The Center for Collaborative Technologies
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Center for Collaborative Technologies at University of Washington
- UW center funded to develop technologies to support education and other collaborative scenarios
  - http://cct.cs.washington.edu
- Extend functionality of ConferenceXP
  - Diagnostics, Security, Remote management, HDTV integration, ...
- Build community of users and developers
- Deploy ConferenceXP in new scenarios
  - International education
  - Developing world

Research in Educational Technology
- How can computing technology enhance education?
  - Focus on classroom instruction
- Challenges:
  - Extending reach of education
  - Increasing interaction
  - Addressing problems of scale
  - Facilitating expression of ideas

Past and Current Research Projects
- Video conferenced distance education
  - UW PMP
  - DISC
  - ConferenceXP
- Classroom interaction systems
  - Classroom Presenter 2.0
  - Classroom Presenter 3
- Tutored Video Instruction
  - UW CC TVI Project
  - Beihang TVI Project
- Structured Interaction Presentations (SIP)
- Student submissions with CP
- Digital Study Hall

Research Approach
- Deployment driven
  - Classroom use
  - Technology development and promotion
- Goals and success criteria
  - Adoption of technology and methodology
  - Influence educational practice
- This is a model that has been working for us
  - Target specific deployments that are innovative in some dimensions

Today’s Talk
- Distance Learning and Video Conferenced Classes
- Tutored Video Instruction
- Lessons learned and remaining challenges
- Future projects
Video Conferenced Teaching

- Multi-site internet based audio-video conferencing
- UW PMP Program
  - Site-to-site courses between UW and Microsoft since Winter 1997
  - www.cs.washington.edu/education/dl/course_index.html
  - Master’s level courses
  - Goal: interaction across sites
    - Approximate single classroom
  - Various technologies have been used since the program was introduced

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Video conferencing in the PMP

  - Polycom + Netmeeting for PPT and SmartBoard
- MSR DISC Project
  - Target: UW, CMU, UCB, Brown graduate class
  - Spring 2002
- MSR ConferenceXP
  - Since Spring 2003
  - UW, MSR, UCB, UCSD
  - Ed Lazowska, Steve Mauer

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Distributed Classroom (DISC)

- High quality, low latency video to support interactive classes
- High bandwidth internet video conferencing
  - Internet2
  - Multicast
- Single machine deployment
  - High end PC
  - Performance limit: handling multiple high resolutions video streams
- Innovative presentation tools

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ConferenceXP

- Redevelopment of DISC
  - Initial deployment in 2002 unsuccessful
  - “How to fail at video conferenced teaching”
- Deployment in UW PMP since Spring 2003
  - High reliability (with unicast backup)
  - Supporting tools for archiving and replay
- Scalability to four site courses
  - UW, UCB, Microsoft, UCSD

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Development of ConferenceXP

- Microsoft Research Project
- Goal: support universities work in distance education and collaboration (on Windows)
- ConferenceXP
  - Internet based video conferencing
  - Extensible platform allowing integration of other data streams
  - Shared source
- Microsoft ended work on project in 2007
  - Established Center for Collaborative Technologies through competitive process to continue stewardship of ConferenceXP

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Center for Collaborative Technologies at University of Washington

- UW center funded for continued work on ConferenceXP Platform
  - http://cct.cs.washington.edu
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Projects related to distance learning

- Working with archived lectures
- Large library of recorded lectures available
  - Autumn 2006 Algorithms class recorded with close talking microphone
- Lecture indexing – support text search of speech (and slides and ink)
  - Language modeling necessary (train on algorithms or CS content)
- Lecture summarization
  - Classify lecture episodes
  - Support for lecture browsing
  - Feedback to the instructor
- Lightweight lecture capture

Tutored Video Instruction

- Video recorded lectures shown with facilitator
  - Original model: lectures stopped by students for discussion
  - Peer tutors
- Developed by Jim Gibbons at Stanford University
- Positive results reported in Science [1977]

UW TVI Projects

- Introductory programming
  - Address community college articulation
  - Experiment with alternate approaches to introductory computing instruction
- UW – Beihang Algorithms course
  - Offering of UW CSE 421 in China

Tutored Video Instruction

- Recorded lecture materials
  - Generally based on live classes
  - Some design to support TVI
    - Good teacher with an interactive style
- Class model
  - Lecture playback alternating with facilitator led discussion
  - Facilitation models
    - Gibbons: Peer instruction
    - Active facilitation

What we’ve learned from all of this

- Value of electronic materials in the process of classroom instruction
- Tools for teaching
  - Teacher and students drive the process
  - Flexible and unpredictable use
- Importance of high reliability
  - And attention to address issues
- Broader context – interplay of technology and other issues

Deployment Driven Research

- Development and deployment of educational technology
- Internal
  - Working with our own classes
  - Opportunity to innovate
  - Pressure to make things work
- External
  - Broad range of ideas
  - User suggestions
  - Feedback on ideas
Directions for future work

- Enhanced lecture capture and analysis
- Speech to text with domain specific training for lecture indexing
- Lecture summarization
- Lightweight capture

Facilitation for Tutored Video Instruction

- Teaching with recorded materials
  - Peer discussion vs. co-teaching
- Regular interruptions for active learning
- Beihang class
  - Facilitators made substantial use of Classroom Presenter
    - Activity structure was successful
- Projects
  - Develop integrated TVI replay, presentation and classroom interaction tools
  - Refine methodology for combining active learning with TVI
  - Replay tools for DSH scenarios

Classroom Technology

- Classroom Presenter Project
  - Integration with student devices
  - Moving beyond tablets and laptops
- Lowcost PCs for school deployments

Classroom Accessibility

- Opportunities in electronic classroom for greater accessibility
- Classroom capture and archiving
- Real time interpretation
  - Captioning/Screen reading
- Input
  - Instant messaging, shared whiteboard, custom input facilities

Center for Collaborative Technologies

- Development of ConferenceXP Platform
- Establish as a shared source project
- System enhancements
  - Multicast diagnostics
  - Security
- Deployments
  - Collaboration with Microsoft sponsored Latin America Virtual Institute
  - UW Professional Master’s Program
    - UW/Microsoft/Lahore University of Management Sciences
  - Music and language instruction

International Education

- Multi-site classes with ConferenceXP
- Challenges
  - Networking issues (firewall, multicast)
  - Identifying cases where interactivity is needed
  - Time zones
    - West Coast US (6:00 pm) & China (9:00 am)
- Short term
  - Pilot tests with Chinese Universities
  - Latin America Virtual Institute
  - International guest lectures for UW CSE PMP Class (spring)
Questions?

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- Center for Collaborative Technologies at UW  
  http://cct.cs.washington.edu/
- UW Professional Master’s Program course  
  http://cs.washington.edu/csep590b

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