CHI 02 Discourse Architecture Workshop
Position Paper

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Understanding of "Coherence"

In my understanding, coherence in computer-mediated conversation (CMC) is a logical, consistent, and orderly flow of conversations in electronic environments. Herring (1999) identified two major problems that could cause incoherence in CMC: lack of simultaneous *feedback* and disrupted turn *adjacency*. Herring demonstrated the problems by using examples from synchronous CMC.

I also regard coherence in CMC as sensemaking of conversations. Dervin and Nilan (1986) discuss a sensemaking approach in information needs and uses. The sense-making approach developed by Dervin mainly deals with individual behaviors rather than collective (Solomon, 1997) or organizational behaviors (Weick, 1995). The synopsis of Dervin's sensemaking approach is that users stop when there is a gap of information, and the sensemaking behavior is to fill in the gap. The gaps are caused by various situations, such as decision-making (there are two or three options to choose), problematic (taking the road that was not your choice), spin-out (having no choice), and social embeddedness (how many people are involved).

Dervin's sensemaking approach would be useful for understanding coherence in CMC for the following reasons: (1) she conceptualizes the gap that users need to bridge when they are making sense of the world. This theory describes the situation that users in CMC environments often face. (2) She identifies situations that cause the gap to stop sensemaking processes. These categories of situations need to be addressed when we support coherence in CMC.

Approach to Analyzing or Designing to Support Coherence

I have used two kinds of graphical representations to analyze CMC (Hara, Bonk, & Angeli, 2000; Hara, in press) that could be used to analyze coherence in CMC.

The first representation is called conference activity graph. The graphs represent the dynamics of discussions within an electronic conference. The graphs have characteristics similar to sociograms because a node represents a message (a person) and a line represents an interaction between the two messages (people). The numbers within the nodes in Figure 1 refer to the order of messages posted on an electronic forum. If there is

an explicit connection, which means that the person who writes the message explicitly referred to the other's message, there is a line with an arrow between the messages. If there is an implicit connection, which means that the person who writes the message referred to the content of other's messages, there is a dotted line with an arrow between the messages. As shown in Figures 1 and 2, connected graphs are reflection of more coherent online discussions. Hara, Bonk and Angeli (2000) call Figure 1 "scattered" because most of the messages are not connected. The messages surrounded by a dotted line discuss relevant topics, and the judgments of relevant discussions were made by the researchers. The researchers suspect that the scattered interactions happened due to the fact that there was no starter of the discussions for this week.

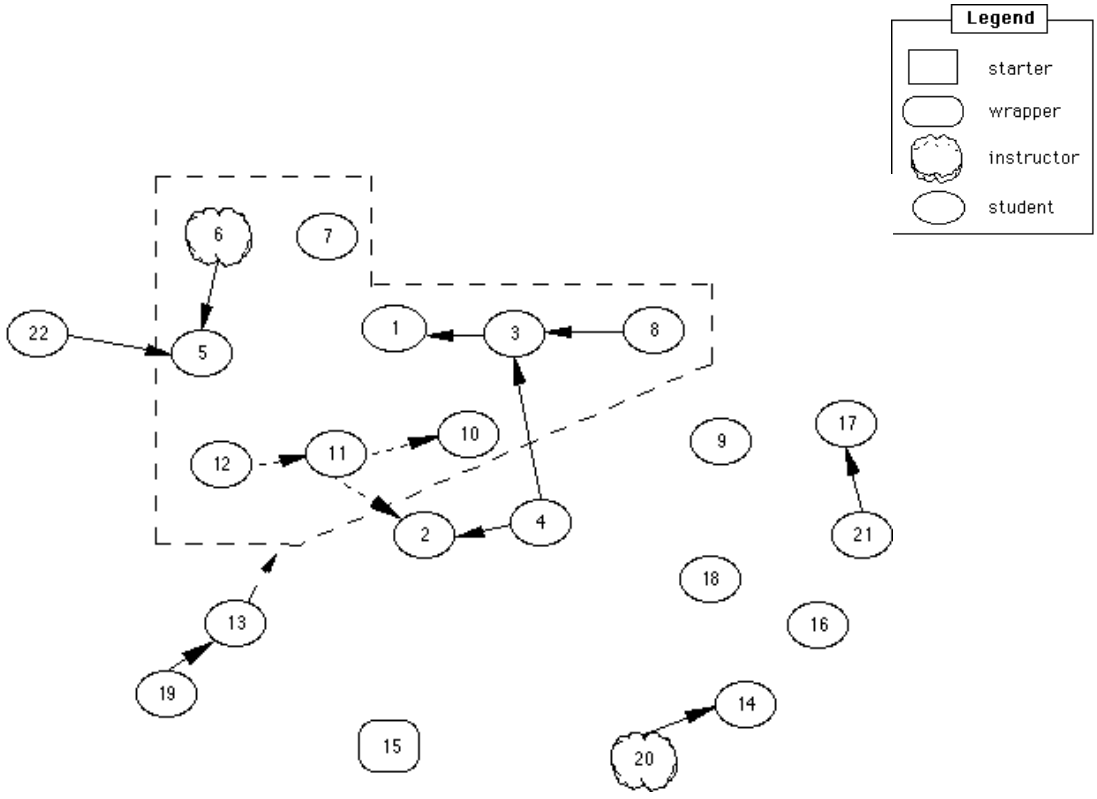

Figure 1: Conference activity graph for week 4 (scattered)

On the other hand, Figure 2 is called "synergistic" because most of the messages are connected either explicitly or implicitly. In the diagram, it is notable that there are several messages (#12, 13, and 20) that referred to multiple messages. In addition, there is a message (#10) that referred to a discussion in the face-to-face classroom.

Although this kind of diagram illustrates the interactions within an electronic conference, coherence of the conversations is decided by the researchers who interpret on-line discussions.

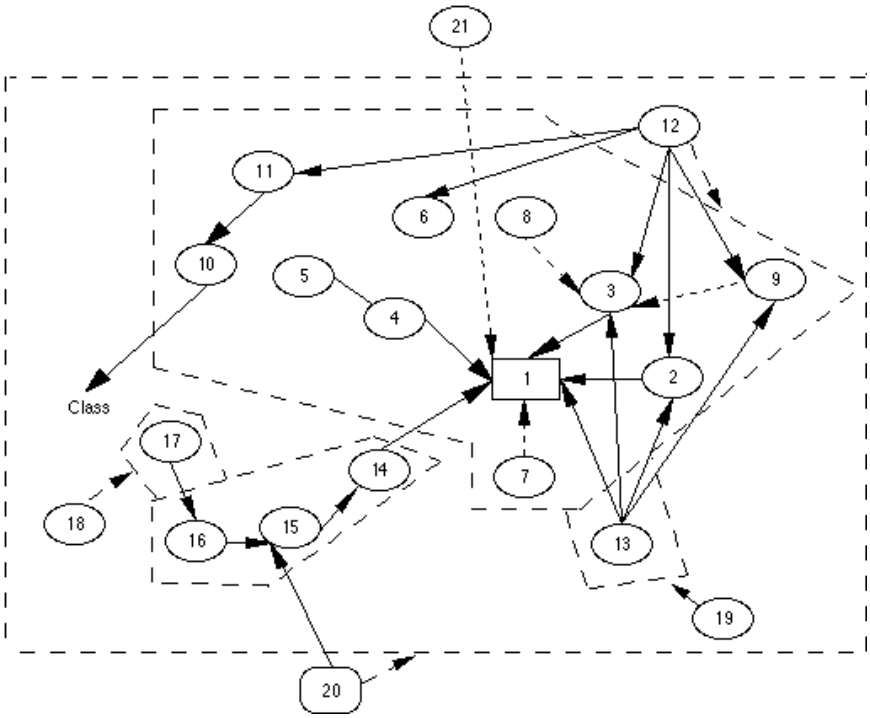

Figure 2: Conference activity graph for week 8 (synergistic)

The second representation is based on the results from content analysis. In Hara (in press), Henri's framework (1992) on social, cognitive, and metacognitive categories was used to conduct content analysis. Five categories for cognitive tasks (elementary clarification, in-depth clarification, inferencing, judgement, and application of strategies), five categories for metacognitive tasks (evaluation, planning, regulation and self-questioning, self-awareness, and reflection on experience), and social cues were coded. Individual messages were again mapped on a diagram weekly. However, this diagram is not based on a single graph used for a conference activity graph, but on a lattice.

Freeman and White (1993) address the limitations of single graphs such as sociograms because they represent only the links between actors, and introduce the use of lattices to represent social networks. They further argue that the advantages of the lattices are visualization of the actor-event structure, the actor-actor structure, and the event-event structure. For example, in order to analyze social relationships of people in multiple events (e.g., nine events), multiple graphs (e.g., nine graphs) are needed. On the other hand, one lattice can describe the multiple social relationships. In order to apply lattices for the results from content analysis of CMC, I used a methodology called Formal Concept Analysis (FCA) (see Priss, 2002). Lattices in FCA are special kinds of graphs that display conceptual hierarchies. Although traditional graphs provide a useful method to represent social interactivity, Hara's study requires lattices in order to visualize relationships in more than one category.

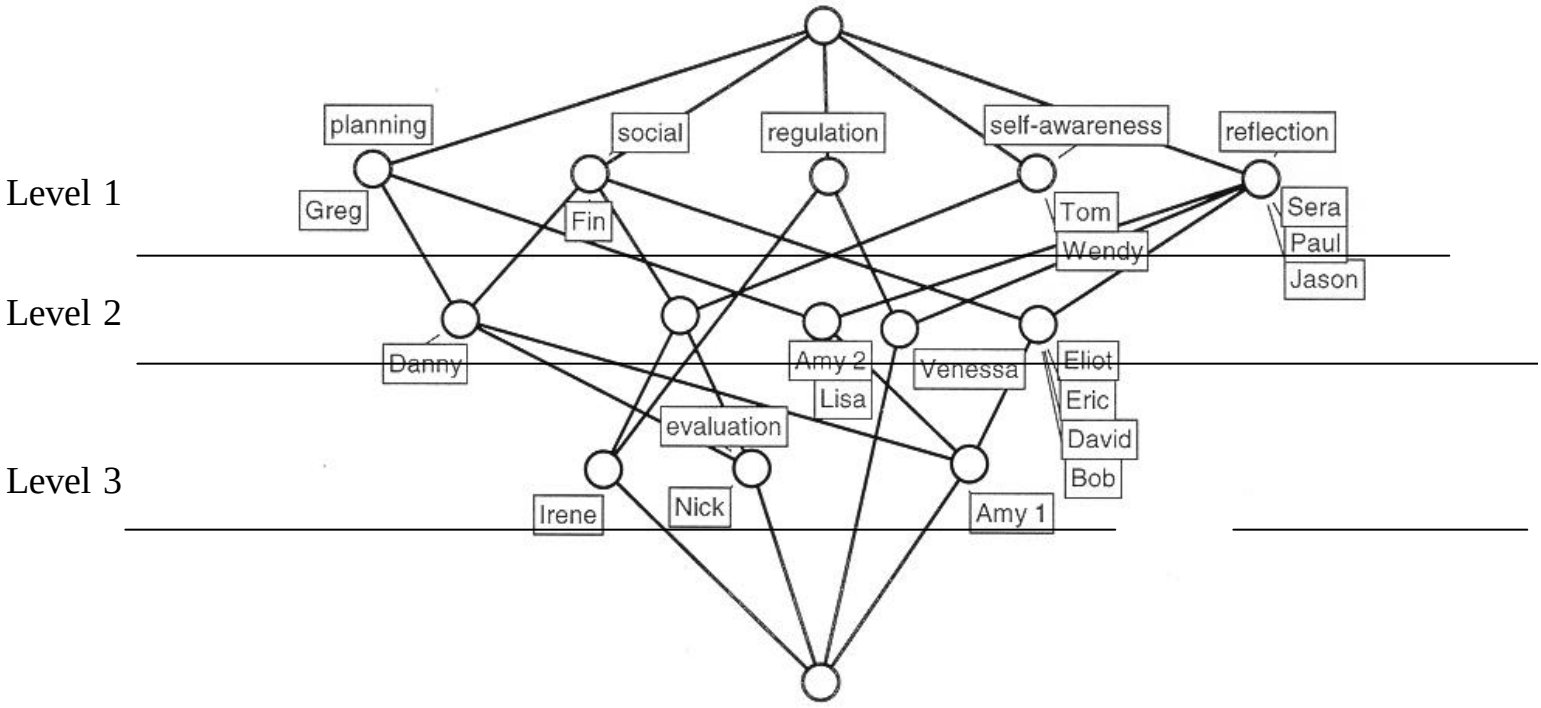

Figure 3: Social-metacognitive dimensions for Week 8

For example, Figure 3 represents two categories from Henri's framework, social and metacognitive dimensions. If we want to identify whose messages contain the elements of regulation, we have to find a node (concept) labeled as "regulation" in Figure 3. All the nodes below the regulation-node are subconcepts, which means that all the messages connected from the regulation-node below have the attribute of "regulation;" that is Venessa and Irene. Additionally, those messages have attributes that are subconcepts of other concepts. For example, the concept where Venessa belongs is a subconcept of these other concepts, so that it has other attributes, e.g., regulation and reflection. Moreover, level indicates the complexity of the messages. For example, the message, Amy 1, located in Level 3 has elements of planning, reflection, and social, whereas another message composed by Greg located in Level 1 only contains planning elements in his message. This example shows the combination of social and metacognitive elements appeared in CMC, and this approach can be applied to examine the coherence of CMC visually.

In summary, I propose the use of lattices to represent the coherence of CMC. There are various potential uses of FCA in terms of research and practice in CMC. First, even though the example used here specifically came from an educational setting, FCA can be applied to the analysis of CMC in different contexts, e.g., in business. Kies, Willinges, and Rosson (1998) discuss three research strategies for computer-supported cooperative work (CSCW): theory-based design; ethnographic methods; and controlled testing methods. In addition to these three research methods, FCA could be a research strategy

to analyze the use of CSCW. For instance, Yates, Orlikowski, and Okamura (1999) analyze genres that appeared in on-line discussions featuring R&D workers. The relationships among the genres could be investigated by using FCA. Yates et al. developed eight categories (i.e., response, solicitation, lost & found, meta-medium, apology, report, announcement, and recreational) under the genre of "purpose of messages." FCA could reveal the relationships among these eight categories and examine how they are related and coherent in on-line discussions.

Second, the lattices could be used as an interface for displaying CMC. While the lattice representation is not intuitive and requires certain training to read, it would provide a role of a map for the users to follow on-line discussions. The designers of CMC software have to supply the categories that the users mark, but this could be employed similar to keywords used to identify research articles.

Incorporating FCA with content analysis will help better equip researchers and practitioners to investigate on-line discourse because data visualization provides different perspectives. In addition, FCA could be used to as an interface to visualize CMC in order to guide the users.

References

Dervin, B., & Nilan, M. (1986). Information needs and uses. *Annual Review of Information Science and Technology*, 21, 3-33.

Freeman, L. C., & White, D. R. (1993). Using Galois lattices to represent network data. In P. V. Marsden (Ed.), *Sociological methodology*, (Vol. 23, pp. 127-146): The American Sociological Association.

Hara, N. (in press). Analysis of Computer-Mediated Communication Using Formal Concept Analysis as a Visualizing Methodology. *Journal of Educational Computing Research*. Note: an earlier version of this paper is available online: http://ils.unc.edu/~haran/paper/fca/fca_aera.html

Hara, N., Bonk, C. J., & Angeli, C. M. (2000). Content Analysis of On-line Discussion in an Applied Educational Psychology Course. *Instructional Science, 28*, 115-152. Note: an earlier version of this paper is available online at: http://www.indiana.edu/~bobweb/temp2/download.html

Henri, F. (1992). Computer conferencing and Content Analysis. In A. R. Kaye (Ed.), *Collaborative learning through computer conferencing: The Najaden papers*, (pp. 115-136). New York, NY: Springer.

Herring, S. (1999). Interactional coherence in CMC. *Journal of Computer-Mediated Communication, 4* (4). [Online]. Available at: http://www.ascusc.org/jcmc/vol4/issue4/herring.html

Kies, J. K., Williges, R. C., & Rosson, M. B. (1998). Coordinating computer-supported cooperative work: A review of research issues and strategies. *Journal of The American Society for Information Science, 49*(9), 776-791.

Press, U. (2002). *A Formal Concept Analysis Homepage*. [Online] Available: http://php.indiana.edu/~upriss/fca/fca.html

Solomon, P. (1997). Discovering information behavior in sense making: I. Time and timing. *Journal of the American Society for Information Science, 48(12),* 1097-1108.

Weick, K. (1995). *Sensemaking in organizations*. Thousand Oaks, CA: Sage.

Yates, J., Orlikowski, W. J., &Okamura, K. (1999). Explicit and Implicit Structuring of Genres: Electronic Communication in a Japanese R&D Organization. *Organization Science, 10* (1), 83-103