Shared Lectures with Integrated Student Activities:

An International Course Offering using Tutored Video Instruction

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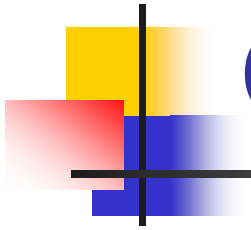
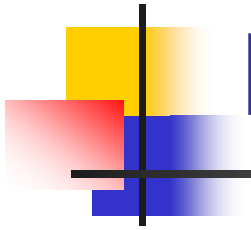


Outline

- Course offering between University of Washington (Seattle) and Beihang University (Beijing)
- Tutored Video Instruction
- Classroom Interaction
- Supporting Technology
- Results

Goal: Offer UW Course at Beihang University



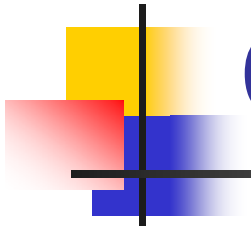
- Motivation
  - Allow course offerings that are not currently available
  - UW/MSR/Beihang partnership
- Sending a UW professor to China was not possible
- Timing issues make synchronous delivery difficult

Tutored Video Instruction

- Base course on facilitated use of recorded materials
- Video materials recorded from a live class
- TVI site facilitator guides discussion around materials
- Gibbons, Science 1977

TVI Offering of UW Course in Beihang

- Capture of UW course offered Fall 2006
- Beihang course uses UW lectures and other materials
  - Same text and assignments
- UW Instructor visited in September and November
- Local facilitators support the course



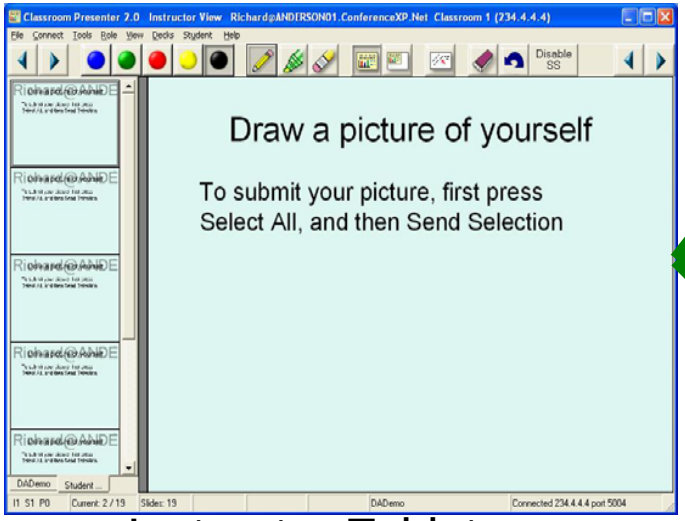
Classroom Presenter

- Tablet PC Based Classroom Interaction System
- Students contribute to class using digital ink on instructors slide
- Instructor views student submissions, and selectively shows them to the class
- Activities embedded into slide based lecture

Pedagogical Goals

- Encourage students to contribute in multiple ways
- Promote engagement in the class
  - Interest
  - Alertness
- Demonstrate that all students have important opinions
- Peer interaction
- Feedback – classroom assessment
- Collection of ideas
  - Collective brainstorm
- Student generation of examples
- Discovery of a pedagogical point
- Gain understanding of an example
- Show misconceptions

Student Submission Workflow



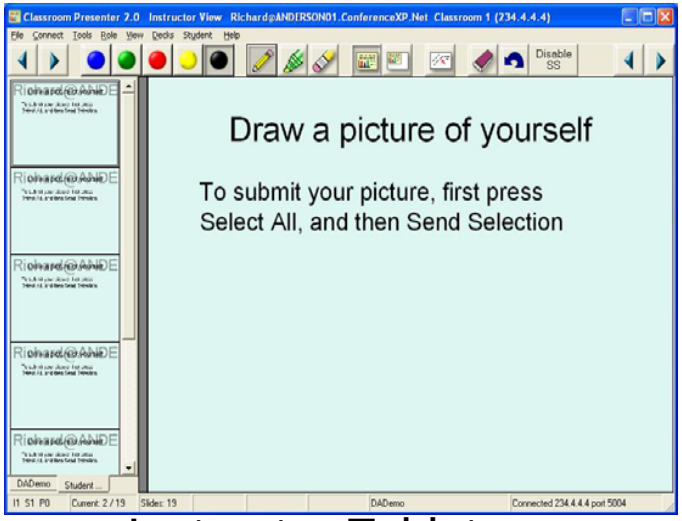
Instructor Tablet

Student Tablet 1

Projected Display

Student Tablet 2

Student Submission Workflow



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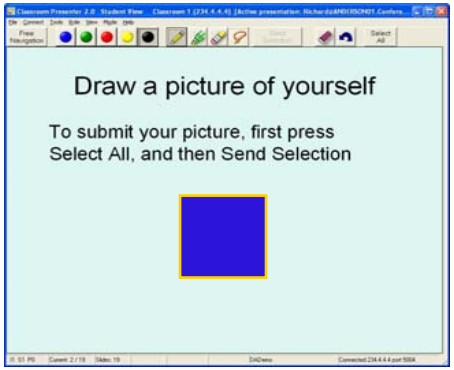

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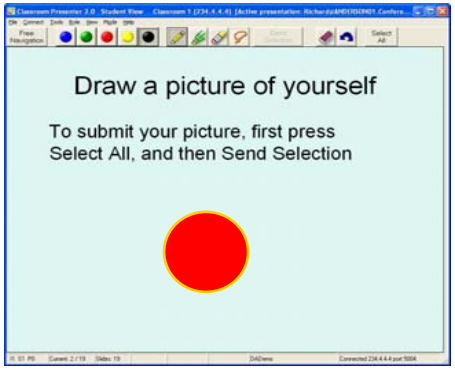
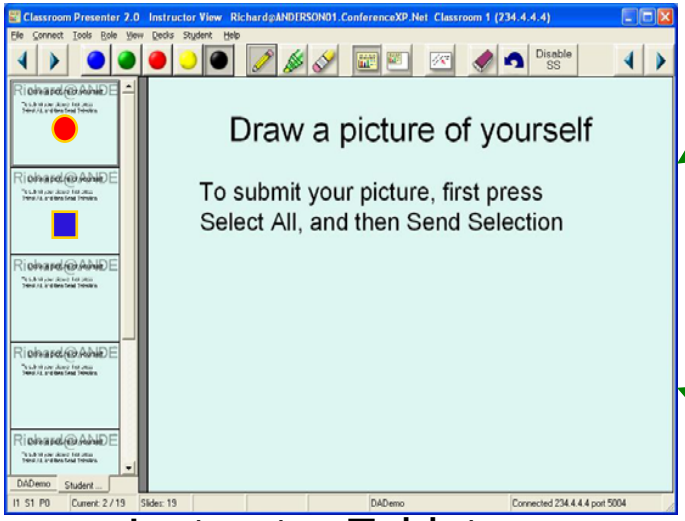


Student Tablet 2

Student Submission Workflow



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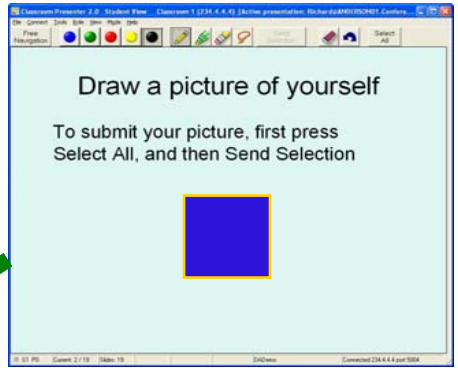

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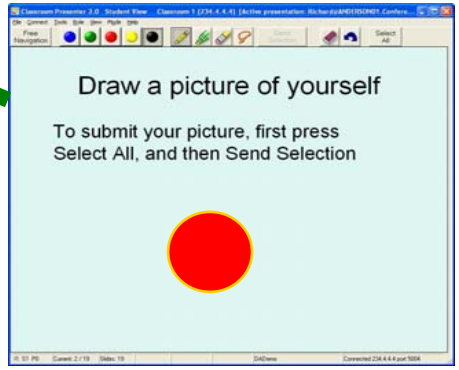
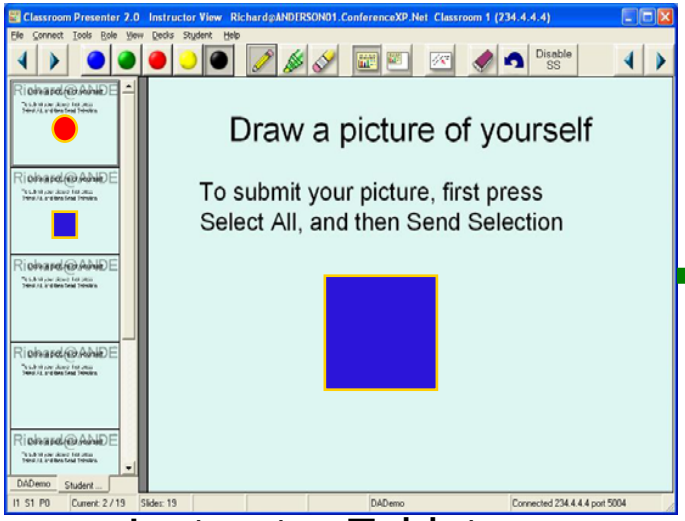


Student Tablet 2

Student Submission Workflow



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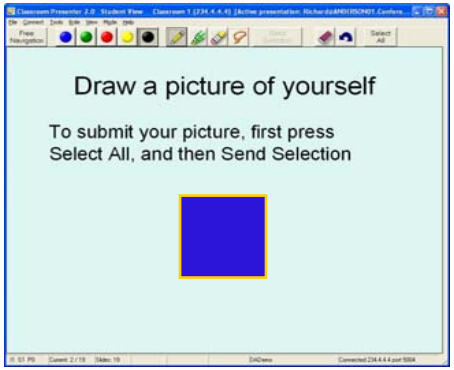

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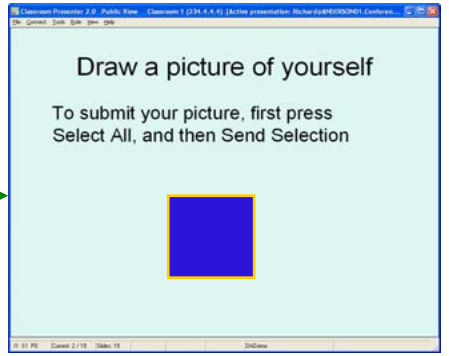

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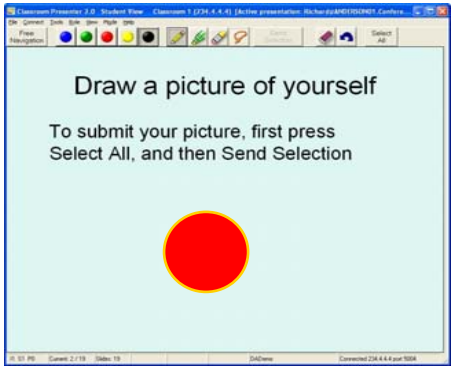
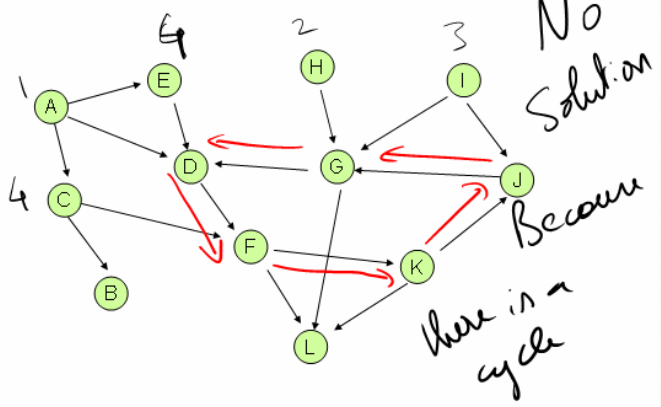


Student Tablet 2

Submission Examples

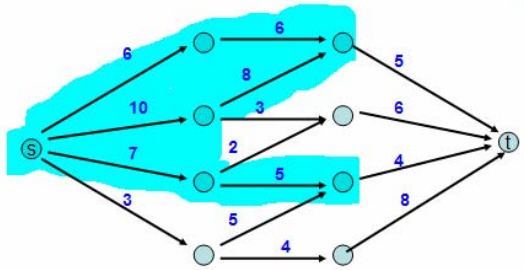
Find a topological order for the following graph



Find a minimum value cut

17

Min Cut Value



Student Submission

Submission examples

Prove $3n^2 + 5n + 20$ is $O(n^2)$

Let c =

Let n_0 =

$(c-3)n^2 - 5n - 20 > 0$

对给定c求出满足

条件的 n_0 即可

Choose c = 6, n_0 = 5

T(n) is O(f(n)) if there exist c, n_0, such that for $n > n_0$, $T(n) < c\ f(n)$

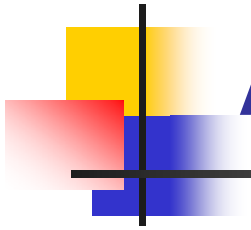
What does it mean for an algorithm to be efficient?

在规定时间内

空间和时间复杂度都小

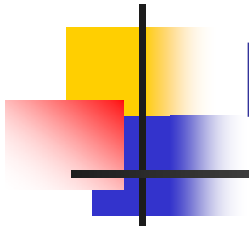
What we are trying to achieve

- Reproduce interactive classroom experience in a remote classroom
  - Moderate level of spoken interaction in UW course
- Promoting interaction through:
  - Design of UW lecture materials to encourage interaction
  - Supporting materials – directions on when to stop for questions
  - Classroom Presenter & TVI Methodology



Archive & Playback Overview

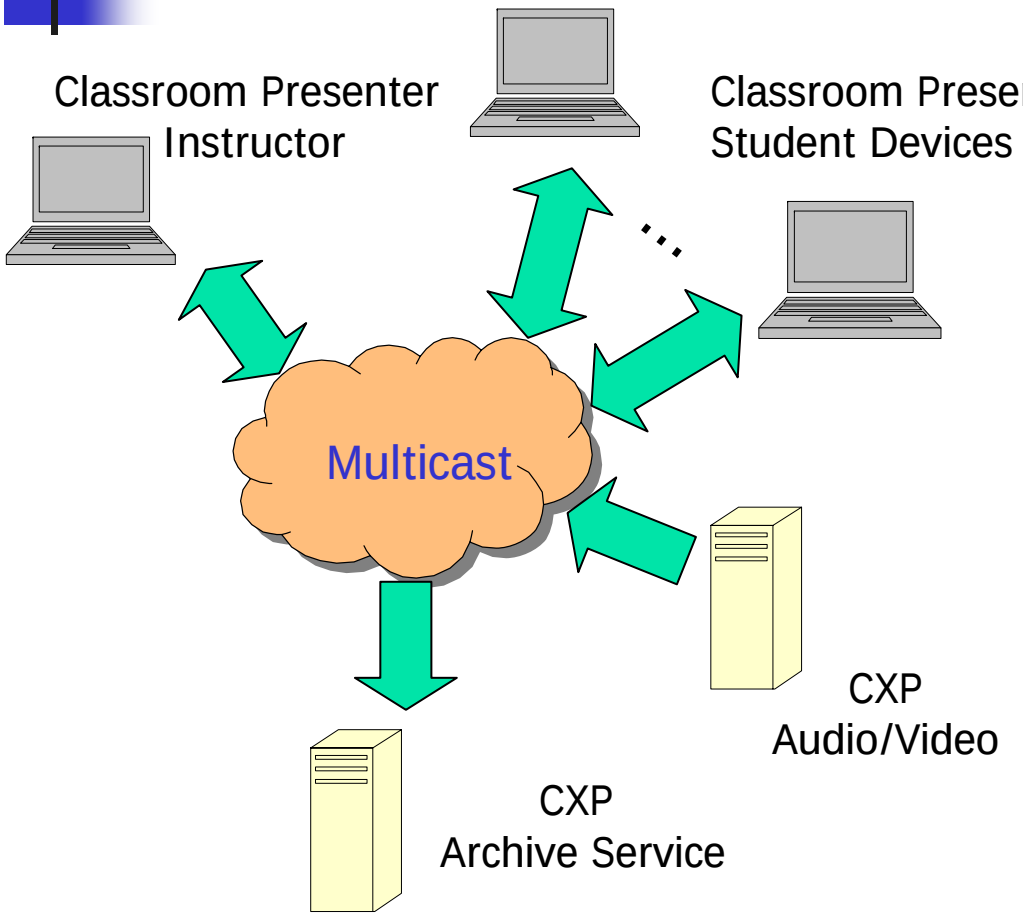
- Leveraging Distance Learning Infrastructure
- Recording: The UW classroom
  - ConferenceXP at the core of our archiving strategy
- Lecture preparation
  - Packaging is automated with CXP Archive Transcoder
- Playback: The Beihang classroom
  - Integrated AV/Presentation Playback using CXP WebViewer



Leveraging Infrastructure at UW

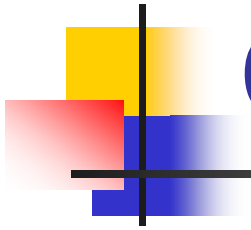
- Distance Learning since 1997
  - ConferenceXP deployed since 2002
  - Tradition of providing archived lectures
- UW ConferenceXP work focusing on archive preparation and playback
- Dedicated distance learning classroom

Recording: The UW Classroom

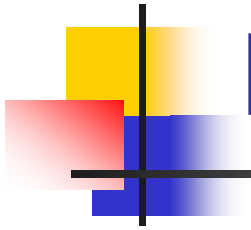


- All devices use Multicast Networking
- ConferenceXP Archive Service provides a simple way to collect all classroom activity

Lecture Packaging: CXP Archive Transcoder



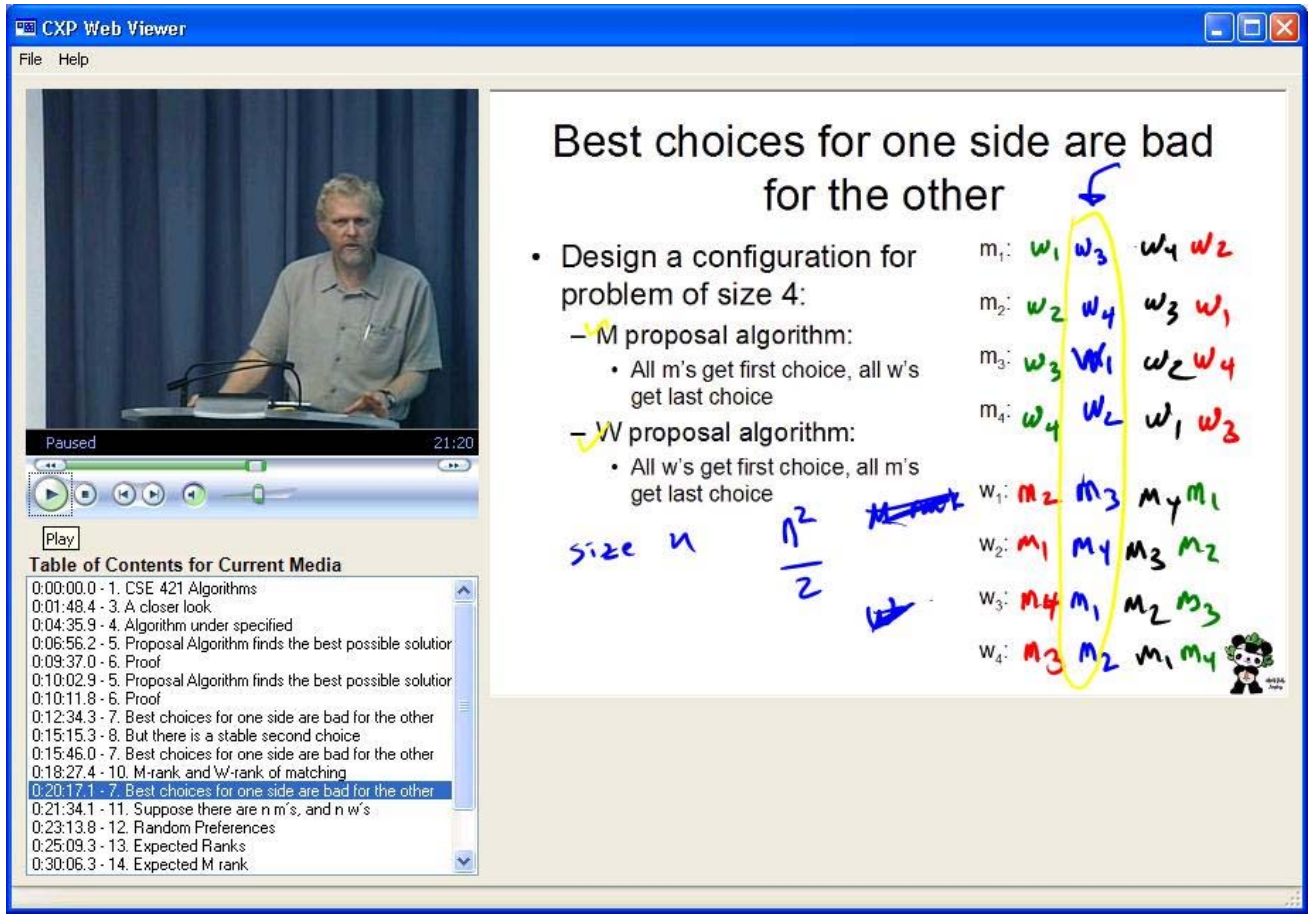
- Extract audio/video streams from Archive Service Database as WMV
- Transcode WMV to preferred profile
- Basic AV editing: crop, join, audio mixing
- Classroom Presenter data transformations targeting CXP WebViewer
- End result is a self contained downloadable package



Lecture Playback: Webviewer

- Integrated synchronized playback including:
  - Audio/Video
  - Instructor slides and ink
  - Student submissions

CXP Webviewer Screenshot



What We Have Learned

- Classroom Interaction is Enhanced
  - Traditional instruction is one-way
  - Average 9 episodes of interaction per 2 hour session
- Successful TA Facilitation
  - Well prepared and highly engaged
  - TAs initiated most interaction
  - Effective at reproducing an interactive classroom
  - Variety of facilitation styles

Midterm Scores

Grade	Number of Students
< 30	2
30-39	7
40-49	13
50-59	18
60-70	7

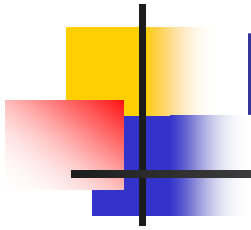
Beihang
Average 48

Grade	Number of Students
< 30	2
30-39	1
40-49	5
50-59	17
60-70	10

UW
Average 54

What Did Not Work Well

- Some minor glitches with new version of Classroom Presenter
  - Possibly compounded by language difficulties
- Audience audio is a problem for replay
  - Student noise is distracting
- Difficulty manipulating multiple applications
  - A “facilitation interface” combining Presenter/Webviewer would be great!
- Lecture summary review by UW instructor is time consuming
- Colloquial/cultural references and jokes did not carry over well



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