A High Resolution Color Monitor
  - CD Quality Audio Output
  - Color Printer
  - Video Output to save Multimedia presentations to (Analog) Video Tape, CD-ROM DVD.
  - Audio Recorder (DAT, DVD, CD-ROM, (Analog) Cassette)
  - Storage Medium (Hard Disk, Removable Drives, CD-ROM)

# Storage Device

- The major problems that affect storage media:
  - Large volume of data
  - Real time delivery
  - Data format
  - Storage Medium
  - Retrieval mechanisms

# Storage Device

- Four factors:
  - Data
  - Data storage
  - Data transfer
  - OS support

# Storage Device

## Hard Disk

- Capacity : **120 gigabyte** to **2 terabyte**
- Access speed : **5400 rpm** to **15000 rpm**
- Less portable (except for removable hard disk)
- Used to store data after processing

# Storage Device

## Optical Disk

- A storage medium from which data is read and to which it is written by lasers.
- Three types:
  - Read Only Memory (ROM)
  - Write Once Read Many (WORM)
  - Erasable

# Storage Device

## Optical Disk

- Compact disc
- Digital versatile disc
- Blu-ray disc

# Storage Device

## RAID

- Short for **R**edundant **A**rray of **I**ndependent (or **I**nexpensive) **D**isks
- A category of disk drives that employ two or more drives in combination for fault tolerance and performance.
- RAID disk drives are used frequently on servers but aren't generally necessary for personal computers.
- RAID allows you to store the same data redundantly (in multiple places) in a balanced way to improve overall performance.

# Text

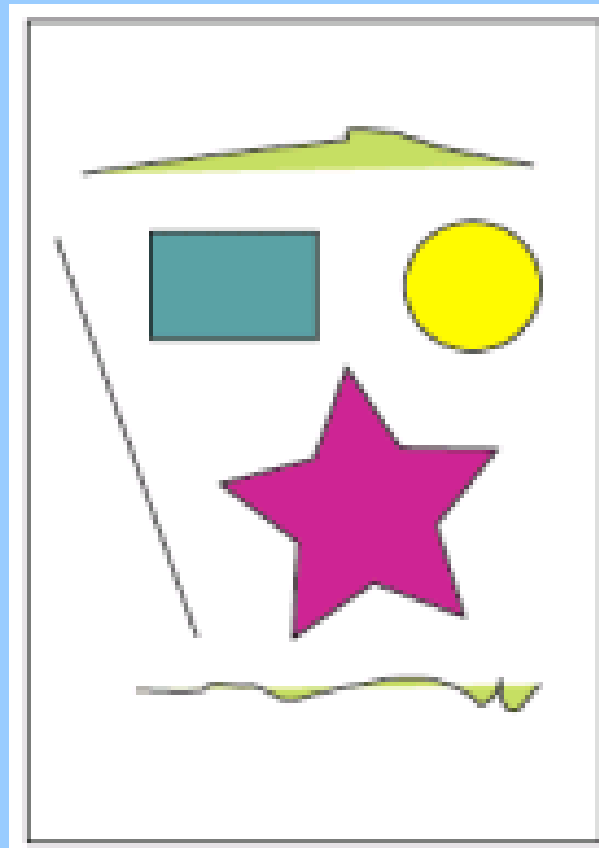
- The sources of this media are the **keyboard**, **floppies**, **disks** and **tapes**.
- Text files are usually stored and input character by character.
- File format:
  - HyperText Markup Language (HTML)
  - Rich Text Format (RTF)
  - A program source code (C, Pascal etc ...)
- The basic storage of text is 1 byte per character (text or format character).



# Graphics

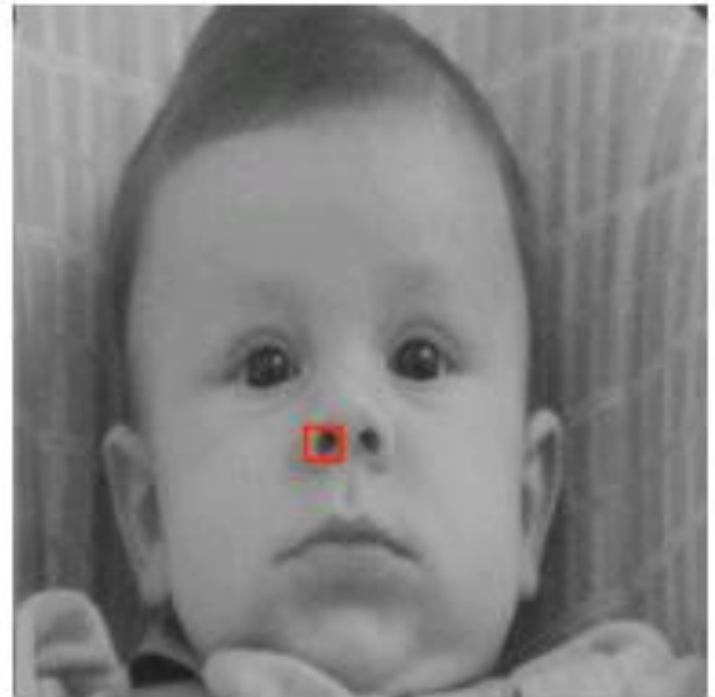
- Graphics are usually constructed by the composition of primitive objects such as lines, polygons, circles, curves and arcs.
- Graphics are usually generated by a graphics editor program or automatically by a program.
- Graphics input devices include:
  - keyboard (for text and cursor control)
  - mouse
  - trackball
  - graphics tablet

# Graphics



# Images

- Images may be generated by programs similar to graphics or animation programs.
- But images may be scanned for photographs or pictures using a digital scanner or from a digital camera.
- Some video cameras allow for still image capture also.



# Images

- Images may be stored at 1 bit per pixel (Black and White), 8 Bits per pixel (Grey Scale, Color Map) or 24 Bits per pixel (True Color).
- Thus a 512x512 Grey scale image takes up 1/4 Mb, a 512x512 24 bit image takes 3/4 Mb with no compression.

# Audio

- Audio signals are continuous analog signals.
- They are first captured by a microphones and then digitized and store -- usually compressed as CD quality audio requires 16-bit sampling at 44.1 KHz.
- 1 Minute of Mono CD quality audio requires  $60 \times 44100 \times 2$  Bytes which is approximately 5 Mb.

# Video

- Analog Video is usually captured by a video camera and then digitized.
- There are a variety of video (analog and digital) formats such as MPEG, AVI, MOV etc ...
- Raw video can be regarded as being a series of single images.
- There are typically 25, 30 or 50 frames per second.
- Therefore a 512x512 size monochrome video images take  $25 \times 0.25 = 6.25\text{Mb}$  for a minute to store uncompressed.
- Digital video clearly needs to be compressed.

# Calculate File Size

## Raw Image File Size

Formula:

$$(\text{Horizontal pixels} \times \text{Vertical pixels} \times \text{Color Depth}) / 8$$

Color depth:

1-bit = 2 colors

3-bit = 8 colors

8-bit = 256 colors

16-bit = 65536 colors

24-bit = 16 777 216 colors

32-bit = 4 294 967 296 color

# Calculate File Size

## Raw Image File Size

Example:

Determine the file size for a 16-bit, size 250 pixels x 340 pixels image.

$$(250 \times 340 \times 16) / 8 = 170000 \text{ bytes}$$



# Calculate File Size

## Audio File Size

Formula:

Duration x Sample Rate x Bit Rate x No. of Channel

Sample Rate in Hertz (Hz)

Bit Rate: 8-bit = 1, 16-bit = 3

No. of Channel: Mono = 1, Stereo = 2, 5.1 = 6

# Calculate File Size

## Audio File Size

Example:

Determine the file size for 30 seconds of 16-bit, 11kHz stereo audio.

$$30 \times 2 \times 11000 \times 2 = 1320000 \text{ bytes}$$

# Calculate File Size

## Digital Video File Size

Formula:

Video size x fps x color x duration

Video size in pixel

Fps: No. of frame per second

No. of Color: B&W = 1, Color = 3

# Calculate File Size

## Digital Video File Size

Example:

Determine the file size for 30 seconds of 320 x 240, 25 fps, color digital video.

$$30 \times 320 \times 240 \times 25 \times 3 = 172800000 \text{ bytes}$$

# Class Exercise

## Exercise 2:

Explain why do computer games require large storage capacity?