CS 414 – Multimedia Systems Design
Lecture 1 - Introduction

Klara Nahrstedt
Spring 2011
Overview

- Course information (personnel, policy, schedule, misc.)
- What is Multimedia?
- What is happening in Multimedia domain?
- Summary
Instructor

- Klara Nahrstedt
  - PhD  University of Pennsylvania
  - Research:
    - Multimedia distributed systems (overlay multicast, peer-to-peer systems, service composition, resource management),
    - Mobile computing – smart phones protocols – P2P, video streaming over mobile phones, group management, …
    - Multimedia operating systems (soft-real-time scheduling, caching),
    - Multimedia networking (routing, QoS management, pricing),
    - Multimedia applications (3D protocols, multi-camera tele-immersive systems, mobile multimedia, P2P TV)
Overview

- **Office Assistant:**
  - Lynette Lubben (llubben@illinois.edu) for Klara Nahrstedt

- **Teaching Assistant:**
  - Shu Shi

- **Class Website**

- **Newsgroup:** class.sp11.cs414 (access through cs414 website)
Required Readings for cs414

- Required Textbooks:
  - *Multimedia Systems*, Ralf Steinmetz, Klara Nahrstedt, Springer Verlag, 2004

- Papers!!! (required reading since many areas are not covered in present textbooks)
Course Prerequisites

- CS 241 – pre-requisite MUST, otherwise the class will be hard, especially the MPs!!!

- You need to know
  - System/C Programming on top of Linux
  - Socket Programming
  - Thread Programming
  - Locks/Semaphore Synchronization/Programming
Facilities and Equipment (1)

Leasing Process from TSG Helpdesk
- Lease one Logitech camera for each student or at least two cameras within one group to start MP1, and then for MP2/MP3.
- Leasing process starts on **January 26**
- Pick up the camera from the **TSG Helpdesk**
- Bring your **student ID** to sign for the camera
- Each cs414 student is responsible for his/her own camera
  - if you lose it (or badly damage) and you don’t have police report, you pay for it (charged to your student account at the end of the semester)
- If nobody is at the TSG Helpdesk, then go to **Barb Leisner office, room 2312 SC**
- Helpdesk hours are **Monday –Friday 8am-8pm**
- No camera pickup on Saturday and Sunday

Returning Process to TSG Helpdesk
- If you drop the class, **return immediately camera** to TSG Helpdesk
- If your camera does not work, return immediately and get a new one
Facilities and Equipment (2)

- Engineering workstations-linux machines
  - 216 SC/SC 220 (SC basement where you can run the camera)

- Leasing mobile G2 phones
  - Need to lease mobile phone for MP3
  - Leasing process through Rick Van Hook equipment office
    - Will be advertised later in the semester
  - Leasing process starts after March 11
Office Hours

- Office hours: available in web page
  - KN:
    - Wed/Fri, 9-10am,
    - Office: 3104 SC
    - Phone: 244-6624
  - Shu:
    - Tu: 11am-12pm; Th: 4-5pm
    - Office: 0207 SC
    - Phone: 244-0526
About this course...

Principles

- Multimedia System concepts
- Multimedia System design
- Some theory
- Rationale
- Practice

Goals

- Understand Digital Audio/Video Media
- Understand Multimedia Systems decisions
- Get hands dirty
Expect (Some) Pain

Fast pace
Hard material
3 MPs (programming)
2 Homework
1 Midterm and 1 Final (Comprehensive) Exam
But....

Students had fun in past cs414!

Ben S. Bernanke
(Image Source: www.federalreserve.gov)
Grading

- Final exam: 35%
- Mid-exam: 10%
- 2 Homework: 10%
- Peer Evaluation: 5%
- 3 MPs: 40%
  - 1st MP – 12%
  - 2nd MP – 12%
  - 3rd MP – 16%
Grading policy

Gradebook system: http://compass.uiuc.edu

Late policy for MPs and Homework Assignments

- No Late Policy

It is your responsibility!

- Check announcements in lectures, newsgroups, or web pages

MPs will be done in Groups of 3 students

- Start forming groups as soon as possible!!
Group Setup Process

- Organize Groups among yourself between 1/19 and 1/24
  - Use newsgroup to find group partners
- Email to TA Shu (shushi2@illinois.edu) your group formation by 1/24
  - If you cannot find a group, email immediately to the TA Shu – email your request as well as skills you can bring to the table.
- TSG will setup accounts and directories for groups.
- Between 1/24 and 1/28 the TA (Shu) will inform each group their login and password to start to work on the Linux machines.
Peer Evaluation

- **By 5/6** each peer submits ‘peer evaluation’ of his/her group

- Evaluation will include
  - His/her own self-evaluation
  - His/her evaluation of each group member for each MP
  - Evaluation should include contribution of each member to each MP
  - Evaluations will be sent to instructor only
  - Evaluations will be known only to the instructor, i.e., will not be revealed neither to any other group members nor TA.
Peer Evaluation – form submitted to instructor at the end of the semester

<table>
<thead>
<tr>
<th></th>
<th>MP1</th>
<th>MP2</th>
<th>MP3</th>
<th>MP4</th>
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<tbody>
<tr>
<td>Self-Evaluation</td>
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<tr>
<td>Group Member X</td>
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<tr>
<td>Group Member Y</td>
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<tr>
<td>Group Member Z</td>
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Re-grading policy

- Students have **1 week** (after the grade for homework/MPs/exam is released into the gradebook) to request for re-grading.

- Re-grading requests need to be in **writing** to the TA.

- After the re-grading period, **no** re-grading request will be granted for this Homework/MP/exam.
Cheating Policy

- **Academic integrity**
- **Exams** must be your own – if cheating, then students will get a failing grade in the course.
- Homework must be your own - first offense 0 point, second offense F grade in the course
- Both the cheater and the student who aided the cheater will be held responsible for the cheating
- Machine problems will be graded per group, i.e., each member gets the same number of points.
Lecture Format

- Help you understand important and hard Media and Multimedia Systems concepts
- Lectures do not cover everything
  - Not all questions in homework or exams are from lectures

- Students responsibility
  - Attend lectures
  - Read textbooks, papers!!
  - Homework, MP, Exam
  - Periodically check web page
  - Read/utilize newsgroup
MPs (Deadlines)

<table>
<thead>
<tr>
<th>MP1, post 1/28, deadline 2/16</th>
<th>Audio/Video Recording and Playback</th>
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<tbody>
<tr>
<td>MP2, post 3/7, deadline 3/30</td>
<td>Audio/Video Streaming Protocols</td>
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<tr>
<td>MP3, post 4/4, deadline 5/2</td>
<td>Multi-Party Conferencing</td>
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• Q&A Session before each MP due date
• MP releases and Q&A Session dates will be announced on the course web page/newsgroup
Conferencing Project

- 3 MPs will hang together and at the end should yield one large multi-party conferencing system

- Choose group members carefully and be committed to the group since if you leave, you may leave the group with piece of code that they will have to live with through the rest of the MPs

- Document your MPs/code carefully
Conferencing project

- All groups will be in **competition** and we will announce the winning group.
- The final demonstration on 5/2 will be seen by and evaluated not only by the instructor and TA but also by Pavlov Company, and/or others (e.g., Qualcomm representative is invited).
- Winning group will be featured on the departmental website.
Conferencing Project

- MP1 – recording video and audio and playback audio and video
- MP2 – streaming protocols for audio and video in synchronized fashion across dynamic network
- MP3 – multi-party conferencing where one of the parties (or more) might be Android phone
## Homework & Exams

<table>
<thead>
<tr>
<th>Date/Deadline</th>
<th>Assignment</th>
<th>Details</th>
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<tbody>
<tr>
<td>Post 2/21, deadline 3/2</td>
<td>HW1</td>
<td>- Announcement in web page</td>
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<tr>
<td>March 7, Monday 11-11:50am 1302 SC</td>
<td>Midterm Exam (In-class)</td>
<td>- No makeup homework</td>
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<tr>
<td>Post 4/27, deadline 5/4</td>
<td>HW2</td>
<td>- No makeup exams unless with documented medical emergency</td>
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<td>May 13, Friday 8-11am Room: TBD</td>
<td>Final Exam</td>
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¼ Unit Project: graduate students

- Final grade is decided upon ¾ unit performance
- ¼ unit project: pass or fail
- Individual or group of two
- Choices
  - Implementation project – extend MPs to achieve more optional points
    - Required part of each MP is 80 points, optional points 40, 50, 70 for MP1, 2, 3,
    - If you can get 360 or more for all MPs, you get pass on the ¼ unit project
  - Other choices: Animation project, Survey, others
- Proposal due: 2/18, Friday, 5pm, by email to klara@illinois.edu
- Details in web page
Digital Media Revolution

- **New digital media**: camcorders, 3D cameras, MP3 players, location sensors, speech, gestures, etc.
- Digital media enables **new forms of expression**
  - inform, educate, entertain, provoke, etc.
  - multi-sensory, emphasizes temporal over spatial
- Digital media places the power of **mega production studios at the fingertips of the user**
  - record, edit, process, play, and share digital media
  - profound social, cultural, educational, technological, and communicative impact – its just now beginning
Multimedia Requires

- Multiple media
  - discrete or continuous
  - at least one continuous

- Coordination
  - temporal and/or spatial

- Interaction
  - user exercises control
Related Terms

- **Media**
  - representation of information
  - text, graphics, images, video, sound, etc.

- **Medium**
  - how that representation is communicated
  - TV, Radio, Print, Web

- **Multimodal**
Integrating Aspects of Multimedia

- Capture
- Representation
- Storage
- Transmission
- Processing
- Information exchange
- Presentation
- Perception
This Class

- **Perception**
  - auditory perception, visual system, cognition

- **Multimedia Systems Design**
  - compression, QoS, Multimedia Processing (process scheduling, buffer management, device management), multimedia servers, multimedia networking, synchronization

- **Multimedia Applications** (video conferencing, 3D tele-immersion, VoD, Skype, YouTube, …)
Where’s the Action in Multimedia?

- **Enable amateurs** to take pictures and shoot video like the pros
- **New interfaces** for organizing, retrieving, and accessing large collections of content (Apple - IPhone, Microsoft – Kinect)
- **Capturing and sharing experiences** (Facebook, Twitter)
- **Multi-party collaborative systems** (Cisco Tele-presence System)
- **3D media** – 3D compression, 3D movies (Avatar, …)
- Internet P2P Streaming (IPTV – PPVlive)
- **Mobile multimedia** (Games on phones, phone-TV)
- **Media servers** – YouTube, Amazon
After this lecture…

- Browse the web site
- Subscribe to newsgroup
- Login to linux machines in 216/220 SC
- Setup Groups: 1/19-1/24(email to Shu about group formation)
- Think what are the next generation of multimedia systems/applications?
- Name multimedia applications that you know