E669 Course Syllabus

Term: Spring 2012

Course Title: Multimedia Data Compression

Lecture: 9:00 - 11:50 am, Friday, OHE 122

Discussion: 8:30 - 9:20 am, Wednesday, Room: TBA

Instructor:
Prof. C.-C. Jay Kuo
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Phone: (213) 740-4651

Website: http://den.usc.edu
1. Course materials, project assignment and announcements are available on the website.
2. Homework submissions and returns are handled electrically (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 Assistants:
Jiangyang Zhang
Room: PHE 330, Phone (213) 740-4372
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Office Hours: Wednesday, 1:00 - 3:00 pm

Hang Yuan
Room: EEB B10, Phone (213) 740-9136
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Office Hours: Monday, 10:00 am - 12:00 pm

Graders:
Sanjay Purushotham
E-mail: spurusho@usc.edu
Office Hours: by appointment only

Sachin Chachada
E-mail: chachada@usc.edu
Office Hours: by appointment only
Textbook:
None. About 50% of the course material is prepared in Power-point slides. The PDF files corresponding to any other topics will be available on the DEN course website.

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

Projects:
3 programming projects will be given as homework. No late submissions are accepted.

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

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: March 30 (Friday) 9:00 am - 11:50 am.

Term Paper:
Details of the term paper assignment will be given later. Due: April 27 (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 Comression (Lectures 1-3)**

**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.
Tentative Schedule:

**Lecture 1:** Overview of image compression, important information theory concepts, entropy definition and interpretation, Shannon-Fano coding, Huffman coding,

**Lecture 2:** Adaptive Huffman coding, Lempel-Ziv codec

**Lecture 3:** QM codec, context-based QM coder, examples of lossless compression

**Lecture 4:** Scalar quantization, optimal scalar quantizer, compander

**Lecture 5:** Vector quantization

**Lecture 6:** Audio and speech compression

**Lecture 7:** JPEG & JPEG-2000 still image compression

**Lecture 8:** Video coding standards (A) MPEG-1, MPEG-2

**Lecture 9:** Video coding standards (B) H.264/AVC and HEVC

**Lecture 10:** Video coding techniques: motion estimation, rate control algorithms, pre & post-processing

**Lecture 11:** Video delivery/streaming over wired and wireless networks

**Lecture 12:** Mobile multimedia computing

**Lecture 13:** Multimedia content management and protection

**Lecture 14:** Future directions – Multi-view video coding, depth coding and others

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/)