Chapter 47
Visualising Social Networks in Collaborative Environments

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ABSTRACT
Social networking and other Web 2.0 applications are becoming ever more popular, with a staggering growth in the number of users and the amount of data they produce. This trend brings new challenges to the Web engineering community, particularly with regard to how we can help users make sense of all this new data. The success of collaborative work and learning environments will increasingly depend on how well they support users in integrating the data that describes the social aspects of the task and its context. This chapter explores the concept of social networking in a collaboration environment, and presents a simple strategy for developers who wish to provide visualisation functionalities as part of their own application. As an explanatory case study, we describe the development of a social network visualisation (SNV) tool, using software components and data publicly available. The SNV tool is designed to support users of a collaborative application by facilitating the exploration of interactions from a network perspective. Since social networks can be large and complex, graph theory is commonly used as a mathematical framework. Our SNV tool integrates techniques from social networking and graph theory, including the filtering and clustering of data, in this case, from a large email dataset. These functions help to facilitate the analysis of the social network and reveal the embedded patterns of user behaviour in the underlying data.

SOCIAL NETWORKS IN WEB 2.0
As discussed elsewhere in this handbook, millions of users worldwide are using Web 2.0 applications to share content and interact on a daily basis. The social networking trend of Web 2.0, evident in applications such as Facebook.com, LinkedIn.com, and MySpace.com, has ushered in a new era of social interaction that is increasingly gaining acceptance as a way of supporting work and learning experiences.
Collaborative Environments (CE) provide users with a wide range of tools for sharing content and finding new ways to understand it. The computer supported collaborative work and learning research communities have been studying how tools, such as wikis and discussion forums, as well as collaborative writing tools such as Google Docs, can be used to facilitate collaborative activities. While these tools are potentially useful, they are sometimes used ineffectively by groups. In learning tasks for example, factors influencing the success of these groups have been linked to two common pitfalls (Kreijns, Kirschner, & Jochems, 2003): First, the tendency to assume that social interaction will occur automatically, and second, restricting social interaction to cognitive processes and overlooking the social processes needed to build relationships.

The first can often be tackled by properly designing activities, for example, by including tasks that increase social interaction. We will focus on the second issue, approaching it by developing tools that help users build social relationships. Social network sites contain many tools that are examples of these. Social Network Visualisation applications are becoming popular amongst these and other more sophisticated SN analysis tools are soon to follow. Take for example an application within a social network that allows a user (i.e. an HR manager) to view his relationships (‘friends’), and ‘friends of a friend’. Lets say, the application is to be used for improving communication within a company, looking for informal patterns in which information may flow. If the network has 10 members interconnected it would be easy to analyse the data manually. If it has a 100 or 1000 it would be hard, and if it has 10,000 or more it would be impossible to manually make sense (see ‘patterns’) amongst all these data. The HR manager would like to identify ‘key people’ in the communication flow, a term that we will later call ‘centrality’. The application should be able to identify different types of ‘key-people’, and display them in useful ways.

Social network analysis, such as the above, began as a field of study within sociology in the 1930’s and involves the application of network characteristics to social phenomena. A thorough history of the development of social network analysis is given by Freeman (Freeman, 2004). Social network analysis is increasingly becoming a popular approach for solving problems that involve social interactions. Users of CE’s develop social networks by using collaborative tools to work together to accomplish a common goal. A social networking approach provides a number of techniques for examining social exchanges. These techniques can be employed to express what is happening in CE’s by drawing attention to the types of relations among users, identifying the various roles of users and uncovering new patterns of behaviour. Social network analysis has the potential to be used to evaluate the benefits of collaborative activities and enable CE’s to be designed and managed with greater insight into the importance of social interaction.

When users interact via collaborative tools, they produce enormous quantities of electronic data recording their every interaction. Too often, this data goes unexploited in CE’s, although it clearly has the potential to provide valuable insight into user behaviour, and therefore feed back into useful socially supportive functionalities. Social Network Visualisation (SNV) tools, such as those described here, are designed to more effectively exploit these collaborative datasets, and produce simple visual representations that users can understand. Our SNV tool generates a unique set of social network visualisations with supporting functions to filter and cluster network users. These functions help to reveal the embedded patterns in the underlying data and develop a more meaningful understanding of the interactions between users.

Section 2 of this chapter reviews the theoretical foundations of social network analysis by examining existing SNV tools and a proven set of techniques to extract, analyse and visualise social
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