Computer-Mediated Cooperation

- Groupware system supports groups of people engaged in a common task (or goal)
  - Provide an interface to shared environments
  - Facilitate communication, coordination, and collaboration of group effort
- Groupware provides representational system
- Development requires analysis of work environment and design of both interface and mediated interaction among users

Examples

- NoteCards
- Whiteboards
- Electronic Group Calendars
- Co-Authoring Tools
- Email
- Bulletin Boards
- Chat Rooms
- Multi-person electronic games

Groupware Systems

	Same Place	Different Place
Same Time	Live Board	Chat Room
Different Time	Shift Change	Email

Social Mechanisms in Communication and Collaboration

Chapter 4

Outline of Chapter 4

- Communication
- Coordination
- Awareness

Communication

A Simplest Systematics for the Organization of Turn-Taking for Conversation

Harvey Sacks, Emanuel Shegloff,
Gail Jefferson

Language, Volume 50, Number 4, 696-735, 1974

Turn Taking Phenomena

1. Speaker-change recurs, or at least occurs
2. Overwhelmingly, one party talks at at time
3. Occurrences of more than one speaker at a time are common, but brief
4. Transitions from one turn to a next with no gap and no overlap are common. Together with transitions characterized by slight gap or slight overlap, they make up the vast majority of transitions
5. Turn order is not fixed, but varies
6. Turn size is not fixed, but varies
7. Length of conversation is not specified in advance
8. What parties say is not specified in advance
9. Relative distribution of turns is not specified in advance
10. Number of parties can vary
11. Talk can be continuous or discontinuous
12. Turn-allocation techniques are obviously used. A current speaker may select a next speaker or parties may self select
13. Various 'turn-constructional units' are employed
14. Repair mechanisms exist for dealing with turn-taking errors and violations.

Turn Taking Rules

At the point of turn transition:

1. Current Speaker selects next
   - The current speaker chooses the next speaker by asking an opinion, question, or request
2. Self-Selection
   - Another person decides to start speaking
3. The current speaker continues talking

Turn-Allocation Techniques

- Example of Speaker selects next is an adjacency pair
- Adjacency pair: A basic rule of adjacency pair operation is to give the recognizable production of a first pair part, on its first possible completion its speaker should stop and a next speaker should start and produce a second pair part from the pair type of which the first is recognizably a member
- Question then answer
- Terminal Exchange on telephone
  - Goodbye; Goodbye

Turn taking as an activity

- Locally managed
- Party administered
- Interactionally managed

Third Position Repair
(Schegloff, 1993)

First Position:
  Speaker presents a contribution
Second Position:
  Other participants have an opportunity to display a response
Third Position:
  First speaker can amend her presentation if it did not invoke a preferred response

Presentation and Acceptance
(H. Clark)

- Presentation Phase:
  - A presents utterance u for B to consider. He does so on the assumption that, if B gives evidence e or stronger, he can believe that B understands what A means by u.
- Acceptance Phase: B accepts utterance u by giving evidence e' that he believes he understands what A means by u. He does so on the assumption that, once A registers evidence e', he will also believe that B understands.

Evidence & Collaborative Effort

- Evidence of Understanding
  1. Continued attention
  2. Initiation of the relevant next contribution
  3. Acknowledgement
  4. Demonstration
  5. Display
- Strength of evidence principle
  - The participants expect that, if evidence e0 is needed for accepting presentation u0, and e1 for accepting the presentation of e0, then e1 will be weaker than e0
- Principle of least collaborative effort
  - The participants in a contribution try to minimize the total effort spent on that contribution -- in both the presentation and the acceptance phases.

Clark's features of communication

- Copresence
  - Users are near each other, and can point at objects in common ground
- Visibility
  - Users can see each other; allows gestures, facial expressions
- Audibility
  - Users can hear each other, and use natural language
- Co-temporality
  - Users can expect to receive a timely reply; interruptions or delays are significant

Clark's features of communication

- Simultaneity
  - Users can send and receive at the same time; allows interruption, backchannel feedback
- Sequentiality
  - User contributions are strictly ordered, and cannot get out of order
- Reviewability
  - Users can look at the past history of the conversation
- Revisability
  - Users have the option of editing their contributions before they commit to them

Some examples

- Face-to-face
  - Copresence, visibility, audibility, Cotemporality, simultaneity, sequentiality
- Telephone / Voice over IP
  - Audibility, cotemporality, simultaneity, sequentiality
- Family radio / DirectConnect / walkie-talkies
  - Audibility, cotemporality, sequentiality
- Email/SMS/Text messaging
  - Reviewability, revisability
- Chat/IM/IRC/ICQ
  - Cotemporality, reviewability, revisability

Costs of Communication

- Different features affect cost for speaker and listener to communicate
  - Cost of formulation (deciding what to say)
  - Cost of production (saying it)
  - Cost of reception (hearing it)
  - Cost of understanding (understanding it)
  - Cost of start-up (starting a conversation)
  - Cost of delay (what impact a delay has)
  - Cost of asynchrony (what impact misordering has)
  - Cost of speaker change or multiple speakers
  - Cost of display / pointing / graphical input
  - Cost of errors (in production or in understanding)
  - Cost of repairs

Coordination

Problems of Coordination

- greeting someone, planning a potluck dinner party, moving through a doorway, forming a queue at the coffee shop
- assignment of roles; location; path; manner; selection and ordering of actions; timing; establishment of co-references
  - example: two people moving a couch

Staying Coordinated

- Coordination Mechanisms
  - Verbal and non-verbal communication
  - Schedules, rules, and conventions
  - Shared external representations
    - Designed
    - Improvised
- Online Medium
  - Shared External Representations (WYSIWIS)
   - Whiteboards; Documents
  - Email

Shared Representations

Shared Representations: Problems in Communication

Design for conversation: lessons from Cognoter

Tatar, Foster, and Bobrow (1990)

Colab Room and Cognoter - Colab

- Same-time/Same-place brainstorming
- Three users each with a private computer
- Liveboard visible to all
- Can mirror other computer's display on own display
- Can mirror one private display on Liveboard
- Colab designed for different collaboration project
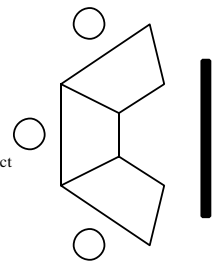
Colab and Cognoter - Cognoter

- Cognoter designed to implement shared workspaces
- Parcel-Post model of communication
  - Basic unit is the "item" - icon + short text
    - Annotations can be added to items
  - Create items in private windows
  - Present and organize items in public (WYSIWIS) item-organization windows

User Experiences

- They hated it!
- First group gave up
  - First, each made private edits, ignoring the others
  - Evidently when the time came to merge them they gave up on the system and switched to pen and paper
- Second group switched to arrangement where one person typed and the rest contributed
  - Effectively, two roles: one author (typing in the information) and two reviewers (heckling)
- Users were extremely frustrated - didn't understand the conceptual model behind displaying others' screens

Some major problems identified

- Visibility
  - Important data was not obvious/visible to users when they needed it
  - Attention was not brought to items that were changed
- Reference
  - Use of deixis ("that one" "this") causes problems when users can't point, or aren't looking at the same thing

Problems with Cognoter

- Separate screens
  - Users had to keep up to date with multiple windows
- Lack of sequentiality
  - No fixed way to determine order of contributions
- Short labels for icons
  - Limited the amount of info that could be viewed at once
- Anonymity
  - No way to determine author of contributions
- Private Editing
  - No feedback for others during editing; changes could conflict
- Unpredictable delay
  - Edits took anywhere from less than a second to 20 seconds!
- Private moving
  - Icons moved by another appeared to teleport across a user's desktop
- Tailorable windows
  - Users' screens could appear different, preventing co-referencing that way

Shared Representations & Communication Problems

- Users must choose between verbal, textual, or combined communication

- Users must attend to both verbal, and three potential sources of textual, communication

- Users need to:
  - Produce contributions
  - Recognize contributions
  - Make responses to contributions

Producing contributions

- Verbal contributions are not permanent
- Textual contributions may not be noticed
- When combining the two, verbalization may precede incoming text; but waiting until the text appears will yield conversational floor.
- Speaker cannot make mid-utterance corrections, nor can the listener contribute by completing the utterance.

Recognizing contributions

- Anonymity of text ensures confusion
- Mixed timing of textual and verbal contributions means that listener has to make effort to connect the two
- Lack of obvious sequentiality makes it difficult to follow conversational thread
- Lack of try-markers and other cues implies that contribution is elementary, i.e., can be understood by itself, even when this is not the case

Making responses to contributions

- Responses, usually required in conversation, are optional in text
- Non-response to a textual contribution is therefore ambiguous
- Textual responses often missed, or not apparent as responses, because attention of listeners cannot be assessed.

Problems - Co-reference

- Users often used inappropriate references ("that one", "the one in the upper left corner")
- Since they were not usually comparing their screen to others', the uselessness of such references was not apparent
- Keeping track of changes increases difficulty of maintaining co-reference.

Findings from observational studies of collaborative work
John C. Tang

- Small groups of people were observed in a collaborative design task using a shared drawing space.
- Hand gestures used to uniquely communicate significant information
- Process of creating and using drawings conveys much information not contained in the resulting drawings
- Drawing space is an important resource for the group in mediating their collaboration
- Fluent mix of activity in the drawing space
- Spatial orientation among the collaborators and the drawing space has a role in structuring activity

Shared Workspaces: How do they work and when are they useful
(Whittaker, Geelhoed, Robinson)

- Compare (Audio) Vs. (Audio + Workspace)
  - Three kinds of tasks
- Undemanding text based
  - Joint production of brief textural summary
  - No benefits to shared external representation
- Demanding text based
  - text editing
  - With task practice, more efficient than audio alone
- Design Collaboration
  - Graphical design
  - Much easier to express spatial relations

Email

Semistructured Messages are Surprisingly Useful for Computer-Supported Coordination

Thomas W. Malone, Kenneth R. Grant, Kum-Yew Lai, Ramana Rao, David Rosenblitt

- Semi-structured Messages
  - "Messages of identifiable types, with each type containing a known set of fields, but with some of the fields containing unstructured text or other information."
- Examples
  - Seminar announcement, debug report, project management, computer conferencing
- Information Lens

Advantages of Semi-Structured Messages

- Reflects structure of the processing people already do in handling data
- Provides templates for creating messages, making sure that all the necessary information is provided in the message.
- Allows communication of non-standard info in the unstructured fields
  - This is the advantage over fully-structured communication.
- Genre Theory

Features Made Possible

- Automatic aids to constructing messages
  - Defaults for each field
  - Possible alternatives for limited fields like date or time
  - Explanation of filed
- Rules for automatically processing messages
- Allows default responses, including complex actions to incoming messages

The Coordinator
(Winograd & Flores)

- Management Information System (MIS) based on Speech Act Theory
- A tool for interoffice communication (like email) about commitments, scheduling.
- Commitments are tracked. Conflict notification and reminders provided.
- Provides a method for filtering and visualizing status of current ongoing conversations.

Speech Acts

- Concerned with the functions of utterances in conversation
- Indirect Speech Act
  - Can you reach the salt?
  - What time does the train to Montreal leave?
- Use plan recognition to understand indirect speech act

5 Categories of Speech Acts

- Assertives
  - Commit the speaker to something being the case
- Commissives
  - Commit the speaker to some future action
- Declarations
  - Pronounce something has happened
- Directives
  - Get the listener to do something
- Expressives
  - Express a state of affairs, such as apologizing or praising someone

Conversation for Action (CfA)
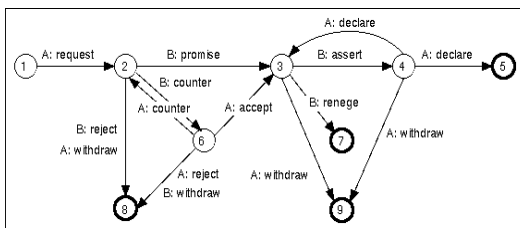
Implementation

- Each message belongs to a particular conversation.
- User specifies which linguistic action each message serves.
  - Request, Offer, Acknowledge, Commit-to-commit, Interim-report, Promise, Counter-offer, Decline, Report-completion
- User specifies a time frame where appropriate.
  - Respond-by date, Complete-by date, alert date

Slide 1 (Converse Menu)

Converse Menu

```
                    C O N V E R S E

OPEN CONVERSATION FOR ACTION        REVIEW / HANDLE
   Request                          Read new mail
   Offer                            Missing my response
                                    Missing other's response
OPEN CONVERSATION FOR POSSIBILITIES
   Declare an opening               My promises/offers
                                    My requests
ANSWER                              Commitments due: 24-May-88

NOTES                               Conversation records
```

Menu generated for responding to a request

```
SPEAKING IN A CONVERSATION FOR ACTION

Acknowledge        Promise
Free-Form          Counter-offer
Commit-to-commit   Decline
Interim-report     Report-completion
```

Slide 2

Issues & Approaches

- Coordination of Action and Talk
  - Not face-to-face
- General-purpose groupware
  - Asynchronous communication: The Coordinator, NoteCards, Information Lens
  - Synchronous communication: Whiteboard, Chat room
  - Issue: Gap between general approach and specific application
- Tailor-made groupware systems
  - But then you need a methodology and tools

Slide 3

Awareness Mechanisms

Slide 4

Awareness

- Social awareness
  - Knowing who is around, what is happening, and who is talking with whom
- Peripheral awareness
  - Ability to keep track of what is going on in the physical or social context
- Versus interruption
- While multi-tasking

Social Translucence:
Designing Systems that
Support Social Processes

Thomas Erickson and Wendy A. Kellogg

Renis Cama
Jie Chen

Foundations: Social Translucence

- What is a **"Socially Translucent System"**?
  Example: Door opens from stairwell into the hall

  Please Open Slowly   vs.

- Three properties:
  - Visibility
  - Awareness
  - Accountability

Making Activity Visible

- The Realist Approach

- The Mimetic Approach

- Abstract Approach

Realist Approach

Teleconferencing and Videospace Systems

Pros:
 Minimizes the difficulty of producing and
  interpreting social cues

Cons:
 a. Resolution limited
 b. Very expensive
 c. Scaling

Mimetic Approach

Graphical MUDS and Virtual Reality Systems
  – Avatars

Pros:

  Reduces bandwidth requirement

Cons:

  a. Scaling issues
  b. Social cues must be consciously produced
    via users manipulating their avatars

Abstract Approach

- Social information independent of physical analogs
  – Text (e.g., emote)
  – abstract graphical representations (e.g., chat circles)

- Interested in Abstract Approach
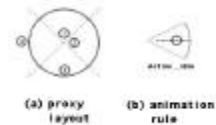 a. Creates and deploys working systems
  b. Lack of attention

Babble Prototype

- Two tactics used:

  a. Textual representation

  b. Synchronous representation

Social Proxy Schema

Minimalist graphical representation of users that depicts
their presence and their activities

- Size of the audience
- Amount of conversational
  activity
  – More active participants
    are closer to the center
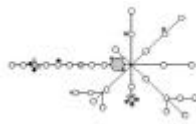- Monitoring activity

(a) proxy layout   (b) animation rule

The Babble

User List — Social Proxy — Topic List — Current Topic
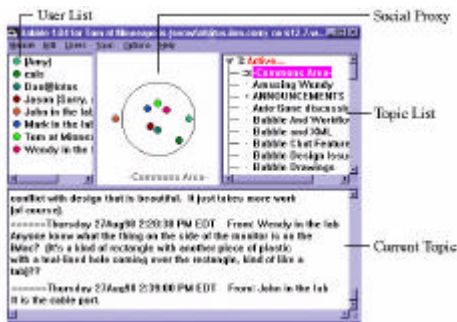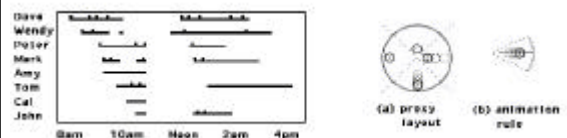
Social Proxy

- Participants are shown in public conversations

- One-One private chats in the system not shown

- Making private chats visible increases Awareness

- Negative scenarios?

- Advice participants what actions are visible
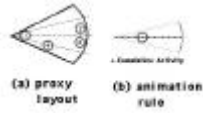
Community Proxy

- Larger circles represent conversation topics
  - Filled circles new information
- Smaller dots represent participants

Diachronic Social Proxies

Lecture Social Proxy

(a) proxy layout   (b) animation rule

- Dots move toward the apex of the wedge with cumulative activity
- Lecturer is all the way to the front

Visualizing Conversation

- Search for various topics in prior conversations
- Hits are color coded