

# Creating and Displaying Nonverbal Social Back-Channels in Online Environments


By  
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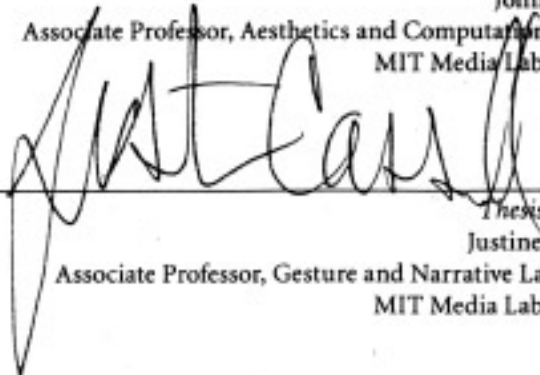
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## **Abstract**

Real-life social interaction depends heavily upon nonverbal social cues. We project many of these cues subconsciously, and they form the back-channels of our interaction with other people. Online, these nonverbal cues, especially those that are subconscious, are difficult or impossible to project to other people. This thesis proposes three related social interaction systems that augment a person's online representation with some of these social back-channel cues. These cues are generated and visually portrayed automatically from sociometric and historical interaction information. Similar back-channel generation and visualization subsystems and techniques are used within the three projects; each project applies these techniques to a different social situation. For example, a participant who is active within a social group may grow in size, or take on a brighter color, whereas a lurker may shrink and move off to the side of the group. The projects will then be evaluated based both on their visual design and ability to portray meaningful and useful social back channel cues.

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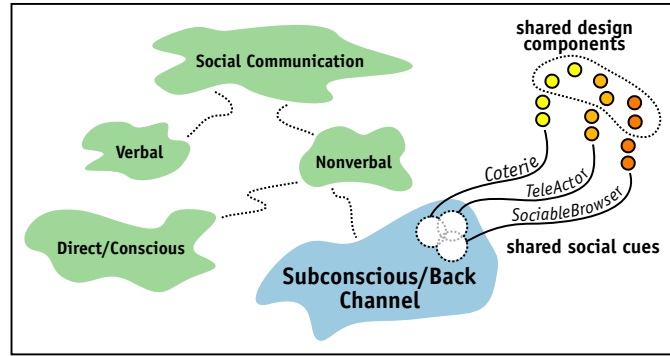
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## Introduction

During real-world social interaction, we depend heavily upon visual information to augment our verbal conversations. Whether we are reading a person's body language as we converse with him, or watching, from afar, groups of people interact, we constantly "read" the nonverbal social expressions that others emit. When interacting within any social situation, we also emit these same expressions to help others understand our own actions and intentions. Ketrow, in "Nonverbal Aspects of Group Communication," distinguishes between "dynamic nonverbal behavior emitted by a person and more static stimuli or cues, such as proxemic distance among three group members" (1999). Goffman, in "The Presentation of Self in Everyday Life," similarly segments nonverbal communication into those expressions "given" and those "given off" (1959). The former type intentional, such as nods of agreement; the latter tends to be subconscious or difficult to control, such as a person's comfort within a group, and generally forms back-channels of social interaction. In many cases, these subconscious social expressions change over time, as we spend time in a particular social environment, interacting with a group of people.

Online, we use existing interfaces to communicate our conscious expressions with relative ease: we can chat, emote, and even choose our representations, be they text or graphical. However, we are much more limited in our ability to express nonverbal back-channel cues. These expressions, which are traditionally visual (hence the need to "read" them), are essentially cut off; we cannot see a person's facial reaction, nor can we see those visual qualities that a person evolves over time, such as their comfort or experience within an environment or how involved they have been in a conversation. Experience and comfort within a social environment, though abstract measures, are reflected in vocabulary, style of dress, and familiarity with the customs and people within the group. In many cases, we can read these qualities easily in real life. We can, by glancing around a party, see who knows whom, determine which conversations are active and lively, and pick out who has a history with the group. Online, we have little or no such facility; it is difficult to gain anything more than a shallow understanding of the social environment from a brief look within, for example, a chat room. To extract even a cursory understanding of how a group interacts in an online environment, we must watch that group for some period of time, and build a picture of the social environment for ourselves, so that we might read it as we do in real life.

It is possible to build online social environments that can provide some of the real-world readability of both the individual and the group as a whole. For this thesis, I propose three design projects that will explore different social environments and provide, within each, representations of



**Figure 1**  
This thesis concentrates on gathering and creating visual back channel communication information within three online social environments.

people that are augmented by social back-channel information. Since much nonverbal communication is difficult to sense, all of these systems will attempt to augment the nonverbal information that is available with sociometric information, such as message post rate, that is gathered within the online social space. A crucial facet of this research is that traditional categories of sociometry, such as proxemics (physical arrangement of individuals), kinesics (physical interaction between individuals), chronemics (use of time within group interaction) and environment (layout of space), may have slightly different meanings or manifestations online than they do in real life.

*Coterie* will be a real-time visualization of Internet Relay Chat (IRC) that automatically generates visual back channels for social expression by keeping track of individual and group social interaction within the chat space. *TeleActor* will be a collaborative decision-making environment, similar to Massively Multiplayer Role Playing Games (MMRPGs), where people collaboratively direct a remote Tele-Actor. In this online space, a person's past decisions and performance, as well as their interactions, will be reflected in their representations. *SociableBrowser* will be a web/document browser which will allow a user to see other users who are currently browsing the same document. A person's interaction with other people and their page-viewing history will augment their visual representation. With these projects, I hope to create social environments online that are both socially richer and more socially readable than current online interaction systems.

## Research

Online, we cannot see the groups of people around us. When we visit a web page, we might know that there are thousands of other people viewing that same web page (particularly if the page is slow to load), but we never actually see them. Previous projects have attempted to make these people more visible, but in most cases, the representations provide only basic and immediate information about people's interactions (Xiong 1999, Minar 1998).

In computer-based chat, which provides an online analogue to real-world social interaction, people can intentionally give social expressions to others. In a text chat environment, such as IRC, we do see other people, but only as names in a list. Each person has a very information-poor representation, and beyond their name or their use of language, there is little that differentiates the members of the chat or cues us into their history with the other members or their conversational activity. Graphical chats, both abstract and icon- or avatar-based, give us representations that can be used to easily differentiate and follow users on-screen (ChatCircles 1998, The Palace, OnLive). Such systems, however, are limited in much the same way as text chats: they provide few, if any, means for users to emit social expressions. While the representations we choose can reflect qualities of our personalities, they never change as we interact within the social space. In the real world, appearances change over time: in the short term, a new person will meet and become more comfortable around others, and interact more; in the long term, a person's dress and vocabulary changes with their increased experience within the group. One notable system, *The Fog*, does present an integrated history of a person's interaction within the system, but only the text of the chat over time is visualized (1999). If a person's visual presentation online would change in response to continued interaction and involvement with a group, as it does in real life, then the social community would become a conversationally richer and more easily navigable space.

### **Coterie**

*Coterie* will be a real-time, dynamic visualization of an IRC channel. The system will monitor the social interaction within that channel over time, keeping track of such things as mes-

sage post rate, length of conversation, and conversation membership, building a history of each participant's interaction as well as a general interaction profile for the channel as a whole. This social information will be used to augment the display of the current activity within that space, creating and displaying automatically some social expressions for each participant.

Figure 2 shows a screen from an initial implementation of the system. In this view, each

**Figure 2**  
*Coterie*.  
In this screenshot, three IRC channels are displayed stacked on top of one another. Each person within a channel is represented by an oval.



participant within a channel is represented by an oval. The ovals are arranged horizontally based on the participant's recent activity: active participants are closer to the center, while lurkers are pushed towards either side. When a participant posts a message, he bounces to the center. Other visual characteristics, such as hue, brightness, and the size of the oval depict other historical social interaction information and change over time as a participant interacts with the group.

With *Coterie*, I will explore what an online crowd looks like, and how back-channel social expressions can be generated automatically by the system. This latter capability will be an important one to explore since we generate many nonverbal expressions subconsciously and automatically in the real world. Such expressions may not carry the same exact information online as they do offline, though by their very nature they will need to be passively generated and projected to other people. *Coterie* will also explore how historical information about a person's and a group's social interaction can create an environment where social information can be read at a glance, as it is in the real world. An environment that displays this increased level of social information should, for an outsider, be easier to join than traditional chat spaces.

### **TeleActor**

The *TeleActor* project will be an environment that allows people to socially interact and collaboratively direct a remote Tele-Actor. This application will be somewhat like an MMRPG in that people will inhabit a remote environment that they share with other people online. However, where the MMRPG places each user within his own body, *TeleActor* places all Tele-Directors within the same remote body, the Tele-Actor. In many instances, the Tele-Actor will be a real person in a real environment; however, the framework will also support a virtual Tele-Actor in a virtual environment, such as in the game *The Sims*, or even a real person within a virtual environment, such as a person playing the game *Quake*.

A screenshot from an implementation of *TeleActor* is shown in Figure 3. To send a direction to the Tele-Actor, a vote can be called. During a vote, which has a short



**Figure 3**  
*TeleActor*.  
Tele-directors can watch a live audio-video feed from the remote tele-actor, while chatting and voting on the tele-actor's high level goals.

time limit, a Tele-Director can either vote on a goal posted by another Tele-Director or post a goal themselves. As a game environment, users will want to gather support for their posted goal, or know how well other people have fared in the past. The voting history of a Tele-Director, as well as their social history within the environment, will be reflected in the user's graphical representation. In the initial implementation, the longer a Tele-Director uses the system, the brighter their representation will become. Additionally, Tele-Directors who are successful in gathering support for their goal will incrementally increase in size, and those Tele-Directors who vote together will tend to take on each other's visual characteristics. These visual displays change over time, so that a user must maintain a certain level of activity or success to maintain a larger size or brighter color.

This information should help users develop a more informed impression of each Tele-Director. In the real world, such back-channel information helps us to decide how believable a person's projected persona is, and, in this online environment, can provide invaluable information for making decisions. *TeleActor* will go beyond traditional textual or graphical collaborative systems by providing this important channel for social expression.

### ***SociableBrowser***

The *SociableBrowser* will be a social interface for reading and browsing an online document or web page with other people. While there exist many shared document-reading applications, *SociableBrowser* will focus on the social side of such an environment. Within *SociableBrowser*, all of the people currently visiting a web page will be shown graphically on that page. The system, which will be based on a graphical chat system like *ChatCircles*, will allow users to interact with each other socially, using the web page as the common ground for this interaction.

Like *Coterie* and *TeleActor*, *SociableBrowser* will augment each user's visual representation with back-channel social information. In this case, that information will include a user's browsing history, as well as information about whom they have met within the system. *Footprints*, a system that exposed the history of access of a web page, by showing an overview over time of the people who browsed that page, centered mainly upon the history of the document or set of documents (Wexelblat 1999). *SociableBrowser* instead will be directed toward the history of the people who are browsing, and more specifically the history of their interaction with others using the system. By tracking who interacts with whom, and other characteristics of that interaction, *SociableBrowser* can project onto a



user's representation information regarding that user's experience within the system, the people they know or have met, and other qualities of their social interaction over time.

Connections between people who share a common browsing or interaction history will be shown by drawing lines between those people on screen. Also, different visual dimensions of each individual, such as hue, shape, and size, will be used to portray their social history within the *SociableBrowser* system. These visual characteristics may also be affected by proximity to other users of the system: one person may take on a visual characteristic of the person close to them if they have a common history. These visual representations should help users navigate the social space more easily, since they can read more about a person from their graphical portrayal. This system should also help facilitate social interaction by qualitatively exposing common histories and shared experiences.

## Evaluation

Since the above three applications are intended as design projects providing a channel for visual back-channel social expressions, I will concentrate on their exploratory and aesthetic qualities. Though I do not plan to do formal user tests, I do intend to informally watch how others use these systems to gauge how successful the systems are in accomplishing the goal of providing richer and more intuitive social spaces through the use of historical and back-channel visual information. I will evaluate *Coterie*, *TeleActor*, and *SociableBrowser* with a critical eye, trying to answer the following questions:

- Can meaningful visual representations of online crowds be generated autonomously?
- How useful are these visualizations for better understanding social interaction?
- How can crowd visualizations go beyond textual and even traditional chat interfaces for reading a person or a group of people?
- How does historical information about a person's and a group's social interactions make for a richer view of people and groups?
- How can historical information allow people to integrate into and navigate already existing social groups online?

## Resources

To build these projects, I will need a high-end computer with a powerful graphics card. Also, I will need a server on which to run the history-gathering subsystems, and to host the applications so that they can be deployed on the Internet for public use. *TeleActor* and *SociableBrowser* will be built upon SMGServer, a framework for building social online spaces. *TeleActor* will also require the broadcast rig for the Tele-Actor, a person to perform as the Tele-Actor, and a real-time Internet broadcasting system. I do not plan to run formal user tests, but rather will rely on informal monitoring of users of these systems.

## Schedule

Date	Work to be completed
11 December 1999	Thesis proposal due
31 January 2000	Implementation of <i>SociableBrowser</i> completed
28 February 2000	Redesign of <i>Coterie</i> completed
31 March 2000	Test and redesign of <i>TeleActor</i>
11 May 2000	Thesis due

## Deliverables

Deliverables for this thesis consist of the three working systems described above: *Coterie*, *TeleActor*, and *SociableBrowser*. All three will be fully usable within any Java 2 environment, and will include complete source code.

## Bibliography

- Ackerman, M. S. and Starr, B. "Social Activity Indicators: Interface Components for CSCW Systems," In *Proceedings of UIST '95*. ACM, N.Y., 1995, pp. 159-168.
- Borgatta, E. F., Cottrell, L. S., Jr., and Meyer, H. J. "On the Dimensions of Group Behavior," *Sociometry*, Vol. 19, No. 4. December 1956, pp. 223-240.
- Cattell, R. B., "New Concepts for Measuring Leadership, in Terms of Group Syntality," *Human Relations*, 1951, 4, pp. 48-63.
- Cherny, Lynn. *Conversation and Community*. Stanford, CA. CSLI Publications. 1999.
- Goffman, E. *The Presentation of Self in Everyday Life*. 1959.
- Hemphill, J. K., and Westie, C. M. "The Measurements of Group Dimensions," *Journal of Psychology*, 1950, 29, pp. 325-342.
- Isbell, C. L., Sr., Kearns, M., Kormann, D., Singh, S., and Stone, P. Cobot in LambdaMOO: A Social Statistics Agent," *American Association for Artificial Intelligence*, 1999.
- Ketrow, S. M., "Nonverbal Aspects of Group Communication," *The Handbook of Group Communication Theory and Research*. California. Sage Publicatios, Inc., 1999.
- Kurlander, D., Skelly, T., and Salesin, D. "Comic Chat," In *Proceedings of SIGGRAPH '96*. ACM/SIGGRAPH, N.Y., 1996, pp. 225-236.
- Milgram, S. *The Individual in a Social World: Essays and Experiments*. Reading, Mass. Addison-Wesley Publishing Company, 1977.
- Minar, N. "Visualizing the Crowds at a Web Site," In *Proceedings of CHI '99*, ACM/SIGCHI, N.Y., 1999.
- OnLive*. <http://www.onlive.com/>. Accessed December 7, 2000.
- The Palace*. <http://www.communities.com/>. Accessed December 7, 2000.
- Thalmann, D., Musse, S. R., Kallmann, M. "From Individual Human Agents to Crowds," *INFORMATIK / INFORMATIQUE*, No. 1, 2000.
- Tufte, Edward R. *Envisioning Information*. Connecticut. Graphics Press, 1990.
- Turkle, S. *Life on the Screen*. New York, N.Y. Simon & Schuster, 1995.
- Viégas, Fernanda B. and Donath, Judith S. "Chat Circles," In *Proceedings of CHI '99*, ACM/SIGCHI, N.Y., 1999, pp. 9-16.
- Wallnöfer, H. *The Fog*. <http://www.t0.or.at/~hwallnoefer/fog2.html>. Accessed May 8, 2000.
- Skog, T. and Holmuist L. E. "WebAware: Continuous Visualization of Web Site Activity in a Public Space," In *Proceedings of CHI '00*, ACM/SIGCHI, N.Y., 2000, pp. 351-352.
- Wexelblatt, A. and Maes, P. "Footprints: History-Rich Tools for Informtion Forging," In *Proceedings of CHI '99*, ACM/SIGCHI, N.Y., 1999.

Whittaker, S., Terveen, L., Hill, W., and Cherny, L. "The Dynamics of Mass Interaction," In *Proceedings of CSCW '98*. ACM, N.Y., 1998, pp. 257–264.

Whyte, William H. *The Social Life of Small Urban Spaces*. Washington, D.C. Conservation Foundation, 1980.

Xiong, R. and Brittain, E. "LiveWeb: Visualizing Live User Activities on the Web," In *Proceedings of SIGGRAPH '99*. ACM/SIGGRAPH, N.Y., 1999, p. 254.

## **Addendum**

*Changed Assistant Professor to Associate Professor for John Maeda and Justine Cassell on title page.*

*Added before the last sentence of the Abstract (p. 2):*

For example, a participant who is active within a social group may grow in size, or take on a brighter color, whereas a lurker may shrink and move off to the side of the group.

*Added after first paragraph of Coterie section (p. 7):*

Figure 2 shows a screen from an initial implementation of the system. In this view, each participant within a channel is represented by an oval. The ovals are arranged horizontally based on the participant's recent activity: active participants are closer to the center, while lurkers are pushed towards either side. When a participant posts a message, he bounces to the center. Other visual characteristics, such as hue, brightness, and the size of the oval depict other historical social interaction information and change over time as a participant interacts with the group.

*Split second paragraph of TeleActor section, and added the following to the end of the second paragraph (p. 8):*

In the initial implementation, the longer a Tele-Director uses the system, the brighter their representation will become. Additionally, Tele-Directors who are successful in gathering support for their goal will incrementally increase in size, and those Tele-Directors who vote together will tend to take on each other's visual characteristics. These visual displays change over time, so that a user must maintain a certain level of activity or success to maintain a larger size or brighter color.

*Split second paragraph of SociableBrowser section, and added the following to the beginning of new paragraph (p. 9):*

In this case, connections between people who share a common browsing or interaction history will be shown by drawing lines between those people on screen. Also, different visual dimensions of each individual, such as hue, shape, and size, will be used to portray their social history within the *SociableBrowser* system. These visual characteristics may also be affected by proximity to other users of the system: one person may take on a visual characteristic of the person close to them if they have a common history.

*Added Deliverables section on page 10.*