Toolkits for Visualizing Co-Authorship Graph

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ABSTRACT

Visualization eases insight into complex systems such as co-authorship networks. We present an initial deployment of an author navigator application for convenient visual examination of JCDL and LANL co-authorship networks.

Categories and Subject Descriptors

H.3.7 [**Information Storage and Retrieval**]: Digital Libraries

General Terms

Design

1. INTRODUCTION

Social network analysis has attracted considerable interest in recent years. A co-authorship network is a type of collaboration network. Visualization provides a convenient way of examining patterns of collaborations in a co-authorship network.

Many tools provide good results for visualizing complex networks. However, these tools are not targeted specifically at co-authorship networks. We faced several problems in our design:

1. A complete co-authorship graph is too large to display in satisfactory detail on a single computer screen.
2. The importance of collaboration cannot be easily visualized and controlled.
3. The visualization usually is not interactive; end-users do not control what they see.

We introduced a weighted directional network model to represent the co-authorship network, in which frequent collaborations are given higher weight [2]. With this model, important links can be emphasized and trivial links can be truncated. We used off-the-shelf visualization tools to develop interactive navigation toolkits. Users can select an author to focus on (center of the graph), set a distance from the selected author, and indicate the minimum weight necessary for links to be displayed. Based on those parameters, a subgraph is dynamically constructed and visualized. In this visualization, the weight of a link plays an important role because it allows users to identify important links. Especially, users can navigate to other interesting authors by following the links.

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2. IMPLEMENTATION

Two applications were developed to help interactively navigate co-authorship networks. The first is a web application based on GraphViz's WebDot tool. Our version first loads co-authorship data and builds an internal graph representation from a user request with specific criteria. Then a query is conducted in the internal graph representation and a subgraph is constructed, formatted for GraphViz, and delivered to WebDot for visualization. Subsequently, if a user navigates the graph, additional CGI requests are sent to the web application and new graphs are constructed.

The second application is a standalone Java swing application based on TouchGraph [1]. It should be easy to convert this tool into a web-based Java applet. In this tool, selecting an author from the list will bring up a graph centered on that author. Clicking on another author in the graph will expand his/her section of the graph and collapse any parts of the previously selected author's portion of the graph that no longer need to be displayed. All collaborations involving the selected author are shown. Beyond that, as distance from the selected author increases, the weakest collaborations are filtered out. At a certain distance all collaborations are filtered out, and the graph extends no further. For the moment, the filtering equation is hard-coded, but we plan to add a control which will allow the user to increase or decrease the amount of filtering. Links between authors are scaled according to the amount of collaboration. Shorter links represent stronger collaboration, so strongly collaborating authors should be located near one another, and strongly collaborating groups should appear as clusters.

Both tools are tested for JCDL and LANL co-authorship networks [2]. Initial evaluations indicate these tools are easy to understand and not difficult to use. However, the quality of metadata greatly influences usability and will be part of our future study.

3. REFERENCES

[1] Touchgraph visualization tool. `http://www.touchgraph.com/`.
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