MAT 594/ECE 594

Multimedia Compression (4 Units)
Lecture, 3 Hours; Laboratory, 3 Hours
Winter Quarter 2003
Friday, 12:00 to 2:50 PM, Phelps 1431

Instructor: Jerry D. Gibson
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Course Description:

       This course covers the principle standards for speech, audio, still image, and video compression, with the emphasis on system performance, key underlying technologies, current applications, and the projected future evolution of the standards. Compression methods covered include those used in wireline telephony and videoconferencing, Internet telephony and videoconferencing, digital cellular and wireless communications, video streaming applications, and technologies for the storage and delivery of high quality audio, still images, and video.

Textbook: J. D. Gibson, T. Berger, T. Lookabaugh, D. Lindbergh, and R. L. Baker, *Digital Compression for Multimedia: Principles and Standards*, Morgan Kaufmann, 1998, plus selected readings.

Grading:

Homework	30%
Laboratory	20%
Mid-term Exam	20%
Final Exam	30%

Prerequisites: Graduate standing and permission of the instructor.

Course Outline:

I.   Introduction
                Why Compress?
                Applications of Data Compression
                Key Issues in Data Compression
                Components of a Data Compression Problem

II.   Lossless Compression
                Huffman Coding, fixed and adaptive

Arithmetic Coding, fixed and adaptive
Tunstall Coding
Bidirectional Coding
Lempel-Ziv Coding

III.   Wireline Telephony Speech Coding Standards
      A. Waveform Coding Methods
            G.711, G.726, G.727
      B. Code-Excited Techniques
            G.728, G.729, G.723.1

IV.   Wireline Wideband Speech Coding Standards
      A. Waveform Coding Methods
            G.722
      B. Spectral Domain Methods
            G.722.1
      C. Code-Excited Methods
            G.722.2

V.   Digital Cellular Speech Coding Standards
IS-54 (IS-85), IS-96C, IS-127, IS-136, IS-641, IS-733, IS-893, Narrowband
AMR, Wideband AMR

VI.   Internet Voice Coding Standards and Issues
      A. Speech Coding Methods
            G.711, G.723.1, G.729, MPEG-4 Coding Tools
      B. Packet Assembly, Error Concealment, Quality Evaluation

VII.   Still Image Compression Standards
      A. JPEG
      B. JPEG2000

VIII.   Wireline and Internet Videoconferencing Standards
      A. H.320
      B. H.323
      C. H.324
      D. Other Protocols

IX.   Video Coding Standards
      A. Videoconferencing
            H.261, H.263, H.263+ and ++, H.26L
      B. Movies and Other Video
            MPEG-1, MPEG-2, MPEG-4 Natural Video Coding

X.   Audio Coding Standards