
A SEMANTIC APPROACH TO VISUALIZING ONLINE CONVERSATIONS

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AT ANY GIVEN MOMENT, THOUSANDS UPON THOUSANDS OF CONVERSATIONS ARE TAKING PLACE ONLINE. THEY COVER EVERY IMAGINABLE TOPIC, FROM TRAVEL ANXIETY IN A TIME OF TERRORISM TO TIPS FOR TEACHING PARROTS TO PRATTLE. SOME ARE PUBLIC, OTHERS PRIVATE. SOME ARE SYNCHRONOUS CHATS, OTHERS ARE ARCHIVED DISCUSSIONS. ALMOST ALL ARE TEXT-BASED: EASY TO USE, EASY TO ACCESS, BUT LACKING IN VISUAL APPEAL AND OBSCURING MANY OF THE CUES THAT AID SOCIAL INTERACTION. VISUALIZING THE PATTERNS IN THESE CONVERSATIONS CAN HELP THE PARTICIPANTS GAIN A BETTER SENSE OF THEIR SOCIAL MILIEU: WHO ARE THE OTHER PARTICIPANTS IN THE DISCUSSION AND WHAT ARE THEIR ROLES? WHAT ARE THE SOCIAL MORES THAT GOVERN THE INTERACTIONS?

This article discusses designing visualizations of online conversations in ways that help the viewer perceive the online space as an intuitive and legible social environment. These visualizations are designed to be used by participants

in the conversations—they are interfaces rather than study tools. Traditional data visualization focuses on making abstract numbers and relationships into concrete, spatialized images; the goal is to highlight important patterns while

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also representing the data accurately. This is a fine approach for social scientists studying the dynamics of online interactions. Yet for our purpose it is also important that the visualization evoke an appropriate intuitive response representing the feel of the conversation as well as depicting its dynamics. We call this approach “semantic visualization,” for it introduces assessments of the meaning and relevance of the data into the visualization process.

The Sociable Media Group at the MIT Media Lab has been exploring ways of visualizing online social interaction for several years. Here, I discuss three such projects: Coterie, PeopleGarden, and the Loom Project.

Coterie

Coterie is a visualization of an Internet Relay Chat (IRC) discussion [9]. It highlights two key ele-

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ments—the activity of the participants and the structure of the conversation. In a standard IRC display one can request a list of everyone logged into the channel, as individual IRC discussions are called, but in typical use only the participants who are actively messaging are visible.

In Coterie, one can see at a glance how many people are logged into a channel. The participants are represented as colored ovals that bounce and become brighter when that person speaks. This highlights the active participants and conveys the vitality of the discussion. 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 sequiturs that are in fact multiple interleaved conversations.

Coterie analyzes the content of the conversation

display fades and scrolls up with time; a channel with a single closely debated topic will appear as a single, dense thread, a channel with multiple active topics would have several dense threads, and a channel with desultory random discussion would have single statements appearing in various parts of the screen.

By visualizing presence and conversational activity, Coterie creates an environment that looks like the conversation—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 are the primary participants.

To create an easily understood display of a conversation, one must not only visualize the right data, but depict it in an intuitive way. Let's take a closer look at the design decisions made in creating Coterie.

A key step is identifying what aspects of the con-

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and attempts to sort the utterances into conversational threads. This makes it easier to follow the discussions. It also depicts the cohesiveness of the group and makes it apparent who are the initiators of new discussions. We use several heuristics for dividing the stream of messages into threads and assigning each message to a thread. Coterie looks for repeated key words and phrases, and places messages sharing them in common conversations. It also looks for direct addressing of a specific person.

Coterie's algorithms include some biases for keeping a person in the conversation to which they are assigned. However, if it is clear they are moving from one to another, it will display them as bouncing across the screen. Thus, participants focused on a single thread appear steady, while those whose attention is pulled in several directions are visibly more scattered.

Coterie also depicts the temporal patterns in the conversation. Many traditional streamed chats add new lines as they arrive—looking at the screen, one cannot tell if the 30 lines or so displayed have accumulated over the last minute or the last day. Coterie's

visualization will highlight. In this case, we focused on conversational cohesion. Conversations are such a part of our everyday existence that we seldom think about their subtle and complex choreography, yet upon close examination even the most mundane exchange resembles an intricate dance, improvised within the constraints 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 individually 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 [2].

Our focus on topic and cohesion led to the design that grouped messages by common content. The raw materials of Coterie's visualizations—the colored

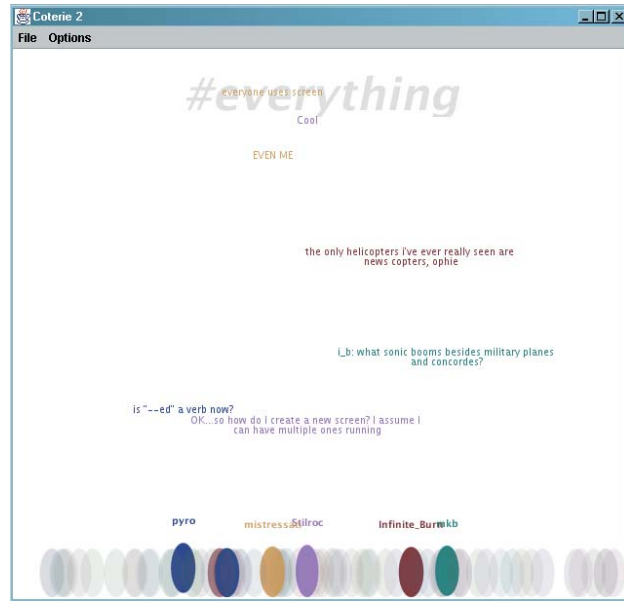
Figure 1. A Coterie display showing three simultaneous conversational threads: one related to aircraft, one about screens, and one with a comment about a previous statement's usage. Six users are currently active, but many more are listening.

ovals, the columns of text—are simple and seemingly neutral. Yet they are used in a way that creates an intuitive feeling for the channel's atmosphere. Cohesive discussions have a single main column, while divergent ones have entries scattered across the screen. Active users are bright and mobile and those who are participating in multiple threads are bounce around from one to another.

PeopleGarden

PeopleGarden uses a flower and garden metaphor to visualize participation on a message board [12]. Participants are each represented by a flower. The longer they have been involved, the higher the stem; the more they have posted, the more petals. Initial postings are shown in red, replies in blue. One can easily get a sense of an individual's role as an active participant, long-time lurker, and so on.

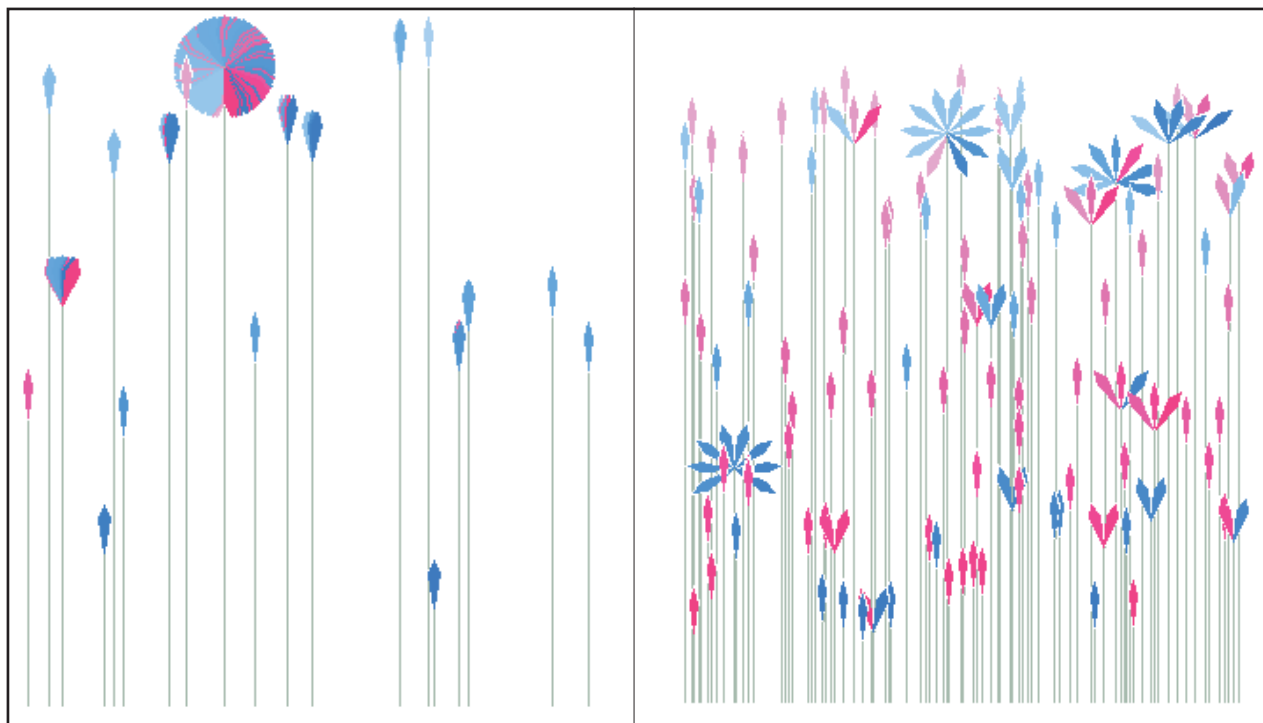
Each message board is a garden full of flowers. There is an inherent legibility to the flower metaphor. A PeopleGarden visualization of a fading group where a few participants occasionally still check in will look like a neglected garden, with a scattering of tall, scraggly plants that are mostly stem and little flower. Its visualization of a lively, active group will resemble a



thriving and varied garden, replete with tall plants and short plants, giant lush flowers and tiny new buds. The viewer can quickly grasp the underlying situation that created the visualization.

The flower imagery is highly evocative, which is both its appeal and its limitation. Gardens are organic, we associate them with life, beauty, freshness. This imagery is fine when the visualization is of, say, a wel-

Figure 2. Two PeopleGarden visualizations. Left: a group with a single dominant member. Right: a group with many members at different levels of participation.



coming support group. It seems jarringly inappropriate for depicting dry technical announcements or vitriolic flame wars.

The problem is the semantic overloading of the symbolic representation given the sparse information to be visualized. If a visualization evokes meaning beyond the direct mapping of the data, there needs to be information in that data that guides the choice and shape of the visualization. If there is no such guiding information, then the evocative quality of the visualization is likely to be misleading and inappropriate. With PeopleGarden, the algorithms that map posting patterns to flower growth and shape are direct mappings of the data, but the flower metaphor also has its own richly metaphoric meaning that should be taken into consideration when applying this visualization.

The Loom Project

The goal of the Loom Project is to create evocative, semantically based visualizations of Usenet newsgroups [3]. To accomplish this, we have been exploring the fundamental questions of what to visualize and how to visualize it through a series of analytic and design studies.

What to visualize? There is a nearly infinite set of statistics that can be derived from a database of Usenet postings. Resolving these statistics into socially meaningful classifications is the essence of the analytic side of semantic visualization.

The initial process is to identify the categories of interest and define them in terms of recognizable features. For example, we may wish to depict the leaders of a group. A reasonable working definition might be people who post frequently and are often replied to in a positive way. This distinguishes them from other frequent posters such as trolls (deliberate troublemak-

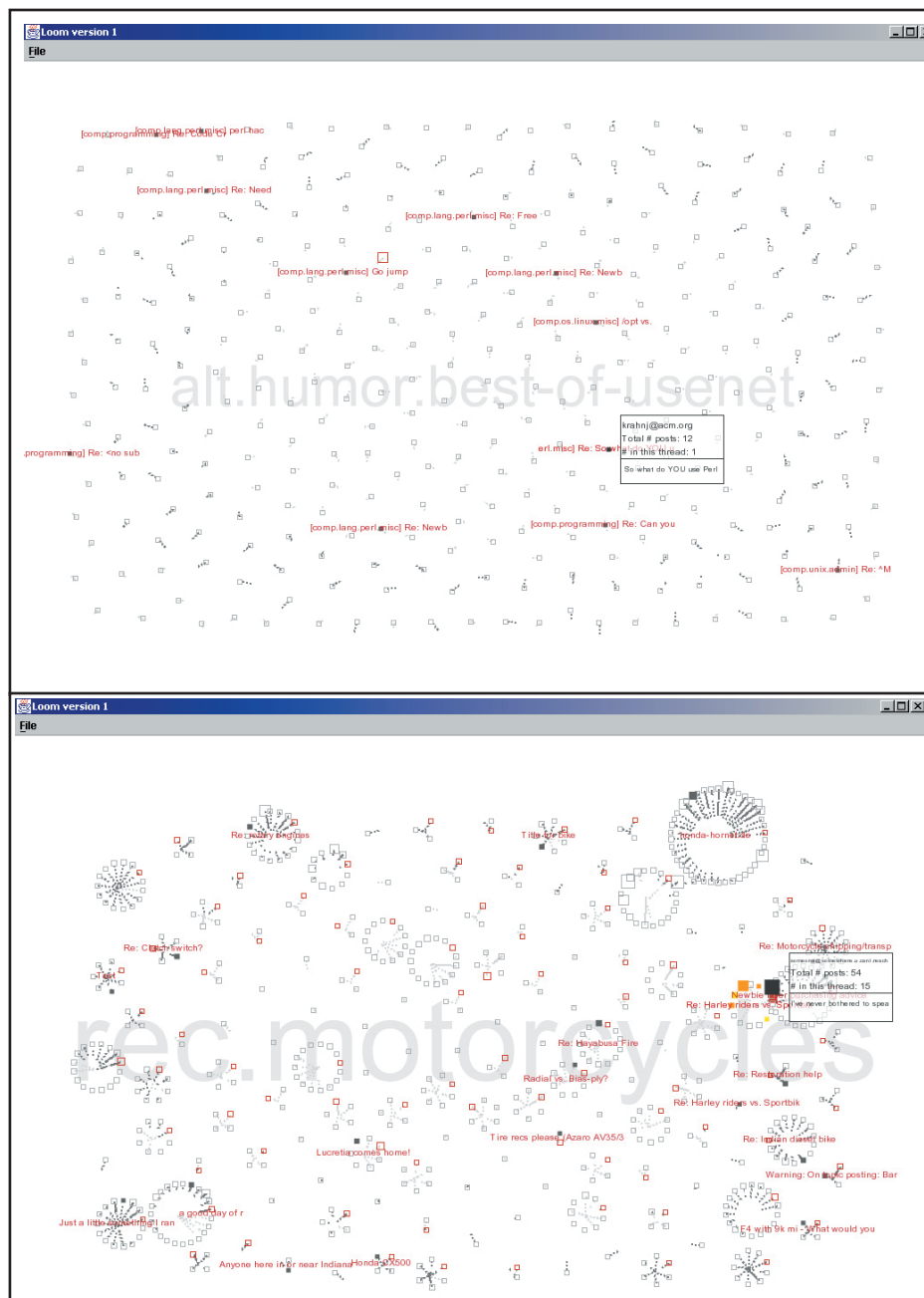


Figure 3. Loom visualization. Here we look at the threading patterns in two groups. Related posts are placed in a circle. Top: a group with almost no threading—posts are sent but seldom replied to. The single dots scattered across the screen are a sign of a nonsocial group. Bottom: a group with dense threads. Numerous and dense circles suggest a vibrant conversational arena. This is a primarily quantitative visualization, one that was initially designed to help our study of what data to depict. Yet the design is not entirely neutral. The circular form is suggestive of a conversational gathering and the scattered dots lend themselves to an interpretation of disconnection [6].

ers), automatic newsfeeds, and the excessively verbose. And it distinguishes them from frequent posters who are often replied to negatively—these we may initially label as “provocateurs.” In this example, the category is about the individuals in the group, but categories can also be classifications of the situation, that is, the conversational thread or the group as a whole. One might choose to look at conversational groupings (as depicted in Figure 3), the affective tone of messages, the group’s circadian rhythms, insularity, and so on.

How to visualize it? The traditional approach is to depict the data, whether the raw statistics or the results of the classification process, in a neutral, quantitative way. In the group leader example, one could graph the number of postings, the percent replied to, and the percent of positive responses as a basic graph. Or one could use a similar chart to show the number of participants classified as “provocateurs,” the number classified as “leaders,” and so on. In either case, the interpretation is not inherent in the picture, only in the viewers’ knowledge of the meaning of the data.

The semantic approach, on the other hand, makes use of our knowledge about the social meaning of the categories we have defined and creates a visualization that reflects this knowledge. To use a simplistic example, a semantic visualization might use simple shapes and saturated colors for the leaders, and spiky shapes and acidic colors to depict the provocateurs. We have been drawing from a variety of cognitive science and graphic design studies that look at how different elements such as color, shape, position, motion, among others, create different impressions for the viewer [1, 4, 5]. One of our future research goals is to develop new approaches to mapping meaning and visual design, such as a system that lets a population of users evolve graphic designs they feel suited for depicting various social patterns [7].

Conclusion

It is important to remember that all visualizations will have some evocative quality. We do not think in pure abstractions; rather, our thinking is metaphoric and grounded in the spatial world [5]. For instance, things higher seem positive—and thus how the axes of a chart are labeled can subtly but strongly influence how it is interpreted [11]. Colors and shapes are highly evocative and once introduced we must be very sensitive to how they appear. Indeed, one argument for deliberately designing evocative visualizations for online social environments is the existing default textual interfaces are themselves evocative, they simply evoke an aura of business-like monotony rather than the lively social scene that actually exists.

There are many complex issues that arise in this

research, both in terms of what to depict and how to depict it. Categorizing social data is a highly subjective and culturally determined process. The designer’s background, values, and prejudices will affect how a category is labeled and how it is matched to an expressive image. Most work in visualization has shied away from such issues, preferring to present itself as neutral, quantitative renderings of neutral, quantitative data. Yet there is no such thing as a truly neutral depiction and we argue it is better to be cognizant of the rendering’s subjective and emotional qualities than to simply let them happen as they may. Furthermore, when the rendering is of social data for participatory use, the neutral stance may not even be appropriate. It is useful to think of the design of such participatory visualizations as being a form of architecture rather than a branch of statistical graphing. Architects strive to bring out the evocative and symbolic qualities of their buildings while working within the constraints of functionality and the need to fit within the larger environment.

While rules can guide architecture, the design of a particular building comes from the aesthetic sense and intellect of its architect. Similarly, we are working toward creating visualizations of online conversations that draw from both the quantitative depiction of their patterns and rhythm and a semantic approach to utilizing meaningful representations. ■

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