# Linguistic Concepts and Methods in CSCW

**John H. Connolly and Lyn Pemberton (editors)**
(Loughborough University and University of Brighton)

London: Springer (Computer
Supported Cooperative Work series,
edited by Dan Diaper and Colston
Sanger), 1996, xvii+230 pp;
paperbound, ISBN 3-540-19984-5, $59.95

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As computer science continues to study human language and its importance to system development, the field of linguistics will undoubtedly play a necessary and crucial role in ensuring that system design is sensitive to the intricacies and complexity of language in carrying out joint actions. To this end, *Linguistic Concepts and Methods in CSCW* provides us with perhaps our first detailed study of potential links between linguistics and the emerging field of computer-supported cooperative work (CSCW). Editors John H. Connolly and Lyn Pemberton have geared this collection of 15 chapters to those interested in either linguistics or CSCW, and the book begins with an excellent summary of both fields that could be used as stand-alone reading for any introductory course on linguistics or collaborative computing.

Though many chapters of this book contain strong, productive links between the two disciplines, CSCW specialists may find certain chapters lacking in their applicability to the design of collaborative computing systems. As someone fairly well-grounded in CSCW research, I was confused about the focus of the first few chapters, which seemed to conflate CSCW and the general field of computer science. For example, in the second chapter, "Linguistics and task analysis in computer supported cooperative work," Christine Cheepen and James Monaghan offer their analysis of business letters produced by a single author in a London solicitor's office as a predictive model for improving the reliability of speech-driven word processing programs. While this chapter is certainly interesting, speech recognition programs are usually intended for individual users composing texts in isolation, and it is not readily apparent from their discussion what application, if any, their research has to CSCW.

In the third chapter, "Spoken language and speech synthesis in computer supported cooperative work," Katherine Morton explores the role that computerized speech synthesis might play in CSCW design. But once again, this topic is never firmly related to how people use computer systems to coordinate joint activities. In her discussion, Morton argues that speech synthesis programs that accurately read textual information could provide the advantages of speech by conveying pragmatic effect, while also taking advantage of narrow bandwidth requirements for transmission of textual information. Her bandwidth argument has some merits, but it seems dubious to me that synthetic speech generated from electronic text could convey much of the "human-ness" that Morton feels natural speech provides to communicative interaction.

But as one continues through the book in a linear fashion, the link to CSCW becomes gradually more apparent, as in Stephanie Robertson's chapter, "The contribution of genre to computer supported cooperative work." Drawing on Swales's (1986) con-

cept of real-life genres, Robertson argues that a firm understanding of task-oriented genres used in joint activities not only can illuminate our knowledge of workplace practices, but also can serve as an explicit basis for designing certain CSCW applications. A curious omission from her discussion, however, is the debate within CSCW during the past decade about the problem of trying to mirror patterns of human language in systems architecture—mainly the various reactions to Terry Winograd's (1988) language/action perspective and its implementation in the Coordinator system. Still, Robertson's approach moves us closer to the realm of CSCW.

This closer link with CSCW continues in subsequent chapters, such as that by Alison Newlands, Anne Anderson, and Jim Mullin entitled "Dialog structure and cooperative task performance in two CSCW environments." Here the authors draw on the work of Herbert Clark and his colleagues on how people achieve mutual knowledge in conversation and how they often alter their "grounding" techniques when using different media. Clark's work has had enormous influence on CSCW research in recent years, and in this chapter, Newlands, Anderson, and Mullin use his notion of grounding as an analytical framework for exploring patterns of communication in two different electronic media—one a text-based synchronous messaging system, and the other a video/audio–based communication system. While there is insufficient room in this review to summarize their findings, the authors conclude that for "some tasks in some settings, fairly low technology solutions might be adequate for delivering effective outcomes, as users will adopt communicative strategies which exploit the available communication resources to achieve effective cooperation. Their motivation and satisfaction, however, are likely to be influenced by the supportive or restrictive nature of the communicative context" (p. 60).

The next two chapters—"A language of cooperation?" by Anthony Clarke, John Connolly, Steven Garner, and Hilary Palmén and "Some grammatical characteristics of spoken dialog in a CSCW context" by John Connolly—offer the reader fairly detailed analyses of linguistic data obtained from a single CSCW research project. Clarke and colleagues examine dialogues at the discourse level between product design students in two conditions—one using full speech and video communication with a common sketchpad, and another using only the sketchpad and the speech channel. Employing word-frequency and content analyses, the authors found linguistic evidence of cooperative behavior in both conditions, though strangely they found no category of speech acts—such as declarative unilateral and cooperative acts—that might be classed as "cooperative" (p. 67). In his chapter, Connolly uses random samples from the same data set, but takes us to the deeper level of grammatical structure, examining such features as structural integrity and the use of pronominal subjects and adverbials. He concludes that while the dialogues are filled with ill-formed and grammatically incorrect clauses, the language of the conversations exhibits a "functional resilience" that helped move the design projects along with little need for conversational repair.

Perhaps the most interesting chapter from a theoretical standpoint is "A semantic framework for computer supported cooperative work" by Pat Healey and Carl Vogel, which offers a formal semantic model of communication between people of disparate backgrounds and worldviews. While acknowledging past criticism of formal models in CSCW research, Healey and Vogel feel such models can provide "productive insights into the structural complexities of natural language" (p. 91), especially if they take into account the ontological pluralism of communicative agents. In contrast to past semantic theory that has presumed individuals to be ontologically transparent, Healey and Vogel seek to map how ontological differences are managed in the information flows between individuals with widely different conceptualizations of a particular situation. To do so, they draw on Seligman and Barwise's (1993) Channel Theory to argue that

successful communication is not the result of intersecting individual ontologies, but instead "the articulation and evolution of channels between agents" (p. 100). A hallmark of Healey and Vogel's formal model is that dialogue and joint actions between two or more individuals can reach a stable point in which disparate conceptualizations coexist. Though Healey and Vogel do not link their model specifically to system design, they believe it does provide a semantic framework for conducting more detailed task analysis and ethnographic studies that in turn can impact CSCW design. It is an interesting chapter that helps explain, for example, how symbolic convergence might occur in multidisciplinary design teams, even though individual team members still hold divergent views of the emerging object.

Continuing in this theoretical vein, Julian Newman argues, in his chapter "Semiotics, information and cooperation," that CSCW research suffers from an inadequate theoretical perspective on the concept of "information." To address this problem, Newman briefly summarizes several theories of information that have informed the field of computer science over the past few decades, and in the end, he favors Nauta's (1972) Cybernetic-Semiotic framework as most suitable for relating the "ethnographic and technocratic strands" of CSCW research (p. 120).

The next two chapters—"Sociolinguistic inquiry + situation theory = contribution to CSCW?" by Duska Rosenberg and "Telltales and overhearers: Participant roles in electronic mail communication" by Lyn Pemberton—take a sociolinguistic perspective on CSCW. As the title would suggest, Rosenberg's chapter blends the qualitative methods of ethnomethodology with the mathematical formalism of situation theory in order to link the social and technological aspects of systems design. But unlike some other language perspectives, Rosenberg's intent is not to mirror social structure in actual system architecture, but instead to inform design "by explicitly expressing the boundaries of technological solutions to human concerns" (p. 123). While acknowledging potential criticisms of applying mathematical formalism to social contexts, Rosenberg believes situation theory can provide a uniform framework encompassing the concerns of computer scientists, linguists, and social scientists in the design of CSCW systems. Pemberton's chapter on e-mail uses a pragmatic perspective to compare the role of participants in spoken, paper-based, and electronic communication. Though production roles are similar across all three media, Pemberton argues that e-mail recipients are often faced with ambiguous response roles depending on whether they are addressed directly or listed under Cc: or Bcc: in the e-mail header. Pemberton believes that understanding the complexity of roles in e-mail communication not only can provide insight into breakdowns in group communication, but can also inform design of future groupware applications.

One of the more interesting chapters in terms of system design is that by John Levine and Chris Mellish on the Collaborative Requirements Capture Tool (CORECT) project being developed at the University of Edinburgh Department of Artificial Intelligence in cooperation with other corporate and academic interests. Using natural language generation tools, the CORECT system creates documents from a central knowledge database that are individualized for the specific information needs of various participants—such as customers, salespersons, and systems engineers—in the design of electronic testing systems. Using CORECT, participants can request an overview of the design's progress geared to their own level of interest and expertise, selectively filtering out information that is irrelevant to their individual concerns. It is a highly ambitious, complex project that is still under development, but the authors believe that such a system will solve a basic problem in CSCW research—how to make the accumulating mass of information in multiauthor knowledge bases accessible in intelligible, natural language form to users of different perspectives and backgrounds.

Another interesting chapter is "An interactive spoken dialog interface to virtual worlds" by Christophe Godéreaux and colleagues at the Université de Caen. As the title suggests, this chapter describes a prototype interface to the DIVE virtual reality system at the Swedish Institute of Computer Science that allows participants to use voice commands instead of a mouse to navigate through the virtual realm. The authors describe in a fair amount of detail their statistical analysis of an initial dialogue corpus, how this analysis helped shape design of the system architecture, and plans for future development, including the ability to create and move objects in the virtual landscape using nothing but the spoken word.

The collection concludes with two chapters on the role that interlanguage linguistics might play in CSCW research. First, Jeremy Fox presents a short chapter, "Computer mediated communication in foreign language learning," in which he outlines three phases in the development of computer-assisted language learning (CALL). In particular, Fox believes the realization that second language learning is best accomplished through collaborative methods and group communication might have some interest for those in the field of CSCW. Larry Selinker has a similar goal in mind in "Understanding the 'good and bad language learner': CSCW as a necessary tool," in which he provides a brief summary of various concepts in interlanguage linguistics and how they might relate to group CALL.

Overall, *Linguistic Concepts and Methods in CSCW* provides an interesting portrait of various perspectives on the role that linguistics might play in CSCW research. Several of the chapters provide detailed analyses of human dialogue at various linguistic levels and how their results might inform systems design, while others describe prototype systems designed to solve language problems in group communication. As noted at the beginning of this review, however, some of the chapters make precarious links to central issues and existing research in the field of CSCW. As a result, most CSCW researchers will find only certain chapters of critical interest, while those steeped in computational linguistics may feel like they are treading on all-too-familiar ground in many chapters. For those fairly new to either or both fields, however, *Linguistic Concepts and Methods in CSCW* does provide some interesting synergy between the two disciplines and much fertile ground in developing ideas for future research.

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