

# Computer-Supported Cooperative Work (CSCW)

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## Agenda

- Issues & Concepts
- Groupware
- Social issues
- Evaluation



## CSCW

- Computer Supported Cooperative Work
  - Study of how people work together as a group and how technology affects this
  - Support the social processes of work, often among geographically separated people

\*Mark Guzdial provided input on this presentation



## Paradigm Shift

- Before: System was a tool that was applied to work
- After: Multitasking paradigm shift
  - The “system” became the medium, the moderator, rather than “just” a tool



## Examples

- Scientists collaborating on a technical issue
- Authors editing a document together
- Programmers debugging a system concurrently
- Workers collaborating over a shared video conferencing application
- Buyers and sellers meeting on eBay



## Research Focus

- Often divided into two main areas
  - Systems - Groupware
    - Designing software to facilitate collaboration
  - Social component
    - Study of human and group dynamics in such situations



## Groupware

- Software *specifically* designed
  - To support group working
  - With cooperative requirements in mind
- NOT just tools for communication
- Groupware can be classified by
  - *Then* and *where* the participants are working
  - The *function* it performs for cooperative work
- Specific and difficult problems with groupware implementation



## Classifying Groupware

- Time/Space matrix
  - When and where the participants are working
- People-Artifact Framework
  - The function it performs for cooperative work



# The Time/Space Matrix

Classify groupware by:

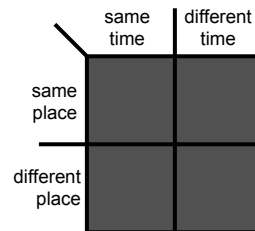
*when* the participants are working,  
at the same *time* or not

*where* the participants are working,  
at the same *place* or not

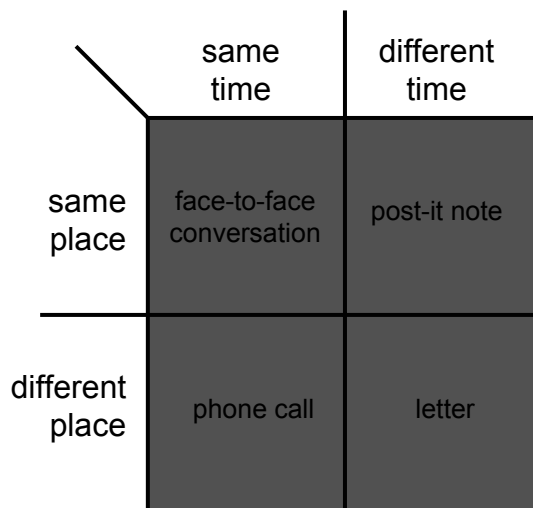
Common names for axes:

time:  
synchronous/asynchronous

place:  
co-located/remote



# Applied to "Traditional" Technology



# Applied to Computer Technology

		Time	
		Synchronous	Asynchronous
Place	Co-located	Face-to-face E-meeting room	Post-it note Argument. tool
	Remote	Phone call Video window,wall	Letter Email



# A More-fleshed Out Taxonomy

	Same Time	Different Time
Same Place	<i>Face to face interactions</i> <ul style="list-style-type: none"> <li>• conference tables with embedded computers</li> <li>• public displays</li> <li>• dedicated tools for e.g., voting and brainstorming</li> </ul>	<i>Ongoing tasks</i> <ul style="list-style-type: none"> <li>• team rooms</li> <li>• group displays</li> <li>• shift work groupware</li> <li>• project management</li> </ul>
Different Places	<i>Distributed real time interactions</i> <ul style="list-style-type: none"> <li>• chat systems</li> <li>• transparent sharing of single user applications</li> <li>• collaboration-aware groupware</li> <li>• video conferencing</li> <li>• media spaces</li> </ul>	<i>Communication and coordination</i> <ul style="list-style-type: none"> <li>• unstructured or semi-structured electronic mail</li> <li>• electronic bulletin boards</li> <li>• asynchronous conferencing</li> <li>• list servers</li> <li>• workflow systems</li> <li>• schedulers</li> <li>• collaborative hypertext</li> </ul>

Table 1. A typical space/time matrix (after Baecker, Grudin Buxton and Greenberg 1995 p.742)



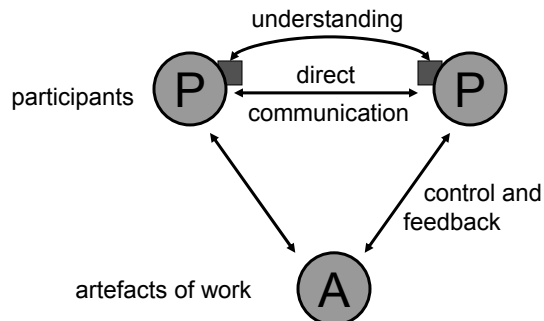
## Styles of Systems

- 1. Computer-mediated communication aids
- 2. Meeting and decision support systems
- 3. Shared applications and tools

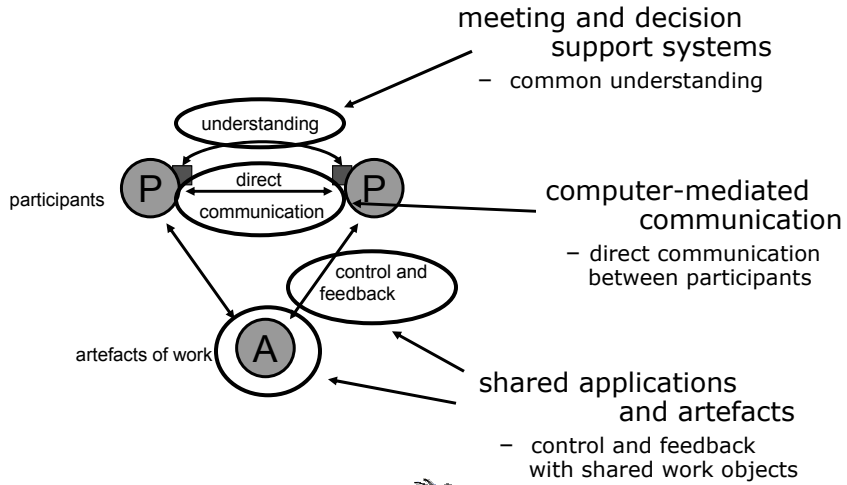


## Classification by Function

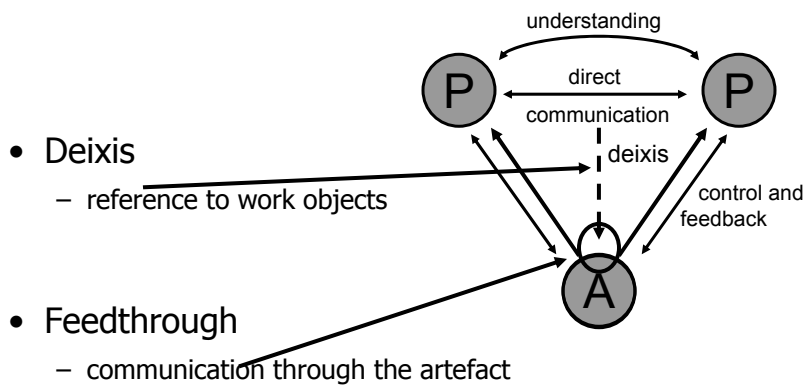
- Cooperative work involves:
  - **Participants** who are working
  - **Artefacts** upon which they work



# What interactions does a tool support?



# Communication via an artifact





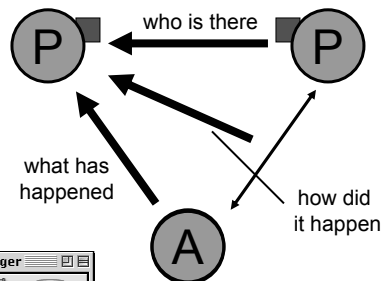
## Many aspects of communication

- Good groupware – open to all aspects of cooperation
  - e.g., annotations in co-authoring systems
  - embedding direct communication
- Bar codes / RF ID
  - Form of deixis
  - Aids diffuse large scale cooperation



## Awareness

- What is happening?
- Who is there  
e.g. IM buddy list
- What has happened  
... and why?



## 1. Computer-mediated Communication Aids

- Examples

- Email, Chats, MUDs, virtual worlds, desktop videoconferencing
- Example: CUSee-Me, iChat, Skype



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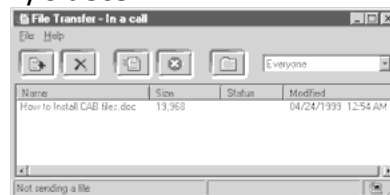
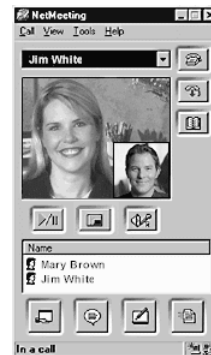


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## 2. Meeting and Decision Support Systems

- Examples

- Corporate decision-support conference room
  - Provides ways of rationalizing decisions, voting, presenting cases, etc.
  - Concurrency control is important
- Shared computer classroom/cluster
  - Group discussion/design aid tools



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### 3. Shared Applications and Tools

- Examples

- Shared editors, design tools, etc.
  - Want to avoid “locking” and allow multiple people to concurrently work on document
  - Requires some form of contention resolution
  - How do you show what others are doing?



### Example

- Teamrooms - Univ. of Calgary, Saul Greenberg

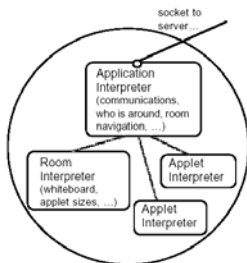
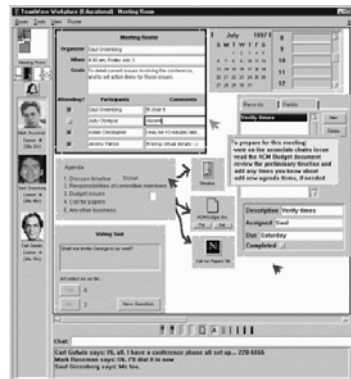


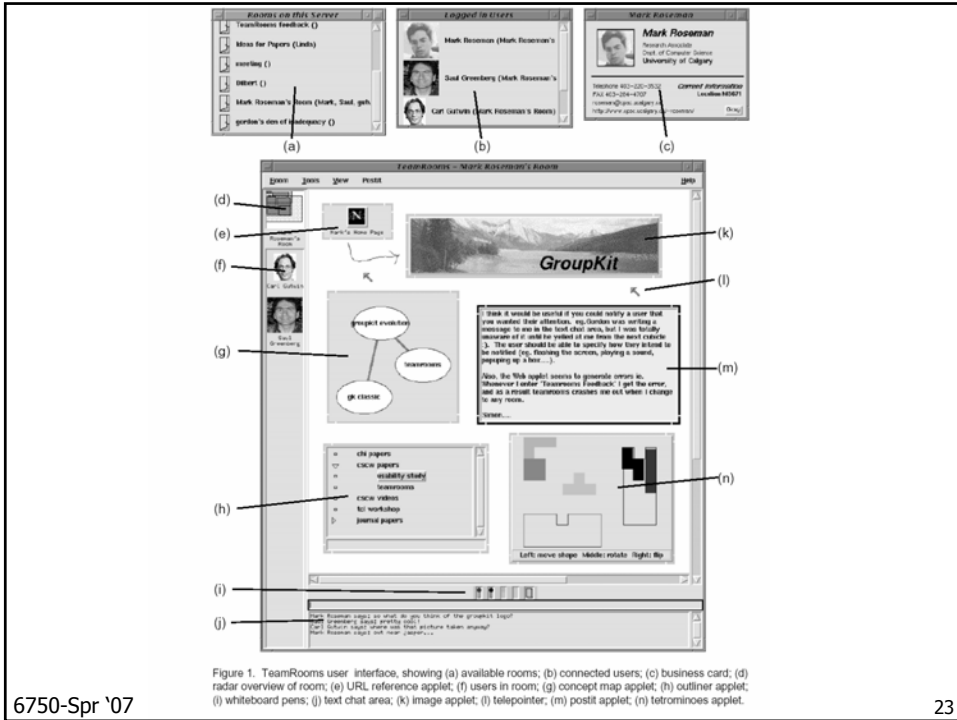
Figure 2. Structure of TeamRooms client, showing use of multiple interpreters.



Video, CHI '97

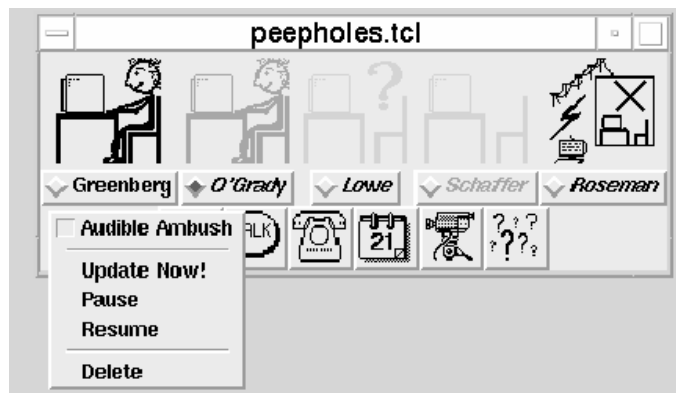
<http://www.cpsc.ualgary.ca/grouplab/projects/index.html>





## Example

- Peepholes (same lab at Calgary)
  - Contact facilitation system that lets you know who is around on the Internet by illustrating their presence through iconic indicators



# Using the CoWeb

The screenshot shows two Internet Explorer windows. The left window displays the 'CS 6750 Coweb' page with the following content:

**CS 6750 Coweb**  
**CS/PSYC 6750 - Human-Computer Interaction**

**Term-specific information:**

CS/PSY 6750 -- HCI -- Spring 2007 Prof. John Stasko  
 (See, also, Class Web Site)

**General course info for all terms:**

*IRB (Institutional Review Board) info for research involving human participants:*

- General Information [Go to WebWISE](#)
- NEW Online Training Requirement as of 1/24/03:** CITI Online Training Course (link updated-BNW) - required by anyone who wishes to conduct research involving human participants at GT
- CITI training instructions and required modules: [http://www.csi.gatech.edu/compliance/humans/wh\\_training.doc](http://www.csi.gatech.edu/compliance/humans/wh_training.doc)
- If you completed the old NIH course prior to 1/24/03, then your certificate from that is still valid.
- IMPORTANT:** Once you get your certification, you must submit it to the GA/Tech Office of Supported Programs (OSP) in person, OR via interoffice mail, fax, or e-mail. OSP is located at Truth Street and Houghall Avenue right next to Rocky Mountain Plaza. Do this as soon as possible; you cannot be listed on an IRB proposal if you have not previously submitted your certification in human subjects protection.

The right window shows the source code of the page, including the title 'CS 6750 Coweb' and various HTML tags.

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# Features to support collaboration: Recent Changes and Attachments

The screenshot shows two Internet Explorer windows. The left window displays 'Recent Changes to CS 6750 Coweb' with the following entries:

**Recent Changes to CS 6750 Coweb**

**12 April 2007**

- [workspace for our project](#) at 2:21 pm by lawa-128-61-116-55 lawa.gatech.edu

**8 April 2007**

- [Student design contest](#) at 12:38 am by lccvies95 skiles.gatech.edu

**3 April 2007**

- [Reassignment Project Workspace](#) at 8:10 am by nat.automated@logi.com

**29 March 2007**

- [English Tutor for Deaf Students](#) at 9:04 pm by r2k224 res.gatech.edu
- [CS/PSY 6750 -- HCI -- Spring 2007](#) at 9:55 am by booya.cc.gatech.edu

[See Complete Changes Listing](#)

The right window displays 'Attachments to this Page (CS 6750 Coweb)' with the following content:

**Attachments to this Page (CS 6750 Coweb)**

upload to the page  add a reference to the upload at the end of the page  
 upload to the Swiki  do not add a reference

To reference your upload, insert `<[[[[[ [name]]]]>` into the page text. To include images (GIF, JPEG, or PNG), use `<[[[[[ [name]]]]>` instead. 3828 Mb used of 5000 Mb, 1171 Mb free.

**Attachments to this Page**

0 attachments to the page

**Attachments to this Swiki**

name	size	time	date
<a href="#">index.jpg</a>	7.7 kb	11:31 am	7 February 2007
<a href="#">indexheader.jpg</a>	761 b	11:31 am	7 February 2007
<a href="#">indexbody.jpg</a>	747 b	11:31 am	7 February 2007
<a href="#">alpha.jpg</a>	11 kb	11:31 am	7 February 2007
<a href="#">alpha.pdf</a>	2.0 Mb	11:31 am	7 February 2007
<a href="#">indexcomp.jpg</a>	123 kb	11:31 am	7 February 2007
<a href="#">Author_HCIPart1.doc</a>	39 kb	11:31 am	7 February 2007
<a href="#">at_index.html</a>	920 b	11:31 am	7 February 2007
<a href="#">at_index.html</a>	1.7 kb	11:31 am	7 February 2007

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## Handling contention in CoWeb

- No locking
  - On the Web, how do you know if someone walks away?
- But if person A edits, then person B starts and saves edit before A saves, how do you deal with it?
  - Old way: A “wins,” but B’s is available in history for retrieval
  - Current way:
    - Each edit time is recorded
    - If incoming edit time is earlier than last save, then note collision. Provide user with both versions for resolution.



## Security

- Save everything,
- But it's mostly social pressure that keeps it working
- Problems (finally) reared ugly head after a while
  - Passwords

The screenshot shows a Netscape browser window titled "Netscape: History of CSL Projects". The address bar displays the URL "http://swiki.cc.gatech.edu/8080/edtech/471/history". Below the address bar, there are several icons for navigation and actions: view, edit, history, top, changes, edittech, search, and help. The main content area is titled "History of CSL Projects" and contains a table with the following data:

Version	Name	User	Date	Time	
current	CSL Projects	generallee cc.gatech.edu	5 December 2000	2:57:24 pm	
16	+	CSL Projects	generallee cc.gatech.edu	5 December 2000	2:57:04 pm
15	+	CSL Projects	oaxaca-nt cc.gatech.edu	29 November 2000	6:56:30 pm
14	+	CSL Projects	oaxaca-nt cc.gatech.edu	29 November 2000	6:55:20 pm
13	+	CSL Projects	47.234.132.33	28 November 2000	1:09:58 pm
12	+	CSL Projects	generallee cc.gatech.edu	28 November 2000	1:06:53 pm
11	+	CSL Projects	generallee cc.gatech.edu	28 November 2000	1:06:17 pm
10	+	CSL Projects	s25-pm04.gatech.campuswix.net	27 November 2000	11:20:10 pm
9	+	CSL Projects	s25-pm04.gatech.campuswix.net	27 November 2000	11:18:47 pm
8	+	CSL Projects	s25-pm04.gatech.campuswix.net	27 November 2000	11:17:55 pm
7	+	CSL Projects	11-26-92-44.atl.mediaone.net	27 November 2000	10:48:51 pm
6	+	CSL Projects	198.2.11.237.142	27 November 2000	9:39:06 pm
5	+	CSL Projects	bosshogg cc.gatech.edu	27 November 2000	6:43:06 pm
4	+	CSL Projects	bosshogg cc.gatech.edu	27 November 2000	6:42:48 pm
3	+	CSL Projects	r57h104.res.gatech.edu	27 November 2000	2:12:35 pm
2	+	CSL Projects	guzdial2 cc.gatech.edu	16 August 2000	11:00:04 am
1	+	CSL Projects	guzdial2 cc.gatech.edu	16 August 2000	10:59:57 am



## Social Issues

- People bring in different perspectives and views to a collaboration environment
- Goal of CSCW systems is often to establish some common ground and to facilitate understanding and interaction



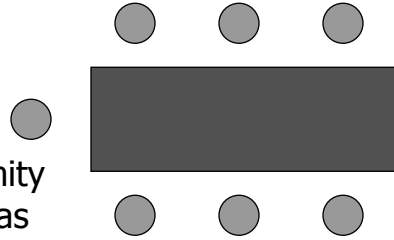
## Turn Taking

- There are many subtle social conventions about turn taking in an interaction
  - Personal space, closeness
  - Eye contact
  - Gestures
  - Body language
  - Conversation cues



# Geography, Position

- In group dynamics, the physical layout of individuals matters a lot
  - “Power positions”



- “Proxemics” – Proximity and body alignment as social cues

- Video: “Stitching” CSCW '04

What about in online collaborations?



# Case Study: WikiPedia





## Case Study: Wikipedia

- Consider the tools available
- Who are the users?
- “Community” ?
- How does all this affect the content?
  
- What to do about it?
- Broader issues of trust, anonymity, validity, responsibility, authority...



## Evaluation

- Evaluating the usability and utility of CSCW tools is quite challenging
  - Need more participants
  - Logistically difficult
  - Apples - oranges
  
- Often use field studies and ethnographic evaluations to assist
  - Video: ESPACE (CSCW'04)
  - Video: Dynamo (CSCW'04)



## Evaluation Efforts at Calgary

- Uses modified heuristic evaluation techniques
  - [www.cpsc.ucalgary.ca/group/lab/papers/2001/01-HeuristicsMechanics.EHCI/talk/EHCI\\_2.html](http://www.cpsc.ucalgary.ca/group/lab/papers/2001/01-HeuristicsMechanics.EHCI/talk/EHCI_2.html)
- Heuristics (reformulated):
  - Support intentional & appropriate communication
    - Verbal communication (content)
    - Gestural communication (deixis) ← Video: VideoArms (CSCW'04)
  - Support communication of individual's embodiment (attitude) ← Video: Jazz (CSCW'04)
  - Support sharing of artifacts ← Video: LiveContacts (CSCW'04)
  - Provide protection of shared resources
  - Switch between loosely and tightly coupled coordination
  - Support establishment of contact



## Interested in More...?

- CS 7460: CSCW
  - Readings, discussion, research-oriented
  - '08-'09
- CS 6470: Online Communities
  - Students study an existing community in depth, and then develop a new community design
  - '08-'09
- CS 7467: - Computer-Supported Collaborative Learning
  - CSCW-like concepts and ideas but in learning and education context
  - '07-'08



## Upcoming

- Ubiquitous Computing
- Project presentations 1
- Project presentations 2 / Final exam

