Social and Temporal Structures in Everyday Collaboration

ISR Institute for Software Research
UNIVERSITY OF CALIFORNIA, IRVINE

UCIrvine
University of California, Irvine

Danyel Fisher and Paul Dourish

Introduction

The boundary between individual and collaborative work is a porous one. Many tasks carried out with ostensibly single-user tools are, on closer examination, collaborative in nature. Documents are frequently assembled out of pieces provided by others; presentations may be crafted as parts of larger projects, and are designed to suit the needs of both presenters and audiences; and spreadsheets are often used to coordinate collective activity. We refer to this as "everyday collaboration." Yet the tools we use force us to choose: "am I now collaborating, or working alone?" Our research asks: *how can the single-user experience be reconfigured to support the collaborative tasks being carried out?*

We propose that an effective solution is not to turn single-user applications into groupware tools, but rather to reveal the collective activity that is already being carried out through those tools. We want to help people coordinate their work by providing them with ways to see how their work is connected to that of their colleagues. To do this, we are exploring the potential for using single-user tools as technologies supporting awareness.

Social Patterns, Temporal Rhythms

We explore the structure in existing collaboration by building analytical and qualitative tools that examine and reflect collaborative patterns. In order to do so, we have developed a tool, **Soylent,** that can visualize networks of interactions between a user and others.

The data set from which we extract this implicit communication information is based on email logs, and stored email messages.

We draw much of our inspiration from the field of social network analysis. Figure 1 shows our "egocentric" network visualization. A message from some person "A" to three others is a cue that "A" sees those three as somehow connected to each other. More messages from "A" to them, or between that list, suggest a stronger connection, or set of connections.
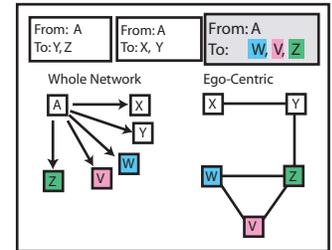

Figure 1: How Soylent visualizes social networks

Figure 2, the full network view, shows how this works in the real world. This is the view from the perspective of a user of the system; the connections show the ties between sets of people in their communications.

Figure 3: The top-ten list shows the most emailed correspondents per month. In this detail, green highlights trace one person.

But it is not only social roles that are important. People's interactions change over time. Figure 3 shows a top-ten list: for each month, the top-ten correspondents' names are written; the user may highlight a single name at a time. This particular image shows how one person's interactions with a correspondent changed: as the correspondent traveled across the country for an extended stay, he gradually fell out of touch; his return prompted a slow climb into prominence.

Sources of Data and Privacy

Soylent visualizations are based on email histories. Messages are read from a mail server, and saved to a database. The database is then analyzed and downloaded in order to be visualized.

Personal social information is a private and important thing. The Soylent system is designed to provide additional information to its users without revealing anything to outside parties. In order to do that, the system reads mail off of the user's personal account, and saves it to a private database, located on the user's own machine. No one can see this information in any form except the user whose mail is being viewed.
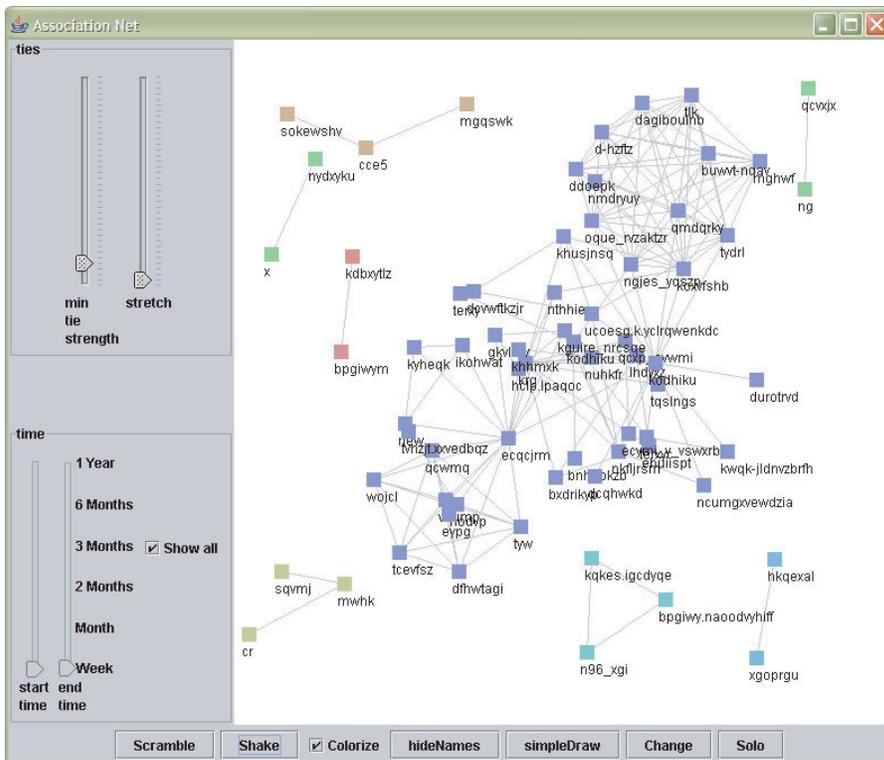

Figure 2: The Soylent network view. Note the different groups with different roles.

Field Study

A variety of volunteers have run Soylent on their own mail archives. From them, we have discovered a series of patterns in their interactions.

Relevant Patterns

We found many recurrent structures in users' email, suggesting that there are regular characterizable ways of understanding their interactions.

The Onion Pattern

The "Onion" pattern (Figure 4) represents a core-and-periphery. Note the tightly-connected group toward the right edge, and the wider group around it. The tight group is a project team, while the larger group consists of people generally interested in the topic.

The Nexus Pattern

Certain individuals (such as team managers secretaries) had a distinctive appearance in the network. They would often be at the center of a hub-and-spoke pattern. This "nexus" pattern could be interpreted as a series of multiple collaborations or projects. An employee, reporting back to his manager on a series of projects, would have the manager tied into each of these different contexts.

Figure 4 highlights two examples of the "nexus pattern" in the upper section. The left-hand nexus center, for example, is a co-researcher a series of different projects, and shares both work and social ties. The circle of connected people describe some of the different contexts that they share.

The Butterfly Pattern ("Dual Roles")

The butterfly pattern - named for its two large "wings" surrounding a single center - is visible when an actor could be found in two roles. A member of a design team would also be a member of a research group, for example.

The node pointed by the arrow in figure 5 illustrates these two roles. The central node designates a student who was involved in both a colloquium and a research team.
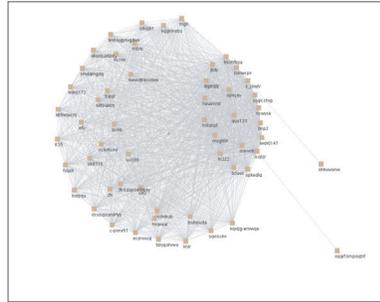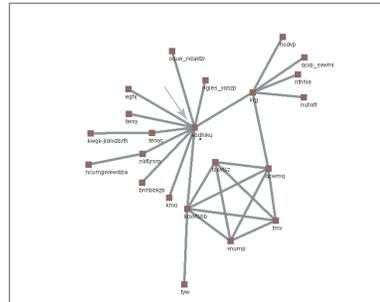

Figure 4: The Onion pattern
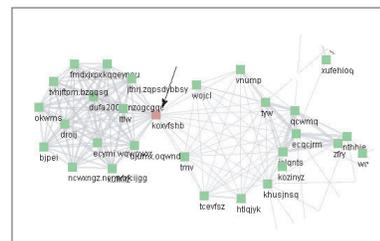

Figure 5: The Nexus pattern
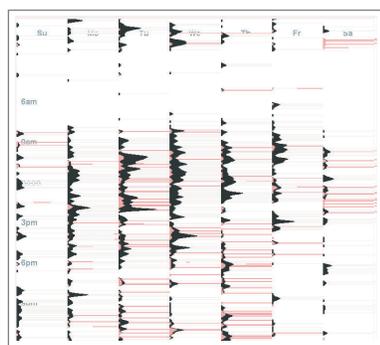

Figure 6: The Butterfly pattern

Figure 7: Daily patterns

Shifting Involvement (Long-Term Change)

Both gradual and sudden changes in project teams were a recurrent theme among most participants. The top-ten list (Figure 3) made it clear that, in addition to recurrent sets of correspondents, most participants had a series of changing team members: people would become prominent for a period of time, then slip away. These changes happened with notable events: the starts or ends of collaborations; joining a new team; the arrival and departure of summer interns.

Daily Rhythms

Figure 7 shows the patterns of a single user's typical week. This shows a cumulative history of all Mondays through Fridays (columns) at various hours of the day (rows). A black spike indicates many messages sent at that time: note the preponderance on weekdays, during the daylight hours. A red bar indicates an email to the respondent's boss–note the interesting late night and afternoon messages, in contrast to the other morning work.

Future Developments

Soylent forms the infrastructure for a developing series of tools that understand and integrate social information. These tools, collectively referred to as **TellMeAbout**, are exploring ways of using the social and temporal structures revealed by Soylent. Some of these tools provide social information directly ("show me the last few groups I've worked with"), while others enhance email and file system interfaces with awareness tools and additional information.

Trying Out Soylent

These visualizations and tools are now available for anyone to try out. A public version of Soylent is available at

http://www.isr.uci.edu/projects/soylent

for experimental use. The system works through Java Web Start, and requires nothing more than Java on your computer and access to your outgoing mail archives (POP, IMAP, MH and MBOX are all supported).

Danyel Fisher is a graduate student (PhD 2004), and

Paul Dourish is an Associate Professor in the Interactive & Collaborative Technologies (ICT) group at UCI.

They share interests in Computer Supported Collaborative Work and Human Computer Interaction.

Contact Information

Danyel Fisher
Institute for Software Research
University of California
Irvine, California 92697-3425

For more information about this work

danyelf@ics.uci.edu

949-824-1338 (phone)
949-824-1715 (fax)

To explore the Soylent project and TellMeAbout further, try our demo at
http://www.isr.uci.edu/projects/soylent

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