Course Presentation

Multimedia Systems

Overview of the Course

Mahdi Amiri

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Course Syllabus

Website

http://ce.sharif.edu/courses/90-91/2/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


... and Wikipedia
Course Syllabus

Grading Policy

- Quiz: Sunday, Lowest quiz will be dropped
- HW: Tuesday, Due: 2 Weeks, Req. MATLAB
Course Syllabus

Examples:
- Traffic control using mobile phones,
- Multimedia systems in schools,
- Human computer interfacing,
- 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
- MATLAB
Course Outline

Introduction to Multimedia

- What is Multimedia?
- Components of Multimedia
- Multimedia Research Topics and Projects
  - Processing: e.g. content-based retrieval
  - Networking: e.g. QoS
  - 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
- Arithmetic 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
  - MPEG1, MPEG2, MPEG4, H.261, H.263, H.264, …
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
Multimedia Systems

Overview of the Course

Thank You

Next Session: Introduction to Multimedia Systems

FIND OUT MORE AT...

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