Syllabus of Multimedia Communications

Instructor: **Prof. Chia-Wen Lin (林嘉文)**

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Teaching Assistant: To Be Decided

Office Hours: 1:00~3:00 pm (Mon) or by email appointment

A. Course Description

This course introduces technologies for multimedia processing, coding, and communications. We will address how to efficiently represent multimedia data and how to deliver them over a variety of networks. In the coding aspect, state-of-the-art compression technologies will be presented. Emphasis will be given to state-of-the-art multimedia coding standards, including JPEG/JPEG-2000, H.26x, MPEG, and scalable video coding (SVC). Besides, considerations for constructing a video codec system will also be discussed. In the aspect of multimedia networking, special considerations for sending multimedia over the Internet and wireless networks, such as video adaptation, error resilience, error concealment, and quality of service will be discussed.

B. Textbooks

- *Standard Codecs: Image Communication to Advanced Video coding*, by Mohammed Ghanbari, IEE, UK, 2003.
- Special Issue on Advances in Video Coding & Delivery of Proceedings of the IEEE (January 2005)

C. References

- *Video Processing and Communications*, by Yao Wang, Joern Ostermann, and Ya-Qin Zhang. Prentice Hall, 2001.
- *Multimedia over IP and Wireless Networks: Compression, networking, and Systems*, by Mihaela van der Schaar. And Philip Chou, Academic Press, 2007.
- *Compressed Video over Networks*, edited by Ming-Ting Sun and Amy R. Reibman, Marcel Dekker Inc., Switzerland, 2000.

D. Teaching Materials

This course will be taught mostly by the lecturer using slides. Lecture notes will be made available on the course webpage before each class. Part of the class time will be assigned to selected students to present their project results. In-class questions and answers, homework (written and computer assignments), and examinations will be used to help the students to understand the course contents.

E. Course Outline

Part I: Overview of Multimedia Processing & Coding (6 weeks)

- Overview of Multimedia Services and Applications
- Video coding fundamentals
- Lossless Compression & Lossy Compression

- Transform Coding
- Motion Compensated Predictive Coding

Part II: Multimedia Coding Standards (6 weeks)

- JPEG/JPEG-2000
- H.26x, MPEG-1/4/7, AVC
- Scalable Video Coding

Part III: Multimedia Networking (6 weeks)

- End-to-End QoS for Video Delivery
- Wireless Video
- Error Control in Video Streaming
- Cross-Layer Video Adaptation

F. Homework Assignments

The best way to understand an algorithm is to program it. Therefore, this course emphasizes computer assignments. The use of C/C++ is encouraged. You may also use Matlab to generate some figures. If you plan to use other programming languages, please discuss it with the instructor. These computer assignments mainly involve building components of multimedia coding and communications. They will be assigned on a monthly basis, and the due day will be indicated on each homework. The homework policy is as follows:

- You can discuss the homework problems with students currently taking the course, the TA, and the instructor. However, solutions and solution-techniques should not be exchanged. You should make sure that you understand the solution you turn in, and should of course write up every word of the solution by yourself. Cribbing others' homework is definitely prohibited and will lead to "0" point in your final grade.
- **No late homework**

G. Term Projects

Students will form small groups of 2~3 members to complete projects in multimedia communications or related technologies. During the week when the project is due, each group (or selected groups) will schedule a time slot with the instructor and TA to demonstrate the project. The same policy for the homework should apply to the projects as well. If in doubt, please check with the instructor.

H. Grading Policy

- Homework (3 times) (25%)
- Midterm Exams (2 times) (45%)
- Course Project (midterm & final project reports) (30%)

I. Course Page

http://www.ee.nthu.edu.tw/~cwlin/courses/multimedia/index.htm