Trammel Map: Providing a Clear View of the Enterprise Social Network

Shixia Liu, Nan Cao, Paul Moody*, and Tianshu Wang
IBM China Research Lab, *IBM Watson Research Center
{liusx, nancao, wangtsh}@cn.ibm.com, *paul_moody@us.ibm.com

Abstract

In this paper, we designed a Trammel Map to display the organization and network structure embedded in the enterprise social network. The basic idea of this design is to display the organization structure as a Treemap and graph links as curved links overlaid on the Treemap. Nodes from different organization units are put into separated squares. The proposed method also places nodes by their quantitative attributes. The most influencing person and organization unit are posited on the most noticeable place. This method enables a quick exploring and better understanding of the enterprise social network. The user can understand the collaboration and communication among diferent organization units in a straight way.

Keywords: Enterprise social network, Treemap visualization, Graph visualization, Interaction techniques

1 Introduction

People and their social networks are the most important assets in organizations. The informal network in the organization can promote change or stifle it. It can augment or disrupt the structure that the organization hierarchy is attempting to create. Thus it is important to study the enterprise social network under certain organization structure. In enterprise, there are a lot of social networks built from large scale communication and collaboration data, such as co-authoring, Email data, chatting, forum. Being able to visually analyze these enterprise social networks and understand their social dimension among different organization units, can help us to understand and exploit these networks more effectively.

Most existing social network visualization methods focus on visualizing the network structures [2]. These methods have been effectively used in the analysis of domains such as e-mail communication [1], online social networks [2], and co-authorship networks in scientific publications [4]. However, existing work mainly focuses on the layout of the unweighted network structures, they treat each person as equal when calculating the layout. Especially for the collaboration and communication networks in enterprise, there is no apparent approach to show the relationships between people under the organization structure. And some important questions, e.g. who is the more important persons of the social network, might be a little hard to answer. Furthermore, little work has been done on weighted enterprise social networks, in which each person has at least one quantitative attribute to indicate its importance in the network. In this paper, we desinged a Trammel Map to display the organization structure and collaboration and communication acts between the people involved in the enterprise social network.

2 Visualization Design

In the enterprise social network, relations are given between persons, and an organization hierarchy is defined on these persons as well. Thus the key of the visualization design is to show the hierarchical structure and relations at the same time. We designed a Trammel Map to visualize such kind of structures.

The basic idea of this design is to use a hybrid social network (link/node style) and organizational map (square Treemap style) to display hierarchical and link structure of an enterprise social network. Such kind of representation provides a number of insights into which persons are contributing to the organization units and which ones are more important. More specific, our design is driven by the following key qualities. For convenience, we denote the person with the highest quantitative value as the highest contributor.

1. The placement of the organization structure.

   The rule for the Treemap layout is to place the block with the highest contributor(s) at the center position. The next highest contribution block goes below the highest contributing block. Continuing down the list of the non-leaf nodes of the hierarchy with the highest contributions, they go to the left, then to the right of the center positions, and continue by going lower and then left and right.

2. The placement of the nodes within their blocks.

   The major goal is to centralize the key person, thus the person with the strongest network ties or highest quantitative value should go to the center of that block.

Both nodes and edges are size-coded. The nodes can be sized based on any quantitative attribute of interest; this could correspond either to measured data (such as the age of a person in a social network) or derived statistics (such as the difference between node in-degree and out-degree). Edges are also sized by the quantitative attribute of interest. In Trammel Map, we use the thickness of the edge to indicate the frequency of connections between two nodes. For example, in a social network, we can use the thickness of the edge to indicate the Email reply frequency of two persons.

3 Interaction

For effective information acquiring and understanding, navigation and user interaction are as important as presentation. We have embedded our visual presentation described above in an interactive system for the analysis of enterprise social networks.

To facilitate network exploration and observation, we adopt the highlighting techniques. The basic idea is to highlight nodes based on connectivity in the network. When the mouse hovers over a node, its direct connections with other nodes are highlighted and a tool tip is shown to display the detail information of the hovered node (See Figure 2).

To help the user find information more easily, Trammel Map combines the overview and detail technique with dynamic queries to facilitate the searching and pruning of large trees and complex links between nodes. The technique allows ranges of depth dependent attributes and ranking values to be specified to prune the tree and links dynamically. To reduce visual clutter caused by large amount of data, the following two filters are adopted.

1. Filter by the depth of the organization structure.

   When the user adjusts the slider on the depth of the organization hierarchy, the depth of the Treemap will change accordingly. The higher the adjusted value is, the more the low-level
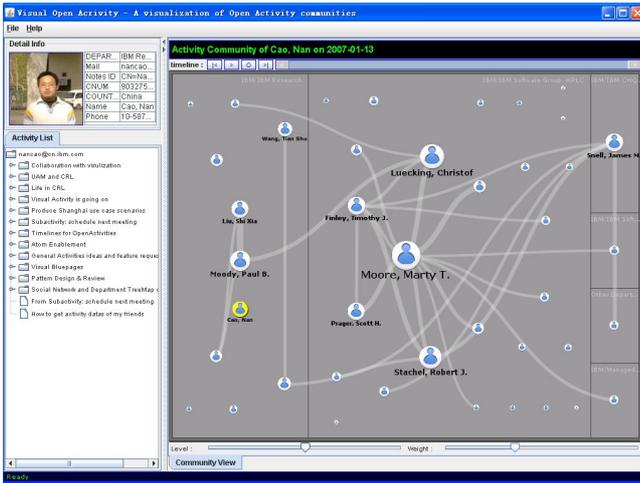
Figure 1: Filter function of Trammel Map

Figure 2: The Visual Activities. 1)the information view; 2)the activity tree view; 3)the social network view

nodes are shown in the treemap. Furthermore, the nodes belong to the sibling treemap blocks will gradually aggregate to one single node when the slider is adjusted to a lower value. This allows the user to drill down from summary data to detailed data continuously, thus encourage further exploration.

2. Filter by the weight of the links or nodes.

In many applications, the node and/or the link of the enterprise social network have some quantitative attributes (weights) to indicate their importance. To reduce the visual clutter caused by the large number of links and/or nodes, we allow the user to adjust the weight slider to filter some unimportant nodes/links and help him focus on the more important ones. Figure 1 shows an example of filtering the unimportant links.

We apply this method to the Activities component of IBM Lotus Connections (http://www-142.ibm.com/software/sw-lotus/connections) for analyzing the collaborative network. Activities component is designed to help users organize and work with all their tasks, both individual as well as group projects, in a single place. Activities are collections of items (memos, files, links and tasks). It allows users collaborate in activities with shared messages, tasks, web links, and files and tag content for better organization. Generally speaking, there are two kinds of relationships among the Activities users. "Reply to" is the most common kind of relationship. For example, when the user B replies to the user A's topic, a direct relation will be generated between B and A. "Tag" is another aspect which is used for generating the relationships. When user A and user B using the same tag in different topics, whether they reply to each other or not, there is an implicit connection between them to indicate both of them have the same interests. We integrate all kinds of relationships together to generate a social network. Here, we use the data corpus acquired from an IBM internal Activities website. In this data corpus, since all the Activities users are the IBM employees, besides the implicit relations generated by the above rules, there also exist a organization tree to organize these users. Intergrating the organization structure with the social network together generates a hierarchical graph. It can be well presented by using the Trammel Map.

We designed a Visual Activities tool based on above data analysis. It helps visually disclose the network built from Activities data. As shown in Figure 2, three views have been designed in this tool. The social network view is used to visualize the organization structure and network structure built from the Activities data. It overlays
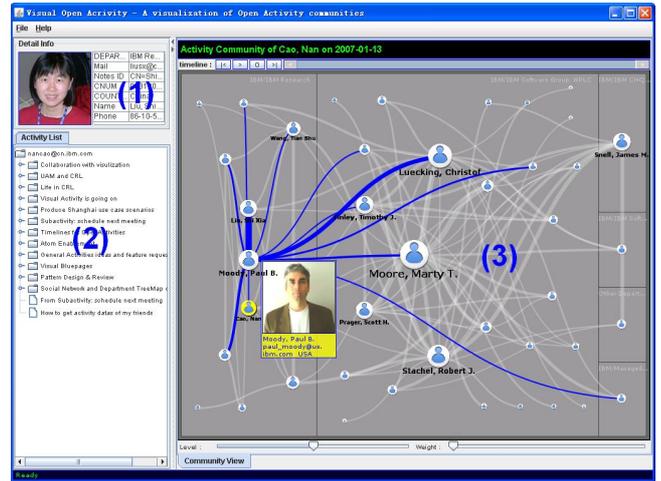
the network on an organization map. The activities' owner is highlighted as a yellow node in this view. As mentioned before, the foreground of this view is a graph visualization of the constructed social network. The node sizes corresponds the quantitative attributes of persons. Each line between two nodes is a relationship between two persons. The thickness of the line indicates whether the relationship between two persons is strong or not. The blocks in the background stand for IBM organization units. The users are laid out inside their corresponding organization blocks. The layout design mentioned before ensures that the most active person is always at the center of the view as the focus which is surrounded by other persons. This tool helps to disclose the collaboration and communication patterns among different organization units. Furthermore, it helps to visually manage and expand personal social capital, enables users to find people with specific knowledge or skills in extended enterprise social networks.

4 Conclusion and Future Work

We have designed a Trammel Map to provide a clear view of enterprise social networks. The main novelty of the proposed method is to use a hybrid graph layout and an improved Treemap to display link and hierarchical structures in the enterprise social network. Customized interactions are designed for the proposed visualization method.

We regard the work presented as initial, there are improvements to be made as well as many directions to pursue. First, we are planning to design more interaction techniques to enhance the usability of the developed toolkit. Second, we need to design an temporal visualization method to help the user to keep his mental model when analyzing the evolution of the enterprise social network. And finally, further user experiments have to be performed to gain insight in the practical usage of our technique.

References

[1] D. Fisher and P. Dourish. Social and temporal structures in everyday collaboration. In *Proceedings of SIGCHI conference on Human Factors in computing systems*, pages 551–558, 2004.

[2] J. Heer and D. Boyd. Vizster: Visualizing online social networks. In *Proceedings of the 2005 IEEE Symposium on Information Visualization (InfoVis05)*, pages 33–40, 2005.

[3] Kleinberg JM. Authoritative sources in a hyperlinked environment. *Journal of the ACM*, 46(5):604–632, September 2006.

[4] M.E.J. Newman. Co-authorship networks and patterns of scientific collaboration. In *Proc. of Natl. Acad. Sciences*, pages 5200–5205, 2004.