Department of Electrical and Computer Engineering
The Johns Hopkins University

520.643 Digital Multimedia Coding and Processing

Spring 2003

Instructor Prof. Trac D. Tran
Address: 310 Barton Hall
Phone: 410-516-7416
Email: trac@jhu.edu
Office Hour: Thursday 1-3 or by appointment.

Course Homepage *http://thanglong.ece.jhu.edu/Course/643/*

Lectures Thursday Friday, 10:30 - 12:00, 225 Barton Hall.

Course Description

An introduction to the coding and processing of digital multimedia. The course covers current techniques for processing, storage and delivery of media such as speech, audio, images, and video. This requires an in-depth understanding of digital signal processing for 1D signals, as well as the extensions to 2D and 3D cases. The emphasis will be on the theoretical basis as well as efficient implementations. Key components studied in details are digital filters, transforms, quantizers, bit allocators, entropy coders, motion estimation and compensation algorithms. Current and future audio/image/video compression standards and formats such as MP3, JPEG, JPEG2000, MPEG, H.263, HDTV... are frequently used as illustrations.

Recommended Textbook (available on library reserve)

- K. R. Rao and J. J. Hwang, *Techniques and Standards for Image Video and Audio Coding,* Prentice Hall, Upper Saddle River, NJ. ISBN 0133099075.
- A. Murat Tekalp, *Digital Video Processing,* Prentice Hall, Upper Saddle River, NJ. ISBN 0131900757.
- Barry G. Haskell, Atul Puri, and Arun N. Netravali, *Digital Video : An Introduction to MPEG-2,* Chapman & Hall, New York, NY. ISBN 0412084112.
- Vasudev Bhaskaran and Konstantinos Konstantinides, *Image and Video Compression Standards Algorithms and Architectures,* Kluwer Academic Publishers, Boston, MA. ISBN 0792399528.

- Arun N. Netravali and Barry G. Haskell, *Digital Pictures: Representation, Compression, and Standards,* 2nd Edition, Plenum Publishing Corporation, New York, NY. ISBN 030644917X.
- Joan L. Mitchell (Editor), William B. Pennebaker (Editor), Chad E. Fogg, and Didier J. LeGall, *MPEG Video: Compression Standard,* Chapman & Hall, New York, NY. ISBN 0412087715.
- William B. Pennebaker and Joan L. Mitchell, *JPEG: Still Image Data Compression Standard,* Van Nostrand Reinhold, New York, NY. ISBN 0442012721.
- P. N. Topiwala (Editor), *Wavelet Image and Video Compression,* Kluwer Academic Publishers, Boston, MA. ISBN 0792381823.
- N. S. Jayant and Peter Noll, *Digital Coding of Waveforms: Principles and Applications to Speech and Video,* Prentice Hall, Englewood Cliffs, NJ. ISBN 0132119137.

Prerequisites

- 520.435 Digital Signal Processing.
- C/C++ and Matlab.
- Basic knowledge in linear algebra and probability.

Programming

- This course emphasizes hand-on learning with computer assignments and projects.
- The use of C/C++ is encouraged.

Exams

- There will be two 90-minute exams. Time and place to be announced.

Homework

- There will be around 5 to 6 problem sets and computer assignments.
- Assignments handed in late will not be accepted unless consent is obtained from the instructor prior to the due date.

Final Project

- Students are expected to work independently or in teams on a related topic of choice.
- The topic can be your own or chosen/modified from a list of suggestions to be provided by the instructor.
- A final project report and an oral demonstration/presentation are required from each team.

Grading

- Homework: 30%
- Midterm exams: 40%
- Final project: 30%