MMC 1

Thursday, May 8, 2025 11:04 AM

Unit 1

1. Global Structure of Multimedia (Device domain, system domain, application domain, cross domain with diagram)

- *Question:* Explain the global structure of multimedia with block diagram and explain each block in detail. *(10 marks, 2080)*

2. Multimedia System Properties (Combination of media, independence, computer support integration)

- *Question:* Explain the properties of multimedia computing. *(2080)*

3. Challenges for Multimedia Systems (Synchronization, sequencing, etc.)

- *Question:* Describe the challenges for multimedia system. *(2081)*

4. Components of Multimedia System (Capture devices, storage, communication, etc.)

- *Question:* What are the multimedia interface components? *(2080)*
  (Can be interpreted as part of system components.)

Definition of Multimedia

- The word **"Multimedia"** is formed from:
  - **Multi**: Means *many*
  - **Media**: Plural form of *medium*, which is a *system of communication* that transfers information from one place to another

Meaning:

- **Multimedia** refers to *content that uses more than one medium*.
- It combines different media types to communicate or present information effectively.

Formal Definition:

- **Multimedia** is the field that deals with **computer-controlled integration** of various media types:
  - **Text**
  - **Graphics**
  - **Drawings**
  - **Still images**
  - **Moving images (Video)**
  - **Animation**
  - **Audio**
  - **Other media formats**
- These media types are:
  - **Represented digitally**
  - **Stored digitally**
  - **Transmitted digitally**
  - **Processed digitally**

Modern Definition

- **Multimedia** is the **presentation of text, pictures, audio, and video** with **links and tools** that allow users to:
  - Navigate

- Engage
- Create
- Communicate
  → *All through the use of a computer*

Multimedia as an Interdisciplinary Subject

- Multimedia involves a blend of multiple disciplines:
  1. **Computer technology** (hardware and software)
  2. **Arts and design**, **literature**, and **presentation skills**
  3. **Application-specific knowledge** (depends on the field of use)

Examples of Multimedia

- **Video podcasts**
- **Audio slideshows**
- **Animated videos**

Global Structure of Multimedia

→ Question: Explain the global structure of multimedia with block diagram and explain each block in detail. (10 marks)

The global structure of multimedia describes the **organization of components** across different domains that work together to capture, process, store, transmit, and present multimedia content.

Main Domains of Multimedia System:

1. Device Domain

- Includes **hardware components** for capturing and displaying multimedia.
- **Examples:**
  - **Capture Devices:** Microphones, Cameras, Scanners
  - **Display Devices:** Monitors, Speakers, Projectors

2. System Domain

- Responsible for **processing**, **storing**, and **managing** multimedia data.
- **Examples:**
  - Multimedia-capable **computer systems**
  - **Operating systems** with multimedia support
  - **File systems**, **compression tools**, **codecs**

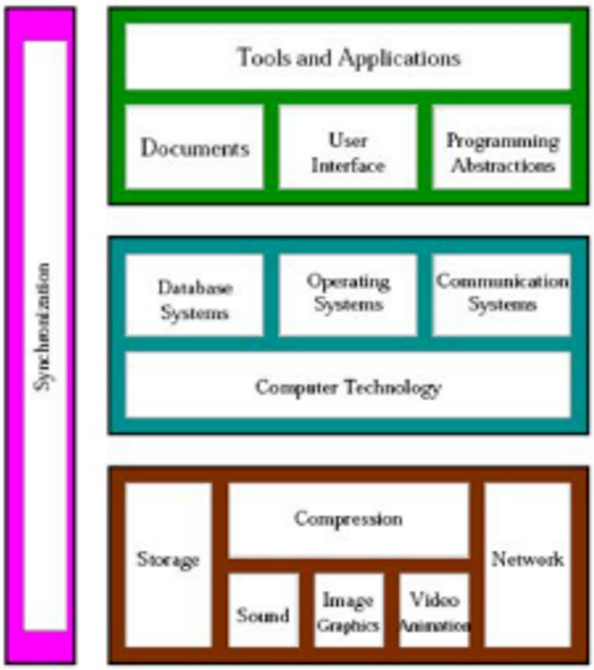
3. Application Domain

- The **end-user interface** where multimedia content is presented and interacted with.
- **Examples:**
  - Educational software, video games, presentation tools
  - Web-based applications, e-learning platforms

4. Cross Domain

- Supports **integration and communication** between other domains.
- Ensures **interoperability**, **synchronization**, and **data consistency** across devices, systems, and applications.
- **Examples:**
  - **Multimedia middleware**
  - **APIs** for video/audio communication
  - **Networking components** like routers and protocols

Block Diagram: Global Structure of Multimedia



Application domain — provides functions to the user to develop and present multimedia projects. This includes *Software tools*, and multimedia projects *development methodology*.

System domain — including all supports for using the functions of the device domain, e.g., operating systems, communication systems (networking) and database systems.

Device domain — basic concepts and skill for processing various multimedia elements and for handling physical device.

History of Multimedia

- **Pre-20th Century**: Early use of **images** and **text** (cave paintings, stone tablets).
- **1960s**: First experiments with **text**, **sound**, and **images**.
- **1970s**: Development of **multimedia computer systems**.
- **1980s**: Introduction of **CD-ROMs** for storing multimedia.
- **1990s**: **Internet** allows global sharing of multimedia.
- **2000s**: Rise of **social media** and **streaming** platforms.
- **2020s**: **Virtual Reality (VR)**, **Augmented Reality (AR)**, and **AI-generated content**.

Applications of Multimedia

1. Business:

- **Marketing & Advertising**: Product demos, digital brochures, interactive websites.
- **E-commerce**: Product presentations with images, videos, 3D models.
- **Corporate Communication**: Video conferencing, online presentations.

2. Education:

- **E-learning**: Online courses, interactive tutorials, educational games.
- **Virtual Labs**: Hands-on learning through simulations.

3. Entertainment:

- **Movies & TV**: Films with special effects, sound, and visuals.
- **Video Games**: 3D graphics, sound effects, interactive elements.
- **Music & Audio**: Podcasts, music videos, and audio books.

4. Home:

- **Home Theaters**: Audio-visual systems, smart TVs, media players.
- **Smart Homes**: Multimedia for home automation and entertainment.

5. Public Places:

- **Digital Signage**: Interactive billboards, information kiosks.
- **Advertising**: Multimedia displays in malls, transport, and public spaces.

Medium

- **Medium** refers to the **communication channel** through which content is transferred, such as **text**, **images**, **audio**, and **video**.
- In **multimedia**, multiple media are integrated to provide an **interactive experience**.

- **1. Time-independent (discrete)**: Information is expressed only in its individual value, without a time component. E.g.: text, image, graphics, etc.
- **2. Time-dependent (continuous):** Information is expressed by its value and the time of its occurrences. E.g.: sound and video.

Classification of Media

Multimedia content can be classified into six types of media based on their **role in the system**:

1. Perception Medium

- Helps **humans sense** multimedia content.
- **Focus**: How humans perceive content (mainly **visual** and **audio**).
- **Examples**: Screen (visual), Speaker (sound)

2. Representation Medium

- Refers to **how data is stored or formatted** in a system.
- Internal **digital format** of multimedia elements.
- **Examples**:
  .txt, .pdf, .jpg, .mp3, .mp4

3. Presentation Medium

- Tools/devices used for **input/output** of data.
- **Focus**: How the computer delivers or receives data.
- **Examples**: Keyboard, Mouse (input); Monitor, Printer (output)

4. Storage Medium

- Devices used to **store multimedia data**.
- **Focus**: How and where data is saved.
- **Examples**: Hard disk, CD-ROM, Microfilm, Flash Drive

5. Transmission Medium

- Carries data from **one location to another**.
- **Focus**: How information is transferred.

- **Examples**:
  Twisted pair, Optical fiber, Satellite, Radio, Wi-Fi

6. Information Exchange Medium

- Platforms or channels for **sharing multimedia** between users/systems.
- **Examples**:
  Internet, VR systems, File sharing tools, Cloud platforms

Properties of Multimedia Systems

- **Combination of Media**:
  - Uses a mix of **text, audio, images, video, and animation**.
  - Example: A video tutorial with subtitles and background music.
- **Media Independence**:
  - Each media type can be handled **independently**.
  - Example: Audio and video can be edited or stored separately.
- **Computer-Supported Integration**:
  - Multimedia systems are managed and integrated using **computer software and hardware**.
  - Enables synchronization, storage, and delivery of different media types efficiently.

Characteristics of Multimedia Systems

- **Computer Controlled**:
  - Multimedia systems are **controlled by computers** for editing, storing, and presenting data.
- **Integrated**:
  - Combines multiple forms of media in a **single, unified system**.
- **Digitally Represented Information**:
  - All media types are **digitized** for processing and transmission (e.g., MP3 for audio, JPEG for images).
- **Interactive Interface**:
  - Users can **interact** with the system (e.g., click, scroll, navigate).
  - Example: An e-learning platform with clickable content and quizzes.

Challenges of Multimedia Systems

1. **Synchronization**
   - All media elements (audio, video, text) must play **in sync**.
   - Example: Audio must match the speaker's lips in a video.
2. **Sequencing**
   - Events should happen in the correct **logical or time-based order**.
   - Example: Slides in a tutorial must follow the correct chapter flow.
3. **Distributed Network**
   - Multimedia often works over **networks**, requiring real-time **delivery and low latency**.
   - Example: Streaming a video smoothly over the internet.
4. **Inter-media Scheduling**
   - Proper timing and coordination among multiple media sources.
   - Ensures smooth user experience without delay or overlap.

Components of a Multimedia System

1. **Capture Devices**
    - Used to **input or capture** media into the system.
    - Examples:
        - Camera (video/images)
        - Microphone (audio)
        - Scanner (documents/images)
2. **Storage Devices**
    - Used to **store multimedia content**.
    - Examples:
        - Hard Disk
        - SSD
        - CD/DVD
        - Cloud Storage
3. **Communication Networks**
    - Used to **transmit multimedia data** over distances.
    - Examples:
        - Internet
        - LAN/WAN
        - Wi-Fi/Bluetooth
4. **Computer Systems**
    - The **central processing unit** that integrates, processes, and manages media.
    - Includes:
        - CPU
        - RAM
        - Graphics Card
        - Multimedia software (e.g., Adobe Premiere, VLC)
5. **Display Devices**
    - Used to **output or present** multimedia content to users.
    - Examples:
        - Monitor
        - Projector
        - Speaker
        - VR headset