Automated Social Network Analysis as a Tool for Evaluating Sociability

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Abstract: Although the tools for mediating Internet-based learning communities have exploded in the last few years, our theoretical understanding of how to evaluate attempts to build online communities has lagged behind (Carroll, 2001). We used automated tools to build social network maps of an educational children's multi-user virtual environment using two modes of CMC. Internal "E-mail" was most frequently used within groups. Short "telegram" messages were frequently used within groups but also provided between-group interaction.

Purpose and Theoretical Background

The growth of the Internet has inspired a large number of projects investigating its potential as a medium for collaborative learning environments. One central argument for the construction of Internet-based learning environments is Internet messaging allows learning to take place without constraints of shared location and time (Hara, Bonk, & Angeli, 2000). This opens the possibility for "anytime anywhere" instruction and professional development. Sociability, the quality of a technical system to enable collaboration between participants, has joined usability as a design criterion.

The larger project from which this study comes is an online educational environment for late-elementary children. Participating engage in instructional content through a 3D Multi-User Virtual Environment and a fictional game-like context. Participating students and teachers are located at sites in the United States, Australia, China, Singapore, Sweden, Turkey and Denmark. One question of concern to this project is to what degree do participants use the available communications tools to interact with participants from other classrooms and other countries. Hampton and Wellman (2003) propose that CMC-based networks interact with and build upon traditional "face to face" networks. If so, the networks constructed using CMC should show a large number of messages sent within local classroom groups. The other hypothetical extreme would involve participants actively seeking out new contacts, resulting in minimal within-group messaging.

Methods

Social Network Analysis (SNA) is another diverse set of methods for examining the relations between individuals and groups (Wasserman & Faust, 1994). A relation can be any form of social interaction including knowing the other person by name, communication, or shared membership within a group. Hampton and Wellman (2003) examined Internet interactions, name recognition and residence visits. While Paolillo (2001) examined responses in chat interactions. SNA provides powerful methods for quantifying the size, shape and scope of a given network.

This paper is based on data from two weeks of activity during May 2005 within the MUVE, examining two modes of communication. Telegrams are short private messages sent from one sender to a single recipient and are persistent until read. The data sample included 1,071 "telegram" messages sent by 77 participants. Mail messages are long private message sent from one sender to multiple recipients and are persistent until deleted. The data sample included 253 messages sent by 82 participants.

Sender and recipient information was automatically extracted from the message headers and used to build social network analysis matrices. Relations were aggregated by classroom membership. The sna package for R (Butts, 2005) was used to create visual maps of this data (see figure 1 below.) In addition, all of the data was read for case characterization, and structural discourse analysis statistics (Herring, 2004) performed to describe the

message samples.

Results

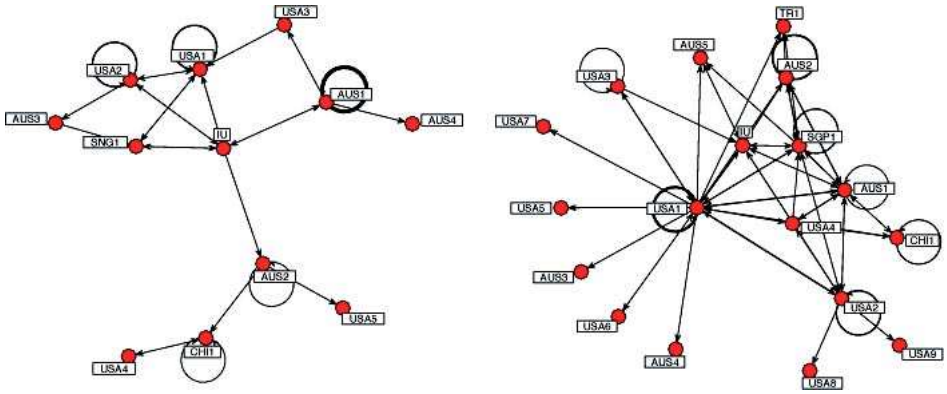

Figure 1. Network maps for mail (left) and telegrams (right). Messages sent within groups are displayed as closed loops. Thickness of lines indicates number of messages.

For internal email, most of the messages were sent within groups, and a handful of messages sent between groups. However, the telegram messages were more frequently used between groups. In addition, classrooms that received direct support from the project researchers and staff were more central within the social networks than classrooms not receiving direct support. Although this paper focused on relationships between classrooms, more sophisticated analysis is possible.

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