

Implicit Links in Asynchronous Communication Spaces

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ABSTRACT

Online asynchronous communication spaces are rich in implicit relationships that are constructed through the collective activity of participants in these spaces. Mapping such relationships to edges between actor-nodes in the spaces often results in a graph structure with great potential to inform the design of and for these spaces. In this paper I present examples of implicit relationships in USENET, the blogosphere, and the LiveJournal community space. Further, I discuss design implications of the visualization and analysis of graph structures resulting from such links.

Author Keywords

Asynchronous communication space, implicit link, design

ACM Classification Keywords

H.5.3 Group and Organization Interfaces, H.5.3.a Asynchronous interaction

INTRODUCTION

Visualizing and analyzing graph structures representing online asynchronous communication spaces is often a useful technique for gaining insight into the activity and interaction patterns of participants in those spaces. However, creating such representations involves making decisions about how to map nodes and edges to actors and relationships in a given space. It is usually fairly straightforward to pin down a good mapping for a node (e.g. a newsgroup, a member of an online forum, etc.), but picking an interesting relationship for edges to represent is a trickier problem. In general, edges can represent one of two types of links between nodes: explicit or implicit.

An explicit link is a relationship imposed by a moderator, or overtly constructed by one or both of the nodes being connected. More often than not, the potential for explicit links is built into the technology behind a particular asynchronous communication space. For example, a

‘friend’ relationship on a social network like Friendster [4] is an explicit link. It is made possible by the Friendster software and established by one of the participants in the relationship. Such a link can be used to define an edge between two user-nodes in a graph representation of the Friendster network.

Implicit links, on the other hand, are relationships that emerge naturally from the way users participate and interact in an asynchronous communication space. They are often more difficult to identify than explicit links, and the presence of individual edges between two nodes more expensive to establish. However, I propose that analysis and visualization of asynchronous communication spaces based on implicit links leads to a better understanding of the patterns of interactions inside these spaces. Furthermore, it allows researchers to explore users’ perceptions of the space they inhabit. These results, in turn, may inform design of and for these spaces.

The rest of this paper explores some implicit relationships that have been useful for examining various asynchronous communication spaces. I will draw examples from research on USENET newsgroups, blogs, and from my own exploration of implicit links in the LiveJournal community-space.

EXAMPLES OF IMPLICIT LINKS IN ASYNCHRONOUS COMMUNICATION SPACES

USENET

The newsgroups of USENET form one of the oldest asynchronous communication spaces in the online world. To overlay USENET with meaningful structure, the Netscan project from Microsoft Research [6] defines the idea of a ‘neighbor’ relationship in pairs of newsgroups. Two newsgroups are considered neighbors if they share cross-posted messages (e.i. messages that are sent to multiple groups simultaneously). If newsgroups are taken as nodes in a graph representation of the USENET space, the neighbor relationship can be represented by an undirected, weighed edge between two newsgroup-nodes, where the weight of the edge is equal to the number of shared messages between the two newsgroups in some given span of time. Neighbor relationships are implicit links in the USENET communication space, as they emerge from the collective posting activity of all USENET authors. Netscan researchers claim that visualizing portions of the graph structure representing newsgroup neighbor relationships

reveals interesting connections in meta-clusters of newsgroups [7].

Blogs

All weblogs (“blogs”) can be thought of as existing in a giant asynchronous communication space termed the *blogosphere* [9]. The blogosphere often acts as a medium for the propagation of simple memes [3]. One very common example is of a URL (e.g. one pointing to a news story or a humorous Flash animation) that will be copied and commented on by blog authors after she sees in a peer’s blog. Repetitions of this process lead to an interesting relationship between blogs – the likelihood of a blog p publishing some URL after seeing it on blog q [1]. Because blog authors very often do not credit their source for a URL, such links must be statistically inferred. For this reason, and because such links represent a relationship negotiated over the span of two blogs’ lifetimes, this relationship can be said to be implicit.

Using the relationship described above to overlay graph structure onto the blogosphere, Adar et al. were able to categorize common patterns of information flow across blogs. In addition, they used it as the foundation of a new blog-ranking algorithm that gives priority to blogs most likely to be first at posting a URL that is then likely to be picked up by other blogs [1].

LiveJournal Community-Space

LiveJournal [<http://www.livejournal.com>] is a blog-publishing tool and website that allows users to create community-blogs. These may be joined by existing LiveJournal members, who are then allowed posting access to the community’s blog. While exploring the structure and dynamics of the LiveJournal community-space, I picked an implicit, ‘shared members’, link by which to give it structure. Two communities participate in a ‘shared members’ relationship if there are LiveJournal users who are members of both communities. Treating each community as a node, I created undirected, weighted edges between community-nodes having a ‘shared member’ relationship, with the edge-weight equal to the number of users common to both communities [2].

Visualizing a much-constrained subset of all the LiveJournal communities I had collected data on (see [2] for details) as the previously-described graph structure, including only edges of weight 50 and above, presented note-worthy patterns in the community-space. Groups of communities with very similar interests were united in densely connected subgraphs or cliques of community-nodes. More interestingly, however, such community-clusters were sometimes inter-connected through weaker links and mediatory communities. For example, note how ‘europe_history’ and especially the very active ‘middle_ages’ community in Figure 1 seem to mediate the general-interest history community-cluster (‘askahistorian’, ‘history’, and ‘historystudents’) and the ancient Greco-

Roman history community-cluster (‘roma_antiqua’ and ‘classics’).

I fully expect that as larger portions of the LiveJournal community-space are visualized, and the threshold for including edges is lowered, inter-cluster ties will increase in number and variety.

IMPLICATIONS FOR DESIGN

Examining graph structures constructed from implicit relationships in an asynchronous communication space offers immediate benefits for designers looking to gain understanding into the workings of the space. By constricting the scope of the analysis to only the strongest links, as I have done above with the LiveJournal community space, it is possible to isolate some of the strongest, most active, or most heavily-linked sections of the space being analyzed. This may be useful for modeling information flow through the system, as well as summarizing and distilling activity and interactions in the space. Exceptionally active or interlinked sections of an asynchronous communication space may also point to the *core group* of the space, whom designers may especially want to bear in mind when considering modifications to the space [8].

Participants in an asynchronous communication space may also be interested in seeing a visual representation of implicit relationships they help establish, and the resulting social structure these links define. Feedback from users who have been presented with such visualizations may help designers appreciate users’ understanding of the space they co-create and the users’ self-perceived position in the space. Such insight may inform design of the space by allowing designers to modify the space to better suite participants’ needs and activities.

CONCLUSION

Implicit links in an online asynchronous communication space are those that arise naturally in the midst of activity and interactions of participants in the space. Visualizing and analyzing a graph representation of a space using such relationships to define edges in the graph is a useful exercise for informing design of and for the space. In particular, such a representation may be useful for helping to identify the core users, model the information flow, or summarize the activity of a space. Reflective feedback from users exposed to such representations may also inform design by highlighting users’ understanding of the space and their perceived place in it.

I believe the Beyond Threaded Conversation workshop would be an excellent place to build upon the ideas presented in this paper. New designs for asynchronous communication spaces presented during the workshop will undoubtedly expand the set of available implicit links. In turn, discussion of the analysis of conventional spaces through visualization of implicit links would bring forth new ideas for alternative spaces or design elements.

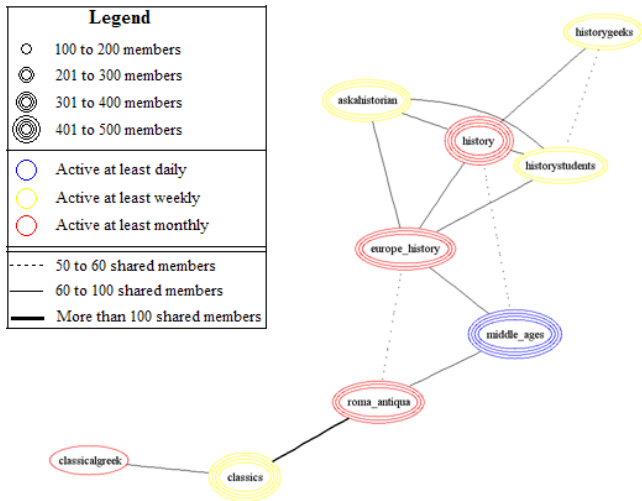


Figure 1. Example of community-cluster exhibiting mediation communities in LiveJournal community space

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REFERENCES

1. Adar, E., Zhang, L., Adamic L.A., and Lukose, R.M. Implicit Structure and the Dynamics of Blogspace. HP Information Dynamics Lab (2003). <http://www.hpl.hp.com/research/idl/papers/blogs/blogspace-draft.pdf>.
2. CemWEB Research Project. Results. <http://www.livejournal.com/users/cemcom/75111.html>.
3. Dawkins, R. *The Selfish Gene*. Oxford Press, 1990.
4. Friendster. <http://www.friendster.com/>.
5. LiveJournal. <http://www.livejournal.com/>.
6. MSR Netscan – Usenet Social Accounting Search Engine. <http://netscan.research.microsoft.com/>.
7. MSR Netscan – Usenet Social Accounting Search: Cross Post. <http://netscan.research.microsoft.com/Static/crosspostVz.asp>.
8. Shirky, C. A Group is Its Own Worst Enemy. *Networks, Economics, and Culture mailing list*. http://www.shirky.com/writings/group_enemy.html
9. Wikipedia contributors. “Blogosphere.” *Wikipedia: The Free Encyclopedia*. 02 Jan 2005. <http://en.wikipedia.org/wiki/Blogosphere>.