EE 669 Multimedia Data Compression (01/15/2009)

Course Syllabus

Term: Spring 2009

Course Title: Multimedia Data Compression

Lecture: 9:00 - 11:50 am, Friday, OHE 132

Instructor:
Prof. C.-C. Jay Kuo
Ming Hsieh Department of Electrical Engineering, Room EEB 440
University of Southern California, Los Angeles, CA 90089-2564
E-mail: cckuo@sipi.usc.edu
Phone: (213) 740-4658, Fax: (213) 740-4651

Website:
http://den.usc.edu
1. Course materials, project assignment and announcements are available on the website.
2. Homework submission and return are handled electrically through the website (no paper copies).
3. FAQ regarding homework will be posted by TA on the discussion board.

Instructor Office Hours:
Monday and Tuesday 8:30-10am
(For homework-related issues, please consult with the TA or grader first.)

Teaching Assistant:
Steve (SeongHo) Cho: Room EEB439, Phone (213) 740-4656
E-mail: seonghoc@usc.edu
Office hours: Tuesday 2pm-4pm Wednesday 3:30pm-5:30pm

Grader:
Sanjay Purushotham: Room EEB B10, Phone (213) 740-9136
E-mail: spurusho@usc.edu
Office hours: by appointment only

Textbook:
None. About 50% of the course material is prepared in Power-point slides. The corresponding PDF files will be available on DEN course website.

Prerequisites:
Familiarity with C/C++ programming.
Students are expected to comprehend existing C/C++ programs and modify the codes for various goals. The students may also be required to write small programs from scratch. Provided sample codes come with makefiles for compilation under Unix environment. Either familiarity with basic unix commands or the ability to convert the codes to a windows project is required.

Projects:
The there will be three programming projects as homework.

Project 1: Lossless Compression I (Huffman Coder, LZW Coder)
Project 2: Lossless Compression II (QM Coder) and Vector Quantization
Project 3: Image and Video Compression

No late submission will be accepted.

Oral Test of the Computer Projects:
An oral test will be held at the end of the semester. The students will be asked about their implementation of the three projects.

Mid-term Exam:
Time: April 10 (Friday)

Term Paper:
Details of term paper assignment will be given later.
Due: May 1 (Friday) in class.

Grading Policy:
1. Projects: 45%
2. Oral Test: 10%
3. Mid-term Exam: 30%
4. Term Paper: 15%

Reference Books:

**General References:**
3. Gilbert Held: Data and Image Compression, John Wiley & Sons Ltd., 1996

**Lossless Compression (Lectures 1-3)**
EE 669 Multimedia Data Compression (01/15/2009)


Audio and Speech Compression (Lecture 4)

Scalar and Vector Quantization (Lectures 5-6)

Still Image Compression (Lectures 7-8)
17. Michael F. Barnsley and Lyman P. Hurd: Fractal Image Compression, Jones and Bartlett, 1993

Video Compression (Lectures 9-10)

Wired and Wireless Video Delivery (Lecture 12)

Note: In addition to the above reference books, some journal papers will be provided as reference reading material.
EE 669 Multimedia Data Compression (01/15/2009)

**Tentative Schedule:**

- **Lecture 1:** An overview of image compression, important information theory concepts, entropy definition and interpretation
- **Lecture 2:** Shannon-Fano coding, Huffman coding, adaptive Huffman coding, QM codec, context-based QM coder
- **Lecture 3:** Lempel-Ziv codec, examples of lossless compression
- **Lecture 4:** Audio and speech compression
- **Lecture 5:** Scalar quantization, optimal scalar quantizer, compander.
- **Lecture 6:** Vector quantization
- **Lecture 7:** JPEG still image compression
- **Lecture 8:** Scalar image coding, JPEG-2000, and fractal image compression
- **Lecture 9:** MPEG-1, -2, -4 and H.26x video compression standards
- **Lecture 10:** Fast motion search algorithm and applications of video coding in DVD and DTV
- **Lecture 11:** Pre- and post-processing techniques, deblocking filters, deranging filter, rate control techniques
- **Lecture 12:** Multimedia delivery/streaming over wired and wireless networks
- **Lecture 13:** Multimedia content protection, encryption and watermarking, MPEG-21
- **Lecture 14:** 3D graphic coding, examples of multimedia systems (VOD systems, Game server systems), embedded multimedia systems for mobile applications

**Important Reminder:**
Please refer to the following web sites for USC policy on academic integrity and the penalties for cheating and plagiarism. These rules will be strictly followed.

1. [http://www.usc.edu/dept/publications/SCAMPUS/gov/gov05.html](http://www.usc.edu/dept/publications/SCAMPUS/gov/gov05.html)
4. [http://www.usc.edu/dept/ARR/grades/](http://www.usc.edu/dept/ARR/grades/)