Multimedia Systems

Overview of the Course

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Course Syllabus

Website

http://ce.sharif.edu/courses/92-93/2/ce342-1/
Course Syllabus

Textbook


* We will mostly use class handouts and lectures. Therefore, text books could be used as a reference.
Course Syllabus

Other Reference Books

  
  [http://books.google.com/books/about/Multimedia_Systems.html?id=k83m5inkjXwC](http://books.google.com/books/about/Multimedia_Systems.html?id=k83m5inkjXwC)


... and Wikipedia
Quiz: Sunday, Lowest quiz will be dropped

HW: Tuesday, Due: 2 Weeks, Req. MATLAB or Octave
Course Syllabus

Examples:
- Traffic control using mobile phones,
- Multimedia systems in schools,
- Human computer interfacing,
- Video chat over LAN network,
- Telemedicine, TeleCollaboration, etc.

* We will review the examples in a session

Report structure
- Literature survey
- Pros. and Cons. of the existing methods
- Definition of new proposals
Course Syllabus

Problem Solving Classes

- TA(s) and session time
  - See the course website.
- Integral component of the course
- Tools:
  - MATLAB
    - www.mathworks.com/products/matlab/
  - GNU Octave
    - www.gnu.org/software/octave/
Course Outline

Introduction to Multimedia

- What is Multimedia?
- Components of Multimedia
- Multimedia Research Topics and Projects
  - Processing: e.g. content-based retrieval
    - Generation, Representation, Storage, Search and retrieval.
  - Networking: e.g. QoS
    - Transmission, Delivery.
  - End-Systems: e.g. User Interfaces
  - Interaction: e.g. “ubiquity“ devices
Course Outline

Review of Signals and Systems

- What is “signal”!?
- Discrete-time signals and systems
- Sampling theorem
- Quantization (Scalar Q., Vector Q.)
- Transform domain analysis
- FFT, STFT, Wavelet
Course Outline

Audio

- Audio representations
  - Formats and standards
- Frequency Masking vs. Temporal Masking
- Speech processing
  - Synthesis, recognition, …
- Audio Compression
  - DPCM, ADPCM, LPC, CELP
Course Outline

Entropy Coding

✦ Data storage
✦ Data redundancy
  ✦ Lossy and lossless compression
  ✦ Entropy encoder
  ✦ Predictive coding
✦ Huffman Coding
✦ Lempel-Ziv-Welch
✦ Arithmatic Coding
Course Outline

Image, Color Space

- Physics of Color
- Human Eye
- Additive and subtractive color mixing
- Color space Models
  - YUV, RGB, HSV, …
- Gamma correction
Course Outline

Image, Acquisition and Representation

- Color Depth
- Palette, Halftone
- Image Resolution
- Histogram, Contrast
- High-Dynamic-Range (HDR)
- Bracketing
Course Outline

Image, Enhancement

- Image Noise
- Gaussian Smoothing
- Mean and Median Filter
- Sharpening
- Edge Detection
- Despeckle
Course Outline

Image, Compression

- JPEG
  - Encoder Diagram
  - Decoder Diagram
  - Color Space Transformation
  - Subsampling in color space
  - Discrete Cosine Transform (DCT)
  - Quantization Matrix
  - Compression Ratio
  - Blocking Artifact
Course Outline

Video, Analog and Digital Video

- Video Display
  - Progressive, Interlaced
- Analog Broadcast TV Systems
  - NTSC, PAL
  - Analog Color Video
    - Composite video, S-Video, Component video
- Digital Video (HDTV)
  - DVI, HDMI, DisplayPort
Course Outline

Video Coding

- Interframe and intraframe coding
- Motion Estimation and Motion Compensation (MEMC)
- Picture Types
  - I-frames, B-frames, P-frames
- Video Codecs
  - MPEG-1, MPEG-2, MPEG-4, h.261, h.263, h.264, h.265, …
Course Outline

Multimedia (Networking) Systems

- Standalone vs. Networked
- Live vs. Orchestrated
- Multimedia system building blocks
- Real-time multimedia system architecture
Course Outline

Multimedia Networking

- Quality of Service (QoS)
- Error concealment
- Prioritized Encoding
- Overlay networks
- Packet-loss, Congestion
- Unicasting and Multicasting
- Streaming protocols
Course Outline

Multimedia Applications

- DVB
- Interactive TV, Internet-TV, IPTV
- E-Learning
- Human Computer Interface
- Multimedia Home Platform (MHP)
- Multimedia Information Retrieval System
- 3D Technologies
Thank You

Next Session: Introduction to Multimedia Systems

FIND OUT MORE AT...

1. http://ce.sharif.edu/~m_amiri/