# *Visualizing Conversational Coherence*

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## What is coherence?

Coherence refers to the way things flow and function together, how they are connected and whether they are consistent. In a conversation, coherence refer to the way the participants cooperate to maintain a reasonably focussed thread of conversation.

Conversations are such a part of our everyday existance that, except for linguists, we seldom think about their subtle and complex choreography. At close examination, even the most mundane exchange resembles an intricate dance, improvised within the constraints of of numerous complex rules. One feature of this choreography is conversational cohesion - how the participants maintain a common topic. During a conversation, people introduce and sustain different topics. Strong conversational cohesion is a sign of cooperation, showing that the members of the group share similar interests and are motivated to sustain a common discussion, rather than each person attempting to redirect the topic. The success of a new topic depends not only on its inherent interest but also on its proponent: topics introduced by higher status participants are more likely to catch on (Bonvillain, 106) .

Maintaining conversational coherence in online discussions is especially problematic for several reasons.

- The number of participants in a discussion is often very large: it is one thing for three people to maintain a focused conversation and quite another for 100 to do so. The sheer number of participants make it likely that at any one time, at least one of them will have some divergent idea to introduce.

- The single-threaded design of many text-based conversation interfaces (particularly synchronous chats) precludes different conversations from splitting off. Here, the problem is one of granularity. The chat or channel or newgroup is really a forum in which multiple conversations occur, but all are presented as a single discussion. Asynchronous forums have somewhat alleviated this problem through the use of threading, but many synchronous discussions use a single-thread structure.

- The absence of non-textual components of communication (e.g. eye contact, gesture, tone of voice) diminishes group cohesiveness (Isaacs and Tang). Nodding, appearing to think about what is being said, etc. convey to others that although there is not an immediate response to the last remark, it is still an active idea within the group. Online, a sentence is posted and the blank interval after the posting can seem as if that topic is ending.

- The flatter hierarchy typical of online communities (Sproull & Kiesler) can diminish coherence. It has been noted that topics introduced by higher status participants are more likely to catch on (Bonvillain); in an environment in which status is relatively equal, participants may be more likely to vie for status by attempting to lead new conversations.

## Visualizing coherence: our projects

The problem of conversational coherence has long been a focus of our research. Here I will describe three approaches to visualizing conversational coherence. *Chat Circles* and *Talking in Circles* are abstract graphical interfaces for synchronous conversation. They neither analyze

content nor enforce coherence; rather, they provide a means for the participants to self-organize into smaller, and presumably more coherent, conversational groupings. *Coterie* is a visualization of the discussion on an IRC channel. Using an algorithm that looks at both the verbal content and participant patterns, it attempts to visually separate the threads in the discussion, thus depicting the channel's overall coherence. *Loom* is an ongoing project looking at ways to expressively visualize Usenet newsgroups. Coherence is one possible metric to use and I will discuss issues of how it might be illustrated.

### *Chat Circles* and *Talking in Circles*: lightweight conversational structuring via hearing range

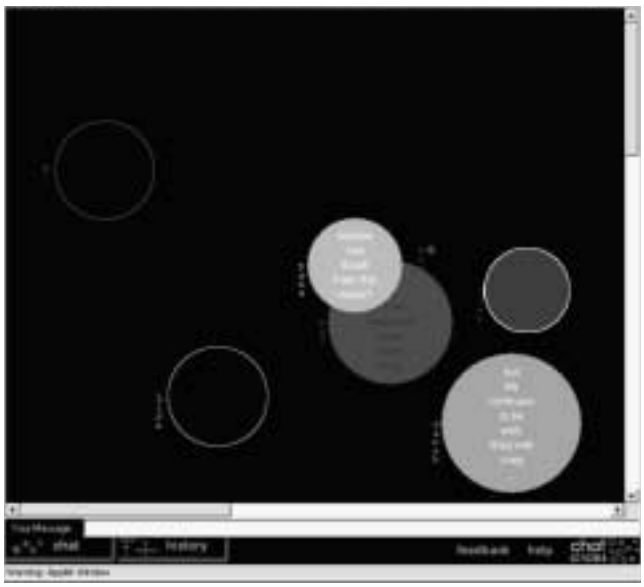

*Figure 1*. The original Chat Circles interface. The local user's circle is bordered in white (in this image, it is Mary, with the red circle). Everyone is speaking, except for "Roy" (in blue). "Lisa" and "K" are outside of Mary's hearing range

One of our group's earliest projects, *Chat Circles*, was designed in part to address this question (Viegas & Donath). We had noted that in synchronous chats, numerous independent conversations were interleaved in a single, confusing thread. *Chat Circles*, which is an abstract graphical interface for online chat, addressed this problem by introducing "hearing range": participants need to be close to each other on the screen to see each others' words (see *figure 1*). While this does not guarantee coherence, the notion was that people who were forming subconversations could choose to group together, thus forming a sort of lightweight threading structure.

This idea was carried into the audio domain in a project called *Talking in Circles* (Rodenstein & Donath). Here, proximity controlled the volume at which one heard the other participants. *Talking in Circles* made it possible for people to easily carry on private subconversations simply by moving their circles to a separate part of the screen. It is interesting to note that while this capability is identical in text-based *Chat Circles* and in audio-based *Talking in Circles*, it seems especially compelling in the latter. Carrying on a private exchange in a public text forum has become an accepted practice, but our expectations for spoken exchanges are that such conversations be done in a non-disruptive way - an expectation that is impossible to fulfill in an ordinary audioconference.

***Coterie*: finding and visualizing coherence in IRC**


*Figure 2.* Three simultaneous conversationial threads are shown in a Coterie display: one related to aircraft, one about screens, and one with a comment about a previous statement's usage. Five users are currently active, but many more are listening.

Coterie is a visualization of an Internet Relay Chat (IRC) discussion (Spiegel). It highlights two key elements: the activity of the participants and the structure of the conversation.

In IRC and other serial chats, multiple discussions often occur simultaneously, interwoven with each other – resulting often in a quite confusing stream of seeming non-sequitors that are in fact multiple interleaved conversations.

Coterie analyzes the content of the conversation and attempts to sort the utterances into conversational threads. This makes following the discussions much easier. It also depicts the cohesivebess of the group and makes it apparent who are the initiators of new discussions.

Coterie has several heuristics for separating the stream of messages into threads and assigning each message to a thread. Speakers often connect turns of talk by repeating pieces of the utterance to which they are responding (Tannen). Coterie look for repeated key words and phrases, and places messages sharing them in a common conversations. It also looks for direct addressing of a specific person. Coterie's algorithsm include some bias for keeping a person in the conversation they are already assigned to; however, if it is clear they are moving from one to another, it will display them as bouncing across the screen. Thus, participants who are focussed on a single thread appear steady, while those whose attention is pulled in several directions are visibly more scattered.

By visualing the presence and conversational activity Coterie creates an environment that looks more like the conversation - where coherent discussions form a solid, central core and scattered chats are, well, scattered all over the place. One easily senses how populated the channel is and who the primary participants are. Involved not just visualziing the right data, but visualizaing the right way - no room to get inot right now, but for instance messages move up at constant rate - fast paced chat is dense, desultory one is sparse.

**Loom**

*Loom* is an ongoing project exploring the problem of expressive visualization (boyd et al). Using Usenet newsgroups as the social environment to be represented, we are analyzing the interactions to find socially meaningful patterns, and depicting them in a way that helps to intuitively convey the semantic significance of the data. The big questions in the research are thus: what are the important patterns to extract and how to depict them.

Conversational cohesion is an excellent example of the sort of pattern we are seeking. It can be qualitatively measured (at least to some degree) and it provides insight about the subjective experience of participating in the conversation.

In Usenet, the threading structure provides a starting point for examining cohesion. If long threads predominate, then presumably there is a high level of cohesion. If single posts are the norm, there is little cohesion: participants send out individual messages, independent of each other's contribution. We depict this comparison in one of our computational design studies (see *figure 2*). There are a number of other statistics we would like to examine beyond threading patterns in order to analyze cohesion within a newsgroup. For instance, the number of participants in a thread is important. A long thread with many contributing participants chiming in with their thoughts on a given subject does indicate a cohesive group, whereas one that a dialogue between two opposing participants does not.

Furthermore, threading does not alone represent cohesion. A group may display many shorter threads yet be quite cohesive if these threads are on closely related topics. An analysis of the content of the messages, looking for keywords in common, etc. is needed to gain a deeper understanding of the level of cohesiveness within a conversational group. The best analysis uses a combination of data: common keywords show that the people are talking about the same thing, and threading structure shows whether they are talking to each other or not.

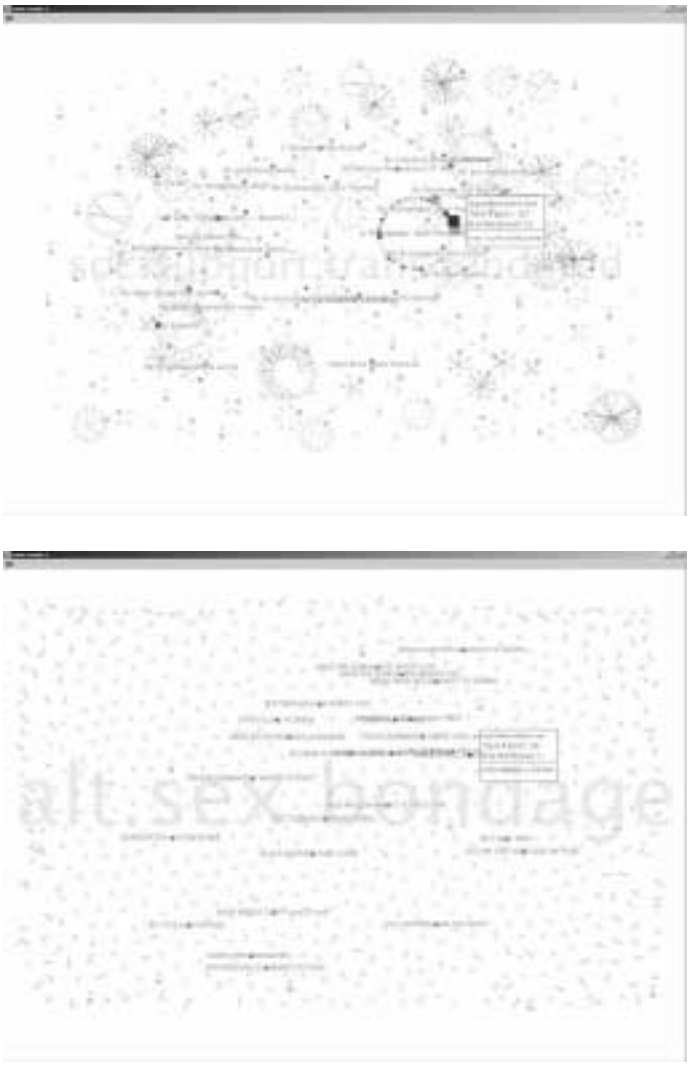


*Figure 3.* Computational sketches from the *Loom* project showing conversational cohesion measured by threading structure. Each thread is depicted in a concentric circle of postings. The top picture shows a relatively cohesive group, with numerous longer threads. The bottom pictures shows a group with very little cohesion, with each posting placed independently and receiving no responses.

Once we have a measurement of conversational cohesion, the next question is how to depict it. The images in *figure 2* are a start. Adding in data about content would give us the ability to group the threads by how closely they are related, thus providing a better sense of the overall cohesiveness of the discussion group. Thinking about our long term goal, which is the development of expressive visualizations, we can say that this initial sketch has some good intuitive features. The circle formation for the threads, for instance, helps to make them feel like a close grouping, and the scattered postings of the 2nd group do convey a sense of separateness. One of current research areas is in the use of motion in expression visualization; addressing cohesiveness, one could for instance have more closely related posts display a dynamic attraction to each other.

## Additional thoughts...

The definition of conversational coherence I have given above and the projects we are doing with this topic all deal with coherence at the immediate, micro level: is there a coherent conversation occuring now?

A related topic, which I find quite interesting, is coherence relative to the ostensible topic of the discussion group, and particularly, how that evolves over time. I am thinking specifically of close-knit communities and how the notion of coherence changes to being much broader as the group amasses greater common ground.

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## Appendix

A. Bio

"Judith Donath is an Assistant Professor at the MIT Media Lab, where she directs the Sociable Media research group. Her work focuses on the social side of computing, synthesizing knowledge from fields such as graphic design, urban studies and cognitive science to build innovative interfaces for the online communities, virtual identities and computer-mediated collaborations that have emerged with the convergence of computing and communication. She pioneered a number of social applications for the web, including the first postcard service ("The Electric Postcard"), the first interactive, juried art show ("Portraits in Cyberspace") and

an early large-scale web event ("A Day in the Life of Cyberspace"). Her current research focuses on designing intuitive visualizations of social interactions, creating abstract graphical environments for mediated conversations, and buildig innovative interfaces that mix real and virtual experiences. Professor Donath received her doctoral and master's degrees in Media Arts and Sciences from MIT, her bachelor's degree in History from Yale University, and has worked professionally as a designer and builder of educational software and experimental media."

B. Discipline

Media arts and sciences: http://www.media.mit.edu/mas/index.html

C. Relevant design work

Here is the homepage of the Sociable Media Group, which I founded and direct:

http://smg.media.mit.edu/

D. Someone else's design work or analysis you think is interesting

At the moment, am finding Tannen and other linguist's work very interesting, particularly in trying to understand the relationship between topical coherence and participant continuity.