

Future User Interfaces'19

Computer Supported Cooperative Work (CSCW)

Hamed S. Alavi, 14.05.2019



Slides (partly) by Himanshu Verma

Human as a social being

Recall:
Social Computing in Ubicomp

Activity

- Think of a time when you enjoyed meeting up with friends to catch up in a cafe. Compare this social occasion with the experience that you have when texting with them on your smart phone. How are the two kinds of conversations different?

Communication

Geographically Distant

- Text (Chats)
- Audio
- Video
- *Virtual Reality*
- *Holograms*

vs.

Face-to-Face (Colocated)

- Verbal
- Facial Expressions
- Dielectics (Gestures, Gaze)
- Posture
- Proximity

Which is a richer means of communicating? Why?

Beam+ Robot



actual product may vary, computer generated image © 2014 Suitable Technologies, Inc.

Beam+ Robot



What do we mean by CSCW?

“... investigate technology’s role in how people collaborate, and define the use of computers to support coordination, cooperation, and communication within a group, *performing a task together...*”

– Iren Greif, Paul Cashman

Time - Space Taxonomy

	Same Time	Different Time
Same Place	Face-to-Face Interactions	Continuous Task
Different Place	Remote Interactions	Asynchronous Distributed Interactions

Classification?

MOOCs

Skype/Hangouts

Wikipedia

ShareLatex

GitHub

Interactive Tabletops

Google Docs

amazon.com

ConceptBoard

Slack

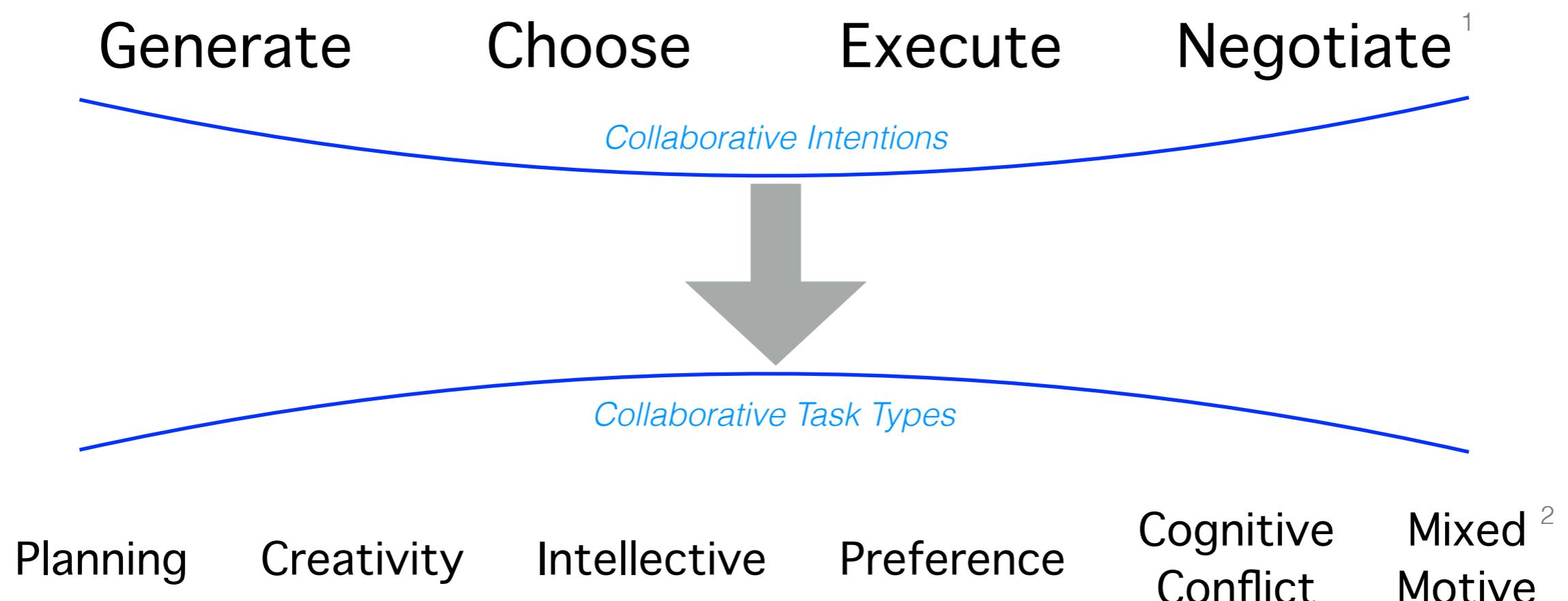
stackoverflow.com

Starcraft

Time - Space Taxonomy

	Same Time	Different Time
Same Place	Face-to-Face Interactions Roomware, Meeting Rooms, Electronic Classrooms, Single Display Groupware	Continuous Task Bulletin Boards, Public (Wall-Mounted) Displays, Project Management
Different Place	Remote Interactions Video Conferencing, Instant Messaging, Chats, Shared Editors, Telepresence	Asynchronous Distributed Interactions Emails, Forums, Workflows, Wikis, Version Control

Collaborative Task Types



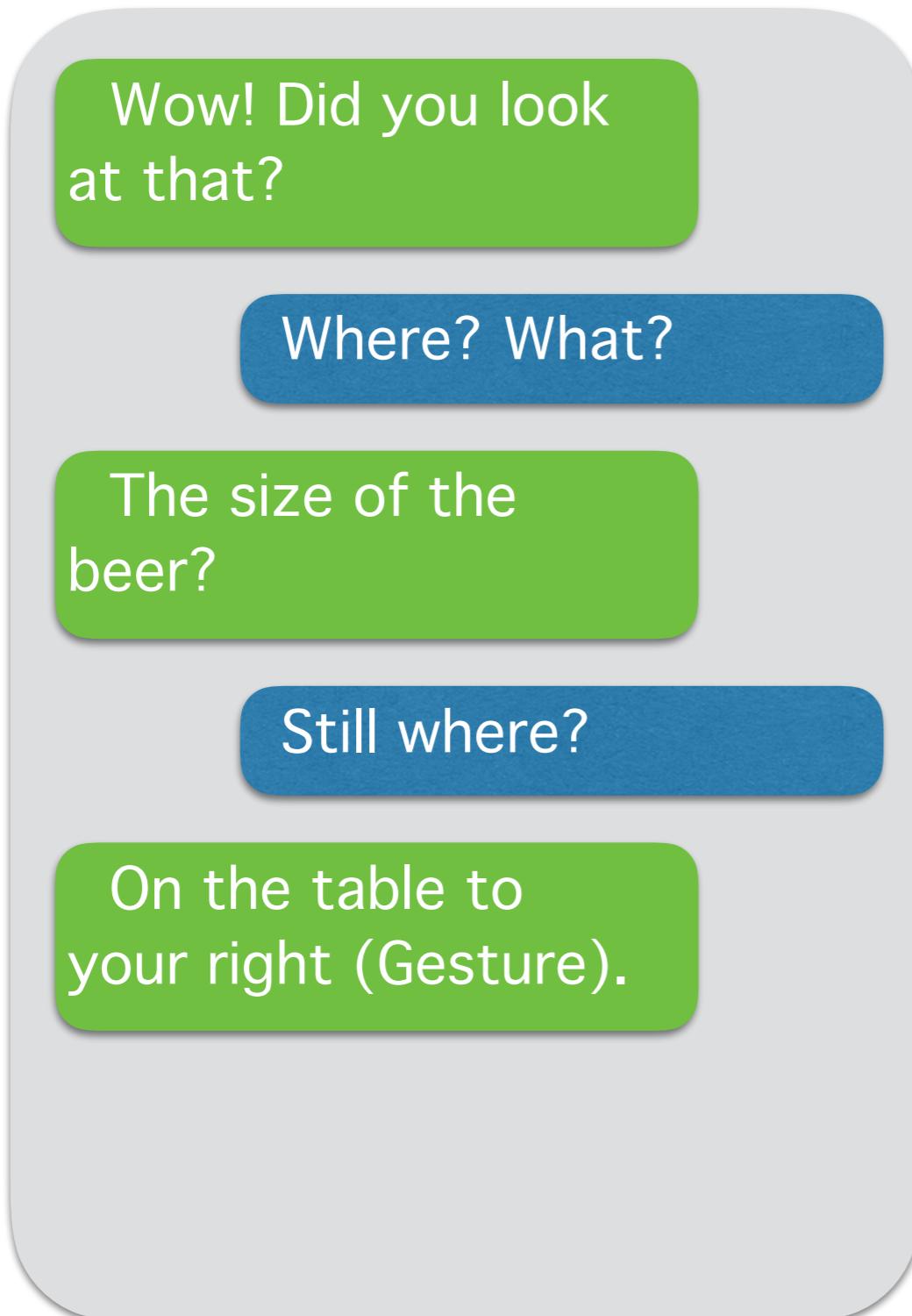
1. J. E. McGrath and A. B. Hollingshead. Groups interacting with technology: Ideas, evidence, issues and an agenda. *Sage Publications*, 1994.

2. G. DeSanctis and R. B. Gallupe. A foundation for the study of GDSS. *Management Science*, 33(5): 589-609, 1987.

Understanding Communication



Understanding Communication



Presentation



Feedback
Diagnosis



Repair

Establishing a Common Ground

Presentation



Feedback
Diagnosis



Repair

- Facial expressions
- Acknowledgements
- Nodding
- Sentence completion
- Continued attention
- Explicit requests for completion

Establishing a Common Ground

Presentation



Feedback
Diagnosis



Repair

- Repeat (Clearly and Loudly)
- Rephrase
- Explain
- Justify

Levels of Grounding

If agent A wants to communicate information X to agent B, A may get different information/feedback about the extent to which B shares X:

Lowest 	
(Level 1) Access: A can infer that B can (not) <u>access</u> X	For instance, in a virtual space, if A knows that B is in room 7 and that information X is available in room 7, then A knows that B can access X. If A knows that X is only available in Room 8, and B is not in room 8, A knows B can't access X.
(Level 2) Perception A can infer that B has (not) <u>perceived</u> X	For instance, if A writes a note on the whiteboard and B moves that note, A can infer that B has seen it (and probably read it). Lack of perception is harder to infer, except for cases of lack of access or behaviour that is inconsistent with understanding, when understanding is simple given perception.
(Level 3) Understanding A can infer that B has (mis-) <u>understood</u> X	For instance, in a virtual space, if A says "let's ask <i>him</i> a few questions" and B moves to the room where " <i>him</i> " is located, then A can infer that B knows who has been referred to as ' <i>him</i> '. If B goes to the wrong room, or asks for repair, A can infer misunderstanding or lack of understanding.
(level 4) Agreement A can infer that B (dis-) <u>agrees</u> on X.	For instance, if A proposes B goes to room 7 and B goes there, A can infer that B agrees. If A writes a note on the whiteboard and B draws a red cross on the top this note ² , A can infer that B disagrees.

Basis for *Common Grounds*

- Shared background **knowledge**
- Shared **perceptions**
- Shared conversational **context**

Activity

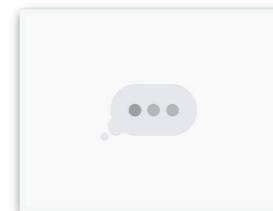
- WhatsApp support for grounding mechanisms

Designing for Grounding

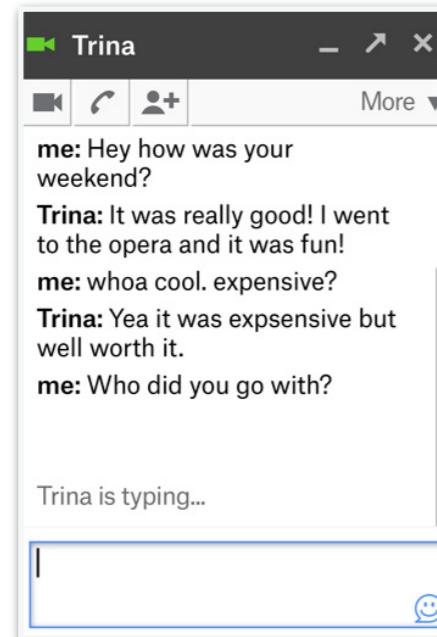
What levels of grounding are incorporated in the design of these clients?

- ✓ message successfully sent.
- ✓✓ message successfully delivered to the recipient's phone.
- ✓✓ the recipient has read your message.

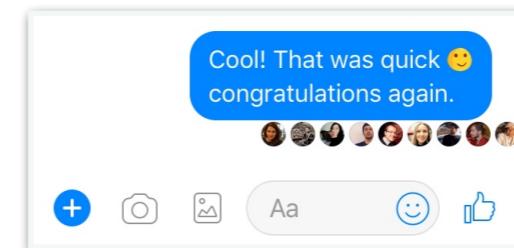
WhatsApp



iMessage



Google Talk



Messenger

Computer Supported Collaborative Learning



Individual vs. Group

N. Li, H. Verma, A. Skevi, G. Zufferey, J. Blom, and P. Dillenbourg, "Watching MOOCs Together: Investigating Co-Located MOOC Study Groups", *Distance Education*, 35(2). 2014.

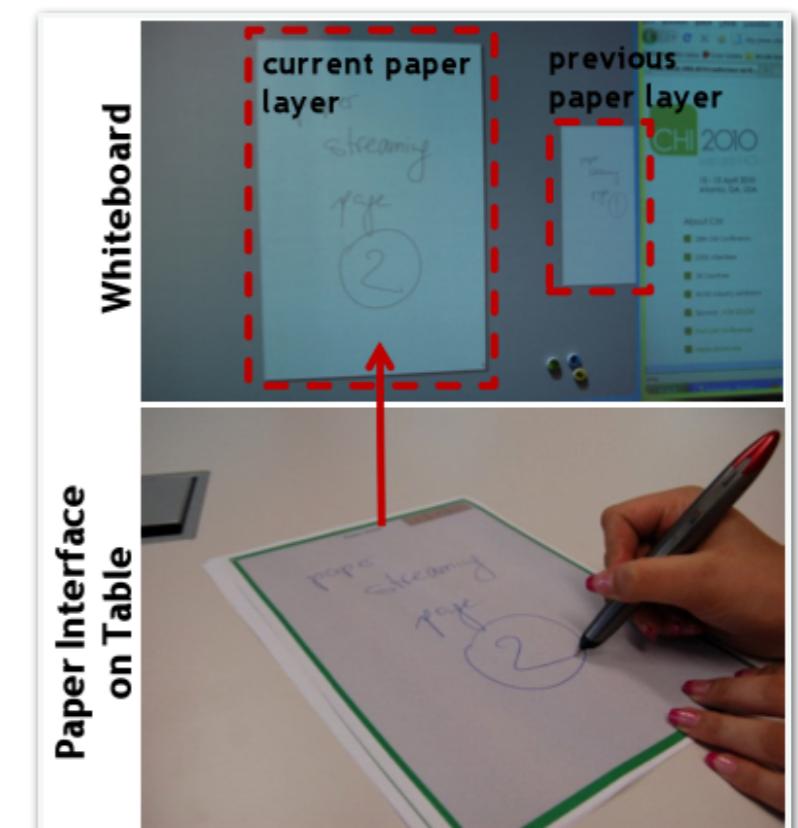
Groupware (noun): “*Computer-based systems that support groups of people engaged in a common task (or goal) and that provide an interface to a shared environment.*”

Colab Meeting Room

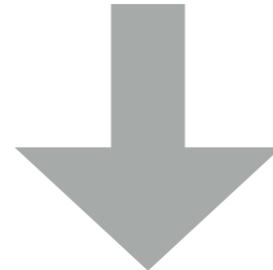


M. Stefk et al. Beyond the Chalkboard: Computer support for collaboration and problem solving in meetings. *Commun. ACM*, 30(1): 32-47, 1987.

NiCE Discussion Room



Groupware + Ubiquitous Computing



Roomware (noun): “*computer-augmented objects resulting from the integration of room elements, such as walls, doors, or furniture with computer based information devices*”

Operations Room (Chile, 1971)



URL: <http://99percentinvisible.org/episode/project-cybersyn/>

i-Land Environment

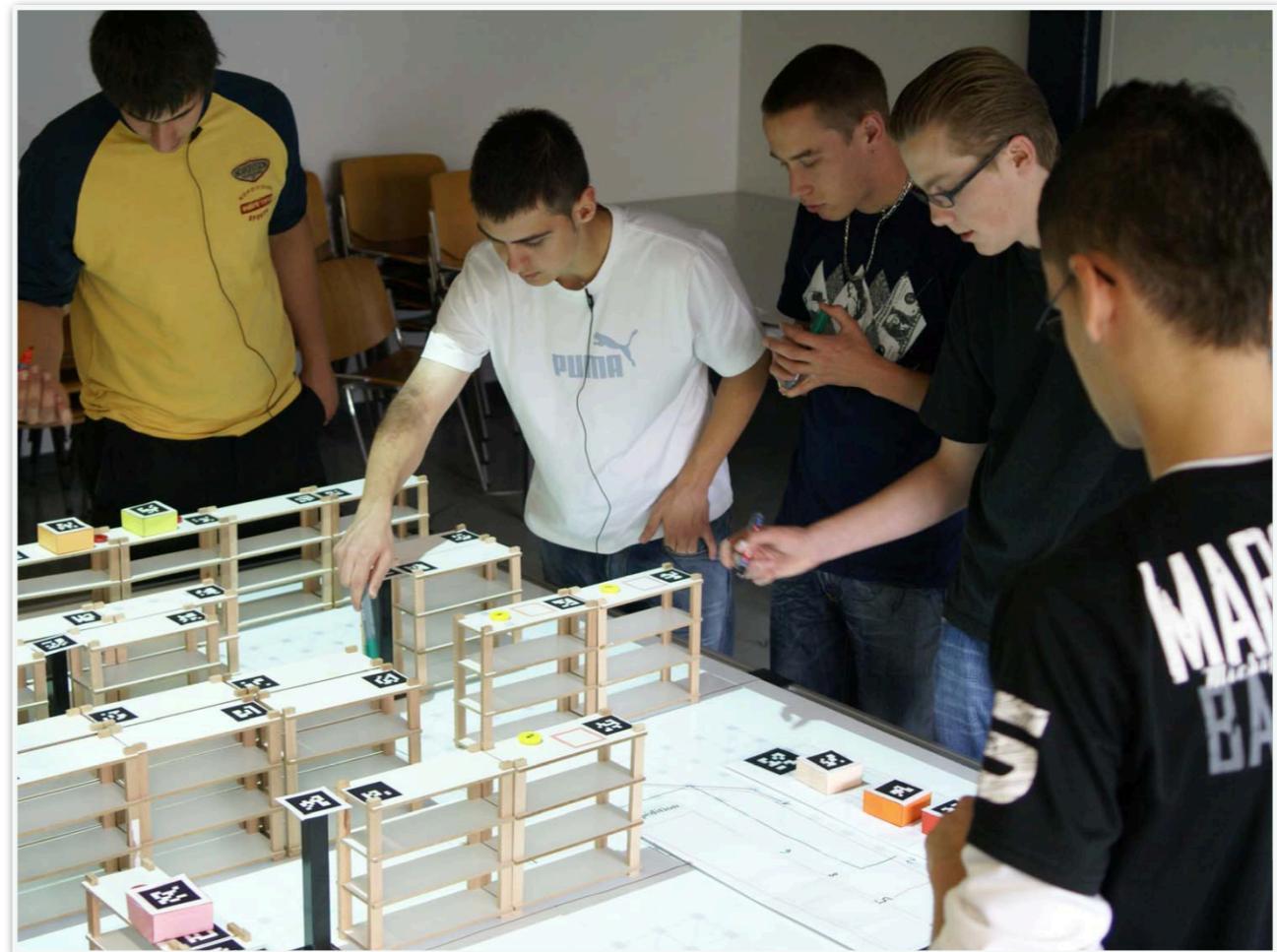


Design: GMD-IPSI, Wiege, Wilkhahn

N. A. Streitz et al. i-LAND: An interactive landscape for creativity and innovation. *ACM CHI'99*, 120-127, 1999.

P. Tandler et al. ConnectTables: Dynamic coupling of displays for the flexible creation of shared workspaces. *ACM UIST'01*, 11-20, 2001.

Tinkerlamp - Tangible SDG



G. Zufferey et al. Using augmentation as bridges from concrete to abstract representations. *BritCHI'09*, 130-139, 2009.

One Mouse Per Child



C. Alcoholado et al. One Mouse Per Child: Interpersonal computer for individual arithmetic practice.
Journal of Computer Assisted Learning, 28(4): 295-309, 2012.

Activity

- Understanding a cooperative work situation

Awareness and Coordination

Awareness is “*an understanding of the activities of others, which provide a context for your own activity.*”

Informational
Collaborators’ actions that are meant to inform others of their activity.

Role-restrictive
Information about the support for various roles, and the nature of the activity

Designing for Awareness

Awareness information should be presented to the group such that its interpretation is moved from *cognitive* to *perceptual* system of collaborators.

OR

Awareness should be *passive*.

Colocated vs. Distributed

Geographically Distant

- Text
- Audio
- Video
- *Virtual Reality*
- *Holograms*

vs.

Face-to-Face (Colocated)

- Verbal
- Facial Expressions
- Diectics (Gestures, Gaze)
- Posture
- Proximity
- Actions

Awareness information arises automatically in colocated situations. However, it has to be explicitly managed in distributed collaboration via *awareness tools*.

Shared Editor - Google Docs

The screenshot shows a Google Doc interface with a toolbar at the top. The document content includes a timestamp 'May 17-28', a pink box containing 'Jono', a red box containing 'SAN FRANCISCO', and a yellow box containing 'VACATION'. Below this is a horizontal line. To the right of the line is a photo of the Golden Gate Bridge with the caption 'Day 1 / Golden Gate Bridge' and a detailed description. Further down, there is another paragraph starting with 'The structure links the U.S. city of San Francisco, on the north...' with a blue box containing 'Lindsay'.

May 17-28

Jono

SAN FRANCISCO

VACATION

Day 1 / Golden Gate Bridge

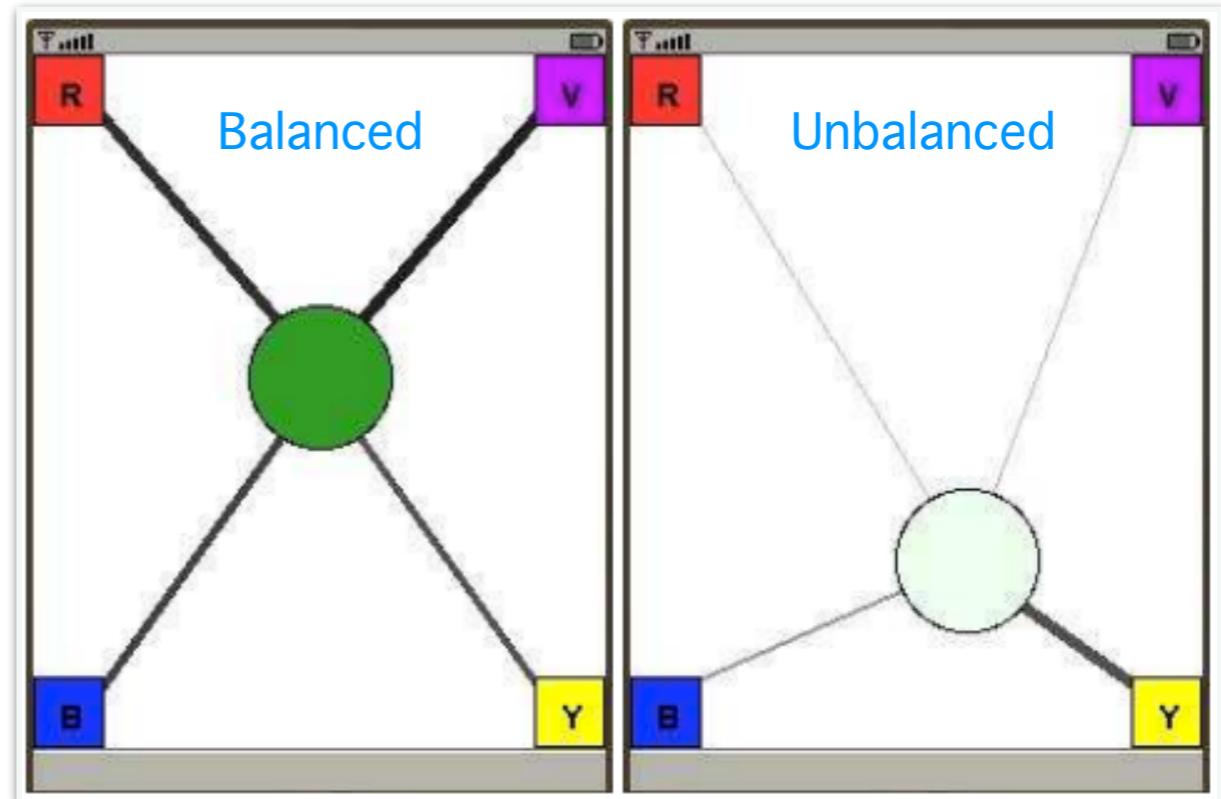
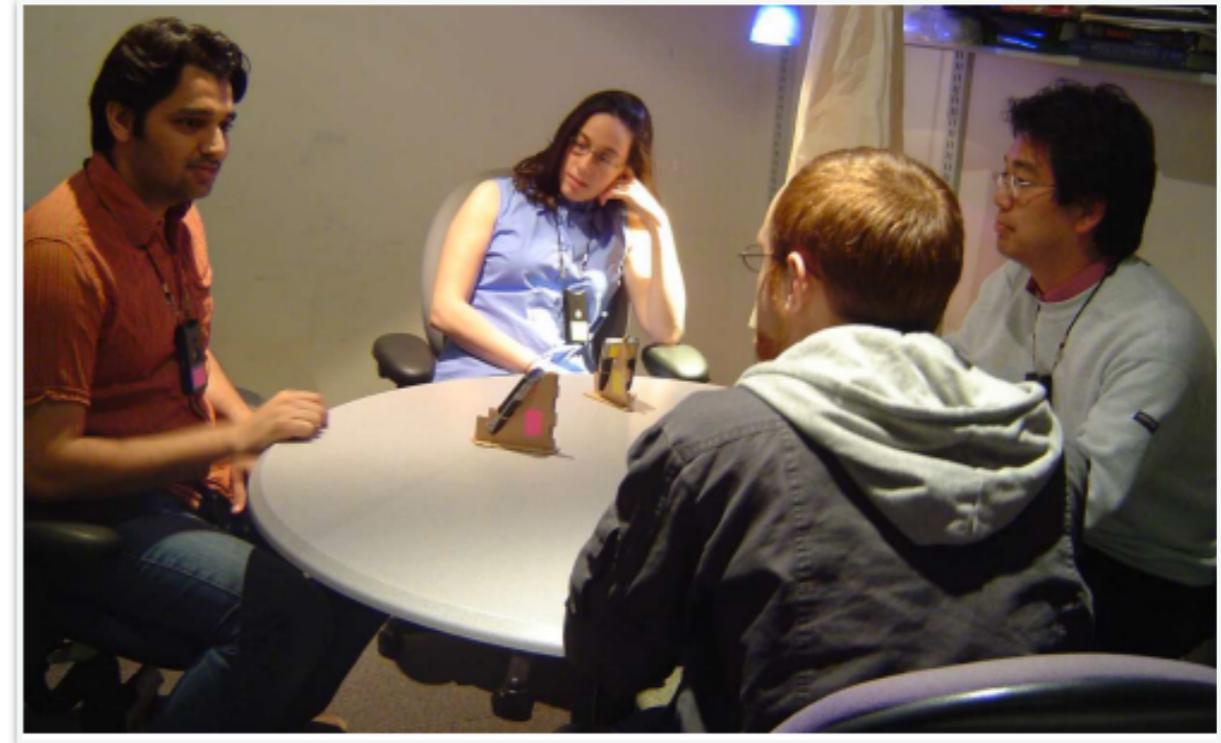
The Golden Gate Bridge is a suspension bridge spanning the Golden Gate strait, the 1 mile wide, 3 mile long channel between San Francisco Bay and the Pacific Ocean.

The structure links the U.S. city of San Francisco, on the north... Lindsay

Types of Awareness Tools

- Based on the degree of active involvement
 - *Group Mirrors* reflect collaborators' actions.
 - *Meta-Cognitive Tools* summarize the state of ongoing interactions.
 - *Coaching Systems* observe and interpret interactions and provide advice.

Meeting Mediator



Reflect Table - *Reification*



K. Bachour, F. Kaplan, and P. Dillenbourg. An interactive table for supporting participation balance in face-to-face collaborative learning.
IEEE Transactions on Learning Technologies. 3(3): 203-213, 2010.

Activity

- Technology-support for a cooperative work situation