EEG453 Multimedia Systems

Lecture (2) Overview of multimedia communications systems

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Lecture Outline

- Multimedia
- applications
- standards
- Overview of MM systems

Multimedia: Definition

Notion
- **Multi**
  - ❖ Many
- **Media**
  - ❖ "Things in the middle"

Means to distribute and present information coded as
- ❖ Graphics, animation, audio and video (and text, ..)
- **by**
  - ❖ Computer, TV, phone, etc.

Key Issues
- **Performance**
  - ❖ bandwidth
  - ❖ storage capacity
  - ❖ processing
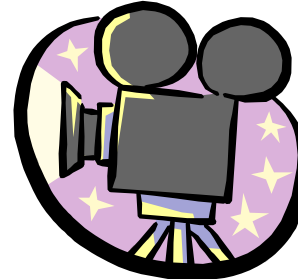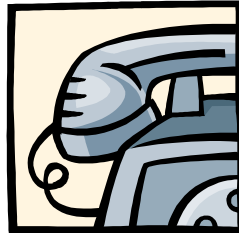- **Quality**
  - ❖ realtime
  - ❖ error tolerance
  - ❖ synchronization

What is Multimedia?

- Multimedia is a combination of text, art, sound, animation, and video.

Slide: Courtesy, Hung Nguyen

What is Multimedia?

- Apps that involve more than conventional data types (e.g., text, drawing and images)
- Best examples are continuous media (e.g., animations, audio, and video)
  - Called continuous media because of time basis
- Do not confuse with hypertext/hypermedia
  - Hyper implies linking
- Eventually all apps will include hypermedia

"**multimedia**"

- **text:** this includes both <u>unformatted text</u> as strings of characters from a limited character set, and <u>formatted text</u> strings as used for the structuring, access, and presentation of electronic documents.

- **images:** these include computer-generated images, comprising lines, curves, and circles, and digitized images of documents and pictures;

- **audio:** this includes both <u>low-fidelity speech</u>, as used in telephony, and <u>high-fidelity stereophonic</u> music as used with compact discs;

- **video:** this includes short sequences of moving images (also known as video clips) and complete movies/films.

Multimedia Components Simplified

- Multimedia can be viewed as they combination of audio, video, data and how they interact with the user (more than the sum of the individual components)
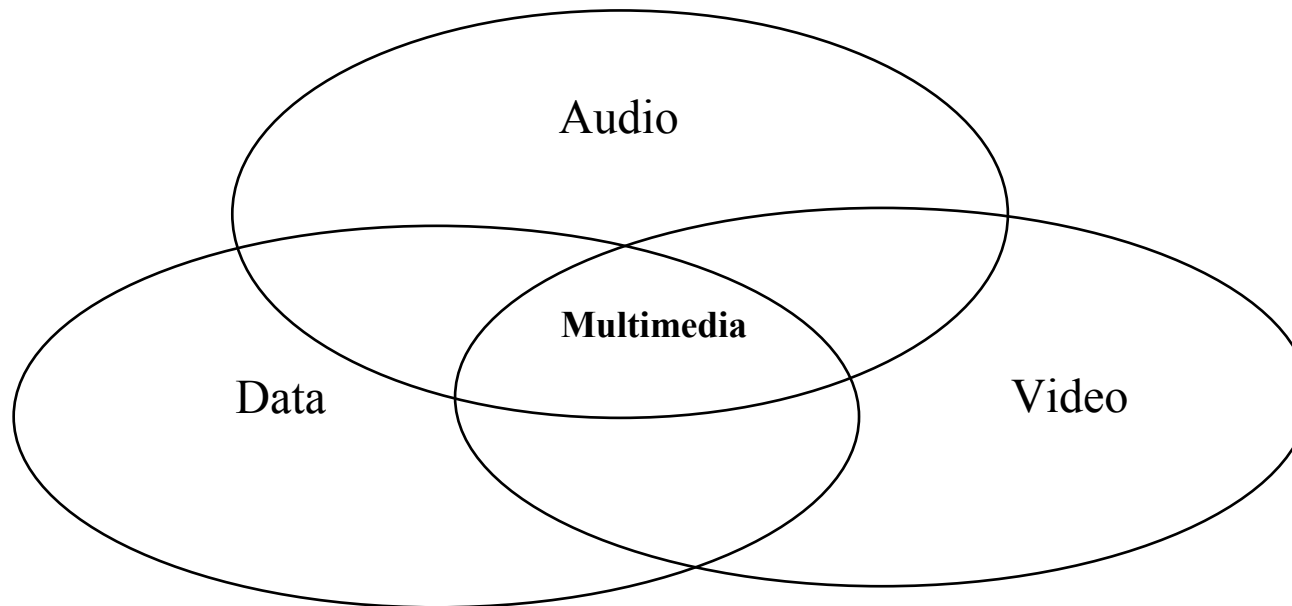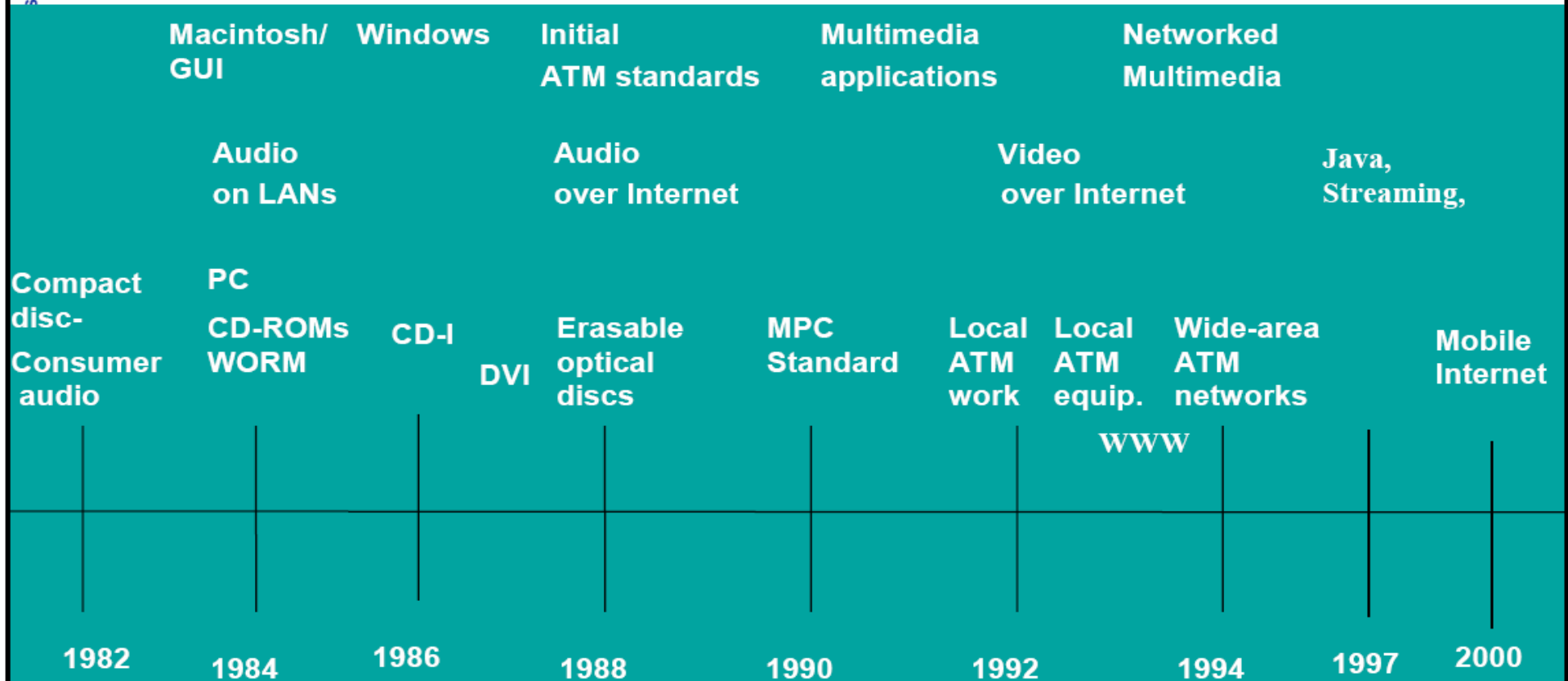
Multimedia: Communications

MULTIMEDIA COMMUNICATIONS is the field referring to the:

> **Representation,**
> **Storage,**
> **Retrieval, and**
> **Dissemination**

of

> **Machine-processable information expressed in multiple media such as:**

❖ **Text, Voice, Graphics, Images, Animations, Audio, and Video**

Milestones in Multimedia

1982	1984	1986	1988	1990	1992		1994	1997	2000
	Macintosh/ GUI	**Windows**	**Initial ATM standards**		**Multimedia applications**		**Networked Multimedia**		
	Audio on LANs		**Audio over Internet**		**Video over Internet**			Java, Streaming,	
Compact disc- Consumer audio	**PC CD-ROMs WORM**	**CD-I** DVI	**Erasable optical discs**	**MPC Standard**	**Local ATM work**	**Local ATM equip.** WWW	**Wide-area ATM networks**		**Mobile Internet**

Multimedia Applications

Application	Media	Selected Functions
Office automation	Images,Text,Spreadsheets,Mail	Composition,Filing,Communication
MEDICAL INFORM.SYSTEMS	VIdeo(Telephony),Images,Text	Data Acquis.,Communication,Filing
GEOGRAPHY	Images,Graphics	Data Acquis.,Storage,Image Manip.
EDUCATION / TRAINING	Audio,Video,Images,Text	Browsing,Interactivity
COMMAND & CONTROL	Audio(Telephony),Images	Data Acquisition,Communication
WEATHER	Images,Numeric Data,Text	Data Acquis.,Simulation,Data Integr.
BANKING	Numeric Data,Text,Images	Image Archiving
TRAVEL AGENTS	Audio,Video,Images,Text	Video Browsing,Communication
ADVERTISING	Video,Images	Image Composition,Enhancement
ELECTRONIC MAIL	Audio,Images,Text	Communication
ENGINEERING, CAD/CAM	Numeric Data,Text	Cooperative Work
CONSUMER ELECTRONIC CAT.	Audio, Video,Text	Video Browsing
HOME VIDEO DISTRIBUTION	Audio, Video	Video Browsing
REAL ESTATE	Audio,Video,Images,Text	Video Browsing,Communication
LIBRARY	Image,Text	Database Browsing,Query
LEGAL INFORMATION SYSTEMS	Image, Text	Database Query
TOURIST INFORMATION	Audio,Video,Text	Video Browsing
NEWSPRINT PUBLICATION	Image,Text	Image,Text Composition
DICTIONARIES	Image,Text	Database Browsing,Query
ELECTRONIC COLLABORATION	Audio,Video,Text	Videoconf.,Concurrency,Communic.
AIR TRAFFIC CONTROL	Audio,Text,Graphics	Concurency Control,Communication

Multimedia Application Categories

Residential
- ➢ **Entertainment**
  - ❖ Video on demand
  - ❖ Games
  - ❖ Interactive TV
- ➢ **News**
- ➢ **Messaging**
- ➢ **Transactions**
  - ❖ Shopping
  - ❖ Banking

Institutional
- ➢ **Advertisement**
- ➢ **Publications**
- ➢ **Telemedicine**
- ➢ **Distance learning**

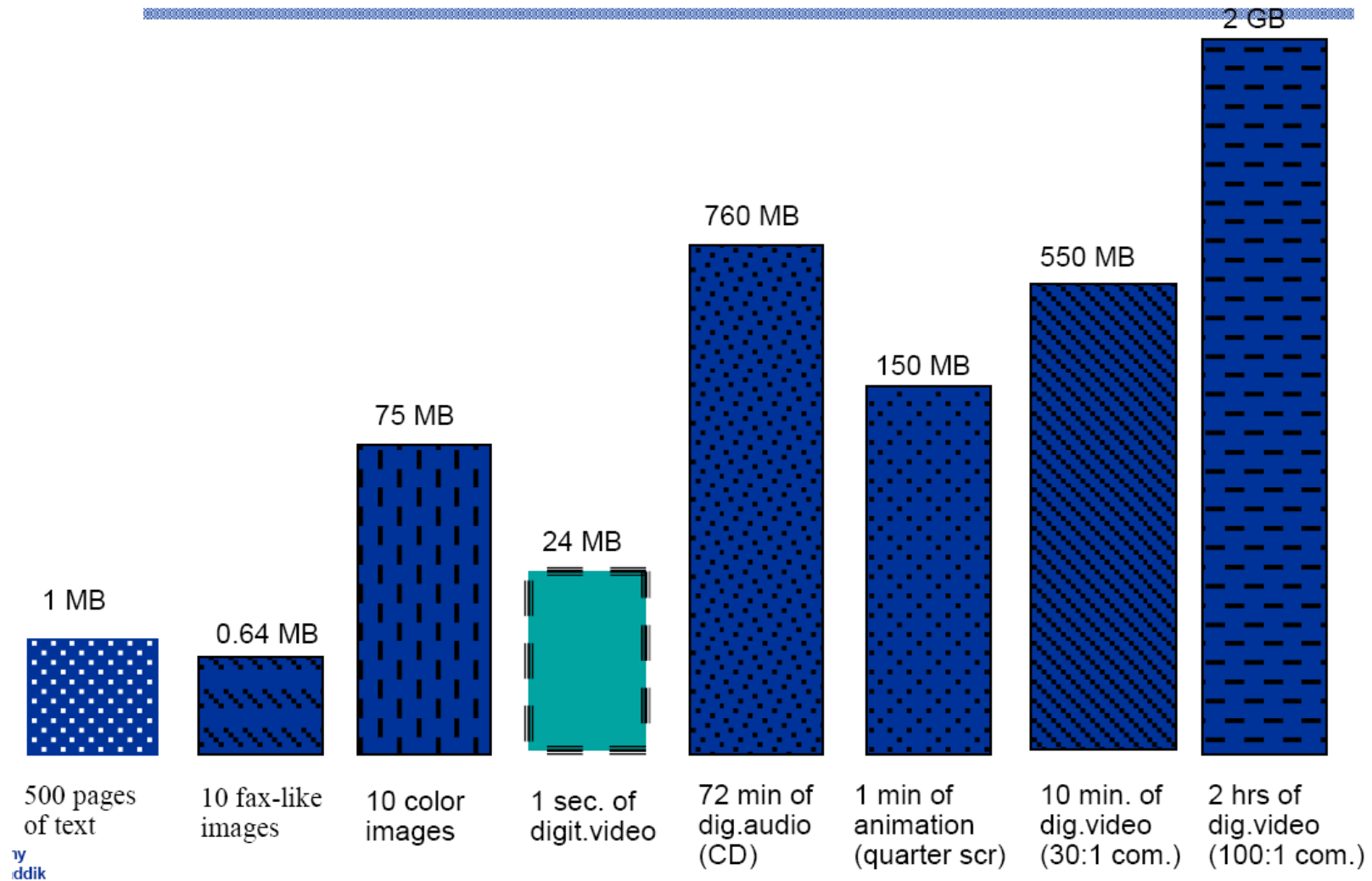**Business**
- ➢ **Conferencing**
- ➢ **Collaboration**

Multimedia Service Categories

- **Conversational Services**
  - Conferencing
  - Video telephony
- **Messaging Services**
  - multimedia e-mail
- **Retrieval Services**
  - VOD
  - News
  - Yellow Pages
- **Distribution Services**
  - Broadcast
  - Network games

Multimedia Storage/Data Rate Requirements

	Text	Image	Audio	Animation	Video
Object Type	Coded •ASCII •EBCDIC	Bit-mapped graphics, still photos, faxes	Noncoded stream of digitized audio or voice	Synched image and audio stream at 15-19 frames per sec (uncompressed)	TV analog or digital image with synched streams at 24-30 frames per sec
Size and Bandwidth	2 kB per page	Simple: 64 kB/image (uncompressed) Detailed: 7.5 MB/image (uncompressed)	Voice/phone •8 kHz/8bits (mono) 64 kb/s Audio CD DA •44.1 kHz/16bits (stereo:2 chan.) 1.4 Mb/s	20 Mb/s for 320 x 240 x 16 pixels per frame(16-bit color); 16 frames per sec	221 Mb/s for 640 x 480 x 24 pixels per frame (24-bit color); 30 frames per sec.

Multimedia Storage Requirements

1 MB	0.64 MB	75 MB	24 MB	760 MB	150 MB	550 MB	2 GB
500 pages of text	10 fax-like images	10 color images	1 sec. of digit.video	72 min of dig.audio (CD)	1 min of animation (quarter scr)	10 min. of dig.video (30:1 com.)	2 hrs of dig.video (100:1 com.)

QoS Requirements for Various Applications

Application	Delay	Accuracy	Throughput
File Transfer	Tolerant of variations in delay (e.g. 100 msecs) and end-to-end delay (e.g., 5 secs).	Any cell loss results in retransmission and lowering of throughput. Very low cell loss is tolerable.	Sustained bursts, with a large degree of idle time between transfers.
Interactive point of sale	Delay sensitive. End-to-end delay < 100 msecs	No cell loss.	Low transfer rates, with no high bursts; low utilization unless already concentrated.
Interactive image exchange	Delay sensitive. End-to-end delay < 100 msecs.	Any cell loss results in retransmission and lowering of throughput. Very low cell loss is tolerable.	Intermittent bursts of high transfer rate with long periods of idle.
Video (H.221 compliant=CBR)	Very sensitive to both variation in delay and end-to-end delay.	No cell loss.	Sustained transfer rate, no burst, no idle.
Voice	Sensitive to both variation in delay and end-to-end delay. With echo cancellation, end-to-end delay can be relatively high.	High cell loss (up to 1%) is easily tolerated by modern coding algorithms with no loss of quality to the human ear.	Short bursts, predictable pattern of idle.

Multimedia Standards Activities

Other Multimedia-Related Standards Activities

US

Accredited Standards Committee T1:
- ➤ T1A1 (video, videophones, ADSL)
- ➤ T1E1 (ADSL, network interfaces)
- ➤ T1S1 (signalling, service descriptions)

Accredited Standards Committee X3:
- ➤ X3H3 (computer graphics, US TAG to SC24)
- ➤ X3L3 (audio and picture coding, US TAG to SC29)
- ➤ X3V1 (text processing, US TAG to SC18)

Other Multimedia-Related Standards Activities

International

ITU-Telecommunications Sector

www.itu.int

- ➢ Study Group 1- Audiovisual Services
- ➢ Study Group 8- Interactive Audiovisual Protocols
- ➢ Study Group 12- Audiovisual Multimedia Quality
- ➢ Study Group 13- Network Capabilities:Multimedia,B-ISDN
- ➢ Study Group 15- Audiovisual Systems, Signal Processing

ITC 1 (Industrial Technology Centre) (ISO/IEC)

- ➢ SC18 (subcommittee 18) - Multimedia/Hypermedia Model and Framework
- ➢ SC24- Presentation Environments for Multimedia Objects
- ➢ SC29- Picture, Audio and Multimedia Coded Representation