Multiple-Mode Communications Environments With IRI-h
Kurt Maly, C. Michael Overstreet, Hussein Abdel-Wahab, Ayman Abdel-Hamid, Sahar Ghanem, Ye Wang, Ankit Kothari

International Conference on New Educational Environments
Lucerne, May 26-28, 2003

Department of Computer Science
Old Dominion University
Norfolk, Virginia 23529-0162, USA
{cmo, maly, wahab, wild, hamid, ghanem}@cs.odu.edu

Outline
- Introduction
- History of IRI & IRI-h
- Primary IRI-h Functionalities
- Interface examples
- Functional Details
- Current Status
- Alternate Uses of IRI-h
- Conclusions and Future Work

IRI-1995
Introduction

IRI-h (Interactive Remote Instruction–heterogeneous) is a multi-platform, multi-network environment scalable system (available from http://www.cs.odu.edu/~iri-h).
IRI-h prototype successfully used to teach a semester-long computer science course across 2 sites 30 km apart.
Fully implemented in JAVA (multi-platform)
Multiple operating system versions (Windows & UNIX) interact freely
Audio and video based on Java Media Framework (JMF)
Tool sharing based on Interactive Program Video IPV

History

- Funded by U.S. National Science Foundation
- First used in real semester-long class in 1995
- Has been used in many different classes
- Current version is third redesign/implementation
  - Originally written in C for speed
  - Used XTV (an environment for distributing simultaneous X applications to multiple workstations) on Sun workstations.
- Reoccurring design problems:
  - System manages too much (e.g. people’s interactions)
  - Interfaces too complex

Primary IRI-h functionalities

- Everyone can:
  - Send video
  - Receive up to 4 simultaneous videos
  - See one or more remote site videos
  - Control/share most any tools
    - Windows, UNIX
  - Control
    - Pointer
  - Whiteboard
  - Session activities (audio, video, annotations) recorded for later review
  - Support for reduced-bandwidth participants
IRI-h Interface, Discussion Mode

A shared view snapshot illustrating a discussion scenario

IRI-h Interface: Presentation Mode

A shared view snapshot illustrating a presentation scenario

IRI-h user functionality details (1/3)

<table>
<thead>
<tr>
<th>Functional</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online management</td>
<td><strong>Class &amp; Internet configuration from Web</strong></td>
</tr>
<tr>
<td></td>
<td>1. Web-based auto start</td>
</tr>
<tr>
<td></td>
<td>2. Command-line start</td>
</tr>
<tr>
<td>Late join</td>
<td>&quot;Session State&quot; delivered to late arriving</td>
</tr>
<tr>
<td></td>
<td>participant</td>
</tr>
<tr>
<td>Presenter control</td>
<td>Controls everyone’s window layout and available services</td>
</tr>
<tr>
<td>Pointer</td>
<td>Option: cursor attached, click activated</td>
</tr>
<tr>
<td>Annotation</td>
<td>Options: pencil, text, clear, others</td>
</tr>
</tbody>
</table>

Title goes here
IRI-h functionality details (2/3)

Audio
- Listen to audio from other sites
- Options: mic on/off; speaker on/off
- Kill/restart sender; kill/restart receiver

Video
- View audio of participants
- Options: activate/deactivate video
- Kill/restart sender; kill/restart receiver

Tool sharing
- Share applications on user's with others

Survey
- Conduct instantly tabulated surveys/quizzes
- Replay an earlier class sessions

Replay
- Names displayed on pointers & videos

Feedback
- Video image of remote classes

IRI-h functionality details (3/3)

Problem/situation awareness
- Identify problems related to class member understanding: audio/video/network

Notebook
- Create & store notes, snapshots during class for later review

Site video
- Control image of entire class

Call student
- Control IRI-h services for students including turning on their video/audio

Monitor
- Participant monitor, service monitor

Bandwidth control
- Control transmission rates for non-multicast users

Current status

- Stable system with significant use history
- Provides administrative support for instructional use
  - Class roles
  - Automatic start-up on a collection of machines so ready when students arrive
  - Available for download
  - But no support
  - In present form, it requires experienced technical support
**Strong support for "lecture-like" class situations**

<table>
<thead>
<tr>
<th>Prepared materials</th>
<th>Slides, simulations, software tool demos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presenter audio &amp; video</td>
<td>Audio only if presenter in another room</td>
</tr>
<tr>
<td>Class members</td>
<td>Attendees names and locations</td>
</tr>
<tr>
<td>Identification of questioner</td>
<td>Names displayed on videos and pointers</td>
</tr>
<tr>
<td>Feedback to presenter</td>
<td>Video of remote rooms, instantly tabulated surveys, participant initiated feedback</td>
</tr>
<tr>
<td>Notebooks</td>
<td>Private notes available after class</td>
</tr>
<tr>
<td>Recorded sessions</td>
<td>Used for student review of class material</td>
</tr>
</tbody>
</table>

---

**Alternative uses of IRI-h**

- Our primary experience has been classroom use
  - Replacing conventional TV-delivered courses
  - We believe it is well-suited for situations with:
    - Presentations of prepared material, e.g., slides to a group of people
    - Tutorial sessions for interactive tools
    - Anyone can control, everyone sees responses to control
    - Active free-flow use participant interaction on a when-desired basis
    - Discussions where participation is primarily managed by a moderator

---

**Example new IRI-h possibilities:**

- Commercial
  - Attorney/client meetings
  - Lawyers/experts report generation
  - Sales meetings
  - Contract negotiations
  - Proposal writing
- Advantages
  - Access to multiple tools, audio, video
  - Free participation of all members
  - Recorded session of what happened (audio, video, annotations)
More educational possibilities

- Student-scheduled project meetings
- Student-scheduled group review for exams
- Instructor help sessions with individual or small groups of students
  - Code debugging
  - Consultants with students on their drafts of papers, etc.
- Student advising

Minimal System Requirements

- Any reasonable modern computer
  - 1.8 GHz Windows or Sun Blade 100 workstation
- Microphone
- Camera (USB works fine)
- Good network connection (56k modem; works well with cable modem)

Future Work

- "IR-lite" and specialized reduced functionality versions
- Reduced capability versions
- Goal: reduced complexity
  - Complexity of use during sessions now seems acceptable
  - Complexity of configuration, set-up, trouble shooting needs to be addressed
  - Eliminate need for configuration files
- Automatic actual rate adaptation for video and tool-sharing gateway servers