

EEG453 Multimedia Systems

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Outline

- Instructor
- Course Description
- Lecture Schedule
- Exams, Homework and Project
- Grading
- General Policies



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Administrative Issues

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Office hours:

- **U T from 1 till 2 pm at my office**
- or by appointment (please feel free to contact me)

References:

- 1. Multimedia Communications: Applications, Networks, Protocols and Standards, Fred Halsall, Addison-Wesley; 2001, ISBN: 0-201-39818-4.**
2. Dr. Abd Alsadeq multimedia course.
www.site.uottawa.ca/~elsaddik/abedweb/teaching/elg5121.html
3. Multimedia: computing, communications and applications;
“steinmetz Nahrstedt” PH, 1995.
4. Cisco multimedia networking course:
www.cisco.com/univercd/cc/td/doc/cisintwk/idg4/nd2013.htm

Course Description

- Architecture, hardware, software and standards of multimedia information systems and multimedia networks.
- Audio compression standards, video compression standards(JPEG, MPEG-1 and MPEG-2).
- Video conferencing standards, video servers, digital libraries. Multimedia real time processing, multimedia enhanced computer systems.
- Multimedia networks, transport protocols, multicasting, and resource management.
- (pre-req: EEG373 “com sys II”, EEG353 “microprocessors”)

Topics

- Motivation, Introduction, applications and MM standards
- Basics of audio, image, video and text
- Multimedia Compression: Text
- Multimedia Compression: Image
- Multimedia Compression: Audio
- Multimedia Compression: Video
- Multimedia Compression: standards
- Networking technologies for MM
- MM in wireless systems
- MM and the internet
- MM security

Objectives

- To understand the basics of audio, speech, image and video signals
- To study the basic techniques for audio compression
- To study the basic techniques for image compression
- To study the basic techniques for video compression
- To study the basic techniques for text compression
- **To implement using MATLAB the basic compression techniques**
- To understand the basic structure of internet and networking
- To understand the multimedia issues regarding networking
- To study the security issues regarding multimedia

Grading percentages

Midterm (test 1) and Pre-final(test 2) 20%

Labs and homeworks 20%

Project 20%

Final Exam 40%

Topics

1. Multimedia Communications
2. Multimedia Information Representation
3. Text and Image Compression
4. Audio and Video Compression
5. Standards for Multimedia Communications
6. Circuit-switched and Enterprise networks
7. The Internet

Multimedia communications

- 1.1 Introduction
- 1.2 Multimedia information representation
- 1.3 Multimedia networks
 - 1.3.1 Telephone networks
 - 1.3.2 Data networks
 - 1.3.3 Broadcast television networks
 - 1.3.4 Integrated services digital networks
 - 1.3.5 Broadband multiservice networks
- 1.4 Multimedia applications
 - 1.4.1 Interpersonal communications
 - 1.4.2 Interactive applications over the Internet
 - 1.4.3 Entertainment applications
- 1.5 Application and networking terminology
 - 1.5.1 Media types
 - 1.5.2 Communication modes
 - 1.5.3 Network types
 - 1.5.4 Multipoint conferencing
 - 1.5.5 Network QoS
 - 1.5.6 Application QoS

Multimedia information representation

- 2.2 Digitization principles
 - 2.2.1 Analog signals
 - 2.2.2 Encoder design
 - 2.2.3 Decoder design
- 2.3 Text
 - 2.3.1 Unformatted text
 - 2.3.2 Formatted text
 - 2.3.3 Hypertext
- 2.4 Images
 - 2.4.1 Graphics
 - 2.4.2 Digitized documents
 - 2.4.3 Digitized pictures
- 2.5 Audio
 - 2.5.1 PCM speech
 - 2.5.2 CD-quality audio
 - 2.5.3 Synthesized audio
- 2.6 Video
 - 2.6.1 Broadcast television
 - 2.6.2 Digital video
 - 2.6.3 PC video
 - 2.6.4 Video content

Text and image compression

- **3.2 Compression principles**
 - 3.2.1 Source encoders and destination decoders
 - 3.2.2 Lossless and lossy compression
 - 3.2.3 Entropy encoding
 - 3.2.4 Source encoding
- **3.3 Text compression**
 - 3.3.1 Static Huffman coding
 - 3.3.2 Dynamic Huffman coding
 - 3.3.3 Arithmetic coding
 - 3.3.4 Lempel-Ziv coding
 - 3.3.5 Lempel-Ziv-Welsh coding
- **3.4 Image compression**
 - 3.4.1 Graphics interchange format
 - 3.4.2 Tagged image file format
 - 3.4.3 Digitized documents
 - 3.4.4 Digitized pictures
 - 3.4.5 JPEG

audio and video compression

- **4.2 Audio compression**

- 4.2.1 Differential pulse code modulation

- 4.2.2 Adaptive differential PCM

- 4.2.3 Adaptive predictive coding

- 4.2.4 Linear predictive coding

- 4.2.5 Code-excited LPC

- 4.2.6 Perceptual coding

- 4.2.7 MPEG audio coders

- 4.2.8 Dolby audio coders

- **Video compression**

- 4.3.1 Video compression principles

- 4.3.2 H.261

- 4.3.3 H.263

- 4.3.4 MPEG

- 4.3.5 MPEG1

- 4.3.6 MPEG-2

- 4.3.7 MPEG-4

❖ Networking Technology for Multimedia

- ❑ **Local Area Networks (LAN) Internetworking and Wide Area Networks (WAN)**
 - "legacy" LANs (Ethernet, Token Ring)
 - FDDI, FDDI-II
 - Switched Ethernet
 - Isochronous Ethernet (IEEE 802.9)
 - Fast Ethernet (100 Mbps)
 - 100 VG-AnyLAN
 - Gigabit Ethernet (IEEE 802.3z)
 - Key WAN Services for Multimedia
 - Bridges and Routers
 - X.25 and Frame Relay
 - Switched Multimegabits Data service (SMDS)

- ❑ **Wireless WANs, LANs and Wireless Personal Area Networks**
 - IEEE 802.11
 - Bluetooth
 - IEEE 802.15
 - HomeRF
 - Mobile IP

❖ Multimedia and the Internet

- ❑ OSI reference model
- ❑ Internet Protocols: TCP, UDP, IP, IPv6
- ❑ Unicast, Broadcast, Multicast
- ❑ Protocol requirements for multimedia
- ❑ RSVP
- ❑ Real Time Transport protocol (RTP, RTCP)
- ❑ Internet telephony
- ❑ The World Wide Web
- ❑ WWW Architecture and HTTP
- ❑ Hypertext and Hypermedia

❖ Multimedia Security

- ❑ Internet Security
- ❑ Secure Sockets Layer, SHTTP, IPSec, SSL
- ❑ Attacks on e-security
- ❑ Digital Watermarking for Multimedia
- ❑ Classification of watermarks
- ❑ Image, video, audio and text watermarking techniques