

EE639 Advanced Topics in Signal Processing and Communication

Fall 2004: Multimedia Information System

Instructor: Samson Cheung	Office Hours: 691 FPAT MW 2 – 3pm	Email: cheung@engr.uky.edu
Office: 691 FPAT (7-6064) 831 KU bldg (7-1257 x80299)	WebPage: http://www.vis.uky.edu/~cheung/courses/ee639/fall04.html	

Course Description:

Thanks to the advances in web technologies and multimedia systems, it is easier than ever to create, transmit and archive multimedia content such as audio, still images, video and 3-D graphical objects. It is increasingly important for both individuals and large organizations to have a systematic way to manage their multimedia contents. Multimedia Information System (MIS) refers to content management systems that utilize technologies for representing, coding, searching, visualizing, and protecting multimedia contents. In this course, we will discuss how these tasks can be accomplished using various signal processing and pattern recognition techniques. We will survey algorithms, theories, tools and international standards in research and market for compression, content-based search, indexing, summarization, copyright protection, and digital right management. Students will be evaluated based on bi-weekly homework assignments, a final project and a presentation. No examinations will be given.

Expected outcomes of student learning:

1. Ability to understand and analyze complex MIS.
2. Ability to read and critically evaluate research in selected areas in MIS.
3. Ability to select and implement appropriate signal processing and statistical pattern recognition algorithms to accomplish various tasks in MIS.
4. Ability to do define, implement and present a substantial project of the student's own choosing.

Grading:

Your grade will be based on:

6 Homework Assignments	40%
Final Project (a project proposal + a final report)	40%
Project Presentation	20%

1. The letter grade assignment is based on the following scale: from 100 to 90 pts. => A, from 89 to 80 pts. => B, from 79 to 70 pts => C, from 69 to 60 pts. => D, from 59 to 50 pts. => E.
2. The homework assignments will include both analytical questions and programming. Each student must submit his or her homework and late homework will not be accepted.
3. One final project is required in which students may implement components of MIS or conduct in-depth analysis of emerging technologies. Team project is encouraged and up to three students can be in the same team. A two-page, single-spaced project proposal is due 10/8, and a final report (no less than eight pages, single-spaced) is due 12/10.
4. Students are also expected to prepare a 10-20 minute presentations based on their projects.

Prerequisites:

Students should be familiar with signal and image processing techniques and basic probability theory. Those who have taken EE 640 (Stochastic System) and EE 635 (Image Processing) should have adequate background, though they can be taken concurrently. Students also need to be familiar with MATLAB and one of the high-level programming languages like C++ or Java.

Text:

D. Feng, W.C. Siu, and H.J. Zhang (Eds.) Multimedia Information Retrieval and Management: Technological Fundamentals and Applications. Signals and Communication Technology Series. Springer-Verlag. 2003.

Additional research papers and lecture notes will be posted on the course website.

Tentative Course Schedule:

Week	Dates	Topics	Assigned	Due (Fri)
1	8/25, 27	Overview, System Architecture, Technical Issues		
2	8/30, 9/1,3	Multimedia Representation and Compression	HW1	
3	9/8,10	Classical Information Retrieval		
4	9/13,15,17	Content-Based Search I – Feature Extraction and Matching	HW2	HW1
5	9/20,22,24	Content-Based Search II – Dimension Reduction and Fast Similarity Search		
6	9/27,29	Video Indexing I – Syntactic Structure Analysis	HW3	HW2
7	10/4,6,8	Video Indexing II – Summarization and Visualization		Proposal
8	10/11,13,15	Introduction to Statistical Pattern Recognition	HW4	HW3
9	10/18,20,22	Advanced Content-Based Search - Active Learning and Relevance Feedback		
10	10/25,27,29	Audio Content Analysis and Retrieval	HW5	HW4
11	11/1,3,5	Multimodal analysis and retrieval		
12	11/8,10,12	Digital Rights Management and IPMP	HW6	HW5
13	11/15,17,19	Multimedia Watermarking I – Introduction		
14	11/22,24	Multimedia Watermarking II – Content Authentication and Identification		HW6
15	11/29, 12/1,3	Emerging Research Areas		
16	12/6,8,10	Oral presentation of class projects		Final report