



Multimedia Systems and Applications

Introduction

James Wang



Attribution

- Materials and lecture notes in this course are adapted from various sources, including the authors of the textbook and references, Internet, instructor's personal notes, instructor's friends, etc.
- The instructor has tried to attribute all authors of the course materials.
- If you think that the instructor may overlook something, please tell the instructor.



What is Multimedia?

- Apps that involve more than conventional data types (e.g., text, drawing and images)
- Best examples are continuous media (e.g., animations, audio, and video)
 - Called continuous media because of its temporal nature
- Do not confuse with hypertext/hypermedia
 - Hyper implies linking
- Eventually all apps will include hypermedia
- The World Wide Web (WWW) is the best example of hypermedia applications



Multimedia Applications

- hypermedia courseware
- video-on-demand
- interactive television
- audio/video conferencing (GroupWare)
- virtual worlds (<http://www.activeworlds.com>)
- games
- multimedia authoring
- digital libraries
- web
- audio/video postproduction
- More ...



Why are we here?

- We are here to learn something that has been hot for years.
- Why Multimedia is so hot?
 - It is fun!!!
 - Interesting technique issues.
 - Huge application potential.
 - Digital audio and video is revolutionizing music, film, and video industries.
 - Collaboration, virtual environments, and web casting.
- How hard is Multimedia?
 - It is easy and fun when you look outside in.
 - It is hard and boring when you look inside out.



Course Objectives

- This course will provide the students with an overview of multimedia technologies and the latest developments in multimedia systems.
- Students will be able to gain valuable hands on experience in multimedia systems and applications.
- Issues in effectively representing, processing, and retrieving multimedia data will also be addressed
- Recent multimedia papers or technique reports will be presented or assigned as homework
- Upon completion of the class, the students will be able to:
 - Comprehend multimedia system fundamentals
 - Design and implement a multimedia application or identify a problem in certain multimedia area and provide a reasonable solution.





Reality

- ☛ The word “multimedia” has been overused to the point it does not mean anything.
- ☛ This course will cover a lot of topics such that I will not get into details for every topics. It is your responsibility to dig into the references for details.
- ☛ Some topics in this course are so young that it might not have a best solution yet.
- ☛ Hard work is essential to succeed in this course.



Class Topics

- ☛ **Audio/Video Fundamentals**
 - ☛ Human visual/auditory system and perception
 - ☛ Video representations (analog and digital)
 - ☛ Audio representations (analog and digital)
 - ☛ Media processing algorithms
- ☛ **Signal Processing and Compression**
 - ☛ Image Compression (JPEG)
 - ☛ Standard video CODEC's (MJPEG, MPEG, H.26x)
 - ☛ HDTV (ATSC standard)
 - ☛ Layered source/channel coding
 - ☛ Standard audio CODEC's (MP3, G.72x, AC3)



Class Topics (Continue)

- ☛ **Operating System Support**
 - ☛ Real-time scheduling
 - ☛ Buffer management
 - ☛ File systems
 - ☛ Cache and storage systems
- ☛ **Network Support**
 - ☛ Network hardware (Sonet, ATM, Ethernet, and 1394/iLink)
 - ☛ Network protocols (link-level resource management, IP-multicast, RTP, SIP, etc.)
 - ☛ Systems services (e.g., continuous media toolkits, announce/listen protocols, receiver-oriented layered multicast, resource discovery, etc.)



Class Topics (Continue)

- ☛ **Web Technologies**
 - ☛ Web Server and Web Caching
 - ☛ Multimedia streaming
 - ☛ X3D/VRML, XML
 - ☛ Multimedia content delivery
- ☛ **Multimedia Databases**
 - ☛ Large-scale multimedia servers
 - ☛ Content based multimedia retrieval
 - ☛ Multimedia data mining
- ☛ **Synchronization**
 - ☛ Synchronization models
 - ☛ Static -vs- dynamic schedules
 - ☛ Distributed collaboration



General Information

- ☛ **Class web:**
<http://www.cs.clemson.edu/~jzwang/ustc11/ustc11.htm>
- ☛ **Class hours:**
 - ☛ Check the course website.
- ☛ **Classroom:**
 - ☛ 324 Mingde Building.
- ☛ **Office hours:**
 - ☛ Any time other than class hours (by appointment only).
- ☛ **Q&A:**
 - ☛ Send questions to jwang@cs.clemson.edu.



Attendance

- ☛ It is very important to attend the class since the lecture contents are drawn from various sources.
- ☛ Failure to attend the course most likely leads to missing some information that won't show in lecture notes or textbook.
- ☛ The students may leave if the instructor does not show up in the classroom by 5:15 PM .





Project

- ✿ The instructor will provide several multimedia-related projects at the beginning of the semester for students to choose from.
- ✿ The students should form teams of 2 to 3 persons by their own choice.
- ✿ Any student who fails to find a team should contact the instructor as soon as possible to avoid any delay in the project.
- ✿ Each team can choose one project from those provided by the instructor to work on.
- ✿ A team can also work on a project they propose upon the approval of the instructor.



Project Policy

- ✿ Each team must finish the project independently. Any form of cheating will result in a grade F in the course for anybody involved.
- ✿ Projects must be submitted before the due date. Late submission will not be accepted unless being approved by instructor.



Grading Policy

- ✿ **Test (60%):** There will be a written exam at the end of the semester to cover the content studied in the class.
- ✿ **Project (40%):** Each team must submit a project report and give a demo at the end of semester. The project report must include the project design, system architecture, implementation details, source code, installation instruction and user manual.
- ✿ **Penalty Points (-10%):** Students are required to attend the class. The instructor may penalize those who fail to attend the class without instructor's approval.
- ✿ **Grading:** A (90 - 100), B (80 - 89), C (70 - 79), D (60 - 69), F (0 - 59). (The scale may be curved down at the end of the semester)



References

- ✿ **ACM Multimedia Conference Proceedings**
- ✿ **Fundamentals of Multimedia**, Ze-Nian Li, and Mark S. Drew, Pearson Prentice Hall, October 2003.
- ✿ **Multimedia Communication Systems**, K. Rammohanarao, Z. S. Bolzkovic, D. A. Milanovic, 1st edition, Prentice Hall, May 2002.
- ✿ **Video Processing and Communications**, Yao Wang, Joern Ostermann, and Ya-Qin Zhang, Prentice Hall, 2002.
- ✿ **Web Caching and Replication**, Michael Rabinovich and Oliver Spatscheck, Addison-Wesley, 2002.
- ✿ **Multimedia Communications: Applications, Networks, Protocols and Standards**, Fred Halsall, Addison-Wesley, 2001.

