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Balancing SNS through Visualization

Dr. Latika Kharb
JIMS, Sector-5, Rohini, Delhi-110085, India.

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ABSTRACT

In recent years, we have witnessed a dramatic popularity of online social networking services, in which millions of people publicly communicate for a kind of mutual friendship relations. Social network research is one of the fastest growing academic areas as it is continuously expanding within our society. One key element of this field of research is social network visualization, which refers to the use of sociogram / illustrative diagrams of the joins that connect various actors in social networks. Visualization of social networks has a rich history, particularly within the social science since at least the 1930s. The use of graphical representations is one of the main defining properties of social networks. Researchers make use of pictorial images of social networks in order to communicate and understand the content and patterns within social networks. However, visual diagrams of social networks often suffer from a range of problems, the most common of which being the high density of edges and complex structures in large networks, providing sociograms that often appear as unclear set of nodes and edges. In this paper, we have made every possible effort to remove the fear from mind of people that understanding networks is a difficult process as it is difficult to visualize, navigate, and find patterns in networks. For this, we begin by defining what constitutes a social network site and then present our introduction of basic concepts of social networks, social network sites and then discussed about visualization needs and problems, benefits of using data visualization, implementations of visualization available over time.

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Introduction

Social Network Interactions

With the advancement in technology, communication becomes cheap and easier and it has become a faster medium to connect with people across the world and the issue of distance is no longer an excuse for lack of communication. Internet has brought many adverse changes in the forms of communication and has led to the rise of social networks where one can communicate and share their thoughts with many individuals side by side. Social networks are the graphs of social and personal interactions /relationships [1] that can be easily explored in a graphical manner using people as nodes, relationships as edges and other additional information as properties. Therefore, it has become very easy to share information like pictures, advertisements, videos and text messages. No doubt, it's a very fast channel to enhance communication and entertainment and today we witness a dramatic popularity of online social networking services.

When it comes to online social networking, websites are commonly used. These websites are known as social sites. Social networking websites function like an online community of internet users. Depending on the website in question, many of these online community members share common interests in hobbies, religion, politics and alternative lifestyles. Once you are granted access to a social networking website you can begin to socialize. This socialization may include reading the profile pages of other members and possibly even contacting them.

Since their introduction, social network sites (SNSs) have attracted billions of users and most of them have integrated these sites into their daily lives. Some SNS cater to diverse audiences, while others attract people based on common language and/or shared religious identities. SNS also vary in the extent to which they incorporate latest information and communication such as mobile connectivity, blogging, and photo/ video-sharing [2]. We define social network sites as web-based services that allow individuals to:

- construct a public or semi-public profile within a bounded system,
- articulate a list of other users with whom they share a connection, and
- view and review their list of connections and/or those made by others within the system.

The nature of these connections may vary from site to site. The reason that makes social network sites unique is not that they allow individuals to meet strangers, but they enable users to be visible in their social networks. This can result in developing connections between individuals that would not otherwise be made. On many of the large SNSs, participants are not necessarily ‘‘networking’’ or looking to meet new people; instead, they are primarily communicating with people who are already a part of their extended social network. To emphasize this articulated social network as a critical organizing feature of these sites, we label them social network sites. While SNSs have implemented a wide variety of technical features, but their backbone consists of all the visible profiles that display an articulated list of Friends who are also users of the system.

Tele:
E-mail address: latika.kharb@jimsindia.org

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After joining an SNS, an individual is asked to fill out forms containing a series of questions and a profile is generated using the answers to these questions, which typically include descriptors such as age, location, interests, photos etc. Some sites allow users to enhance their profiles by adding multimedia content or modifying their profile's look and feel. In short, we can say that visibility mode at various SNS differs.

Since recent years, social network analysis (SNA) has emerged as a powerful method for understanding the importance of relationships in networks. However, interactive exploration of networks is currently challenging because of two reasons:

- It is difficult to find patterns and comprehend the structure of networks with various nodes and links
- Current systems are often a mixture of statistical methods and visual outputs to confuse analysts about how to explore in an orderly manner.

Social network analysis (SNA) is the process of investigating social structures through the use of network and graph theories. It characterizes networked structures in terms of *nodes* (individual actors, people, or things within the network) and the *ties, edges, or links* (relationships or interactions) that connect them. Social Network Analysis is a powerful key to ensuring a useful visualization of a social network. Using SNA, users can flexibly iterate through visualizations of nodes and links, thereby understanding system clearly; aggregate various available networks on the basis of subgroups of interest; explore networks by viewing different link types separately and find patterns across different networks.

Understanding networks is a difficult process as it's difficult to visualize and find patterns in networks. One key element of this field of research is social network visualization, which refers to the use of sociogram / illustrative diagrams of the joins that connect various actors in social networks. Visualization of social networks has a rich history, particularly within the social science since at least the 1930s. The use of graphical representations is one of the main defining properties of social networks. Researchers make use of pictorial images of social networks in order to communicate and understand the content and patterns within social networks. However, visual diagrams of social networks often suffer from a range of problems, the most common of which being the high density of edges and complex structures in large networks, providing sociograms that often appear as unclear set of nodes and edges.

A visualization system works for end-users of social networking services to provide an increased awareness and discovery of the online social community [3]. The visualization of networks is important because it is a natural way to communicate connectivity and allows for fast pattern recognition by humans and is useful to grasp the perceptive abilities of humans, but overlapping links and indistinct labels of nodes often ruin this approach. Network analysts have always been able to learn by generating and sharing visual images. Modern technology promises to enhance our ability to learn from images by continuing to provide new tools that allow for more powerful visualizations.

II. Need of Visualizing Social Networks

For understanding human behaviors and their interactions, we can visualize social networks in associated groups listed below:

Social network analysis (SNA) is used extensively in a wide range of applications and disciplines. To sum up, some common network analysis applications include:

- Data aggregation and mining
- Network propagation modeling
- Network modeling and sampling
- User attribute and behavior analysis
- Community-maintained resource support
- Location-based interaction analysis
- Social sharing and filtering
- Recommender systems development
- Link prediction
- Entity resolution
- Customer interaction and analysis
- Information system development analysis
- Marketing, and business intelligence needs
- Development of leader engagement strategies
- Community-based problem solving
- Law enforcement activities

III. Various Problems in Social Networks

The three major problems exist in social networks:

- Uncertainty in a Social Network

The uncertainty in digital evidence is not being evaluated at present, thus making it difficult to assess the reliability of evidence stored on and transmitted using computer networks [4]. Uncertainty occurs when the actors are confronted with too many interpretations, causing confusion.

- Missing Data in a Social Network

The inherent problem with much of the data is that it is incomplete for meaningful data analysis. Thus, there is a need for methods that extract and infer networks and this involves attribute prediction and link prediction to eliminate duplicate nodes in network.

- Finding the Shortest Path

The problem of finding the shortest path is finding the path with minimum distance or cost from a starting node to an ending node.

It is one of the most fundamental network optimization problems. Computing shortest paths in graphs is one of the well-studied problems in combinatorial optimization [5, 6].

IV. Benefits of Using Data Visualization

A visualization system for social networking services could be used to facilitate increased awareness of online community thereby giving users easier access to discover and group patterns on the basis of their interests.

A. Absorb information in new and more constructive ways

By comparison, data visualization enables users to receive vast amounts of information regarding operational and business conditions. Data visualization allows decision makers to see connections between multi-dimensional data sets and provides new ways to interpret data through the use of rich graphical representations. Organizations that use visual data discovery are more likely to find the information they need when they need it and do so more productively than other companies.

B. Visualize relationships and patterns between operational and business activities.

One of the key benefits of data visualization is how it enables users to more effectively see connections as they are occurring between operating conditions and business performance. In today's highly competitive business environment, finding these correlations among the data has never been more important.

C. Identify and act on emerging trends faster.

The volume of data that companies are able to gather about customers and market conditions can provide business leaders with insights into new revenue and business opportunities. Using data visualization, decision makers are able to grasp trends in customer behaviors and market conditions across multiple data sets much more quickly.

D. Manipulate and interact directly with data.

Data visualization tools enable users to interact with data i.e. one of the greatest strengths of data visualization is how it brings actionable insights to the surface.

E. Foster a new business language.

Another advantage of using data visualization is its ability to provide analytics through data.

V. Implementations of Visualization

A. Visualizing E-mails

Visualizations have played an important role in generating new insights in social network analysis. Such visualizations can be of interest not only to analysts and researchers but also to the people whose data is being analyzed. In this paper, we will briefly discuss about two visualizations of email that have been developed to show different aspects of a person's social network and thus guide people to have a better understanding of their email archives and social networks**: SNF and Post History.** Even though both visualizations reveal aspects of the email social landscape of the user, they do quite differently.

○ **Social Network Fragments (SNF):** It is a traditional graph visualization that highlights clusters of contacts derived from the TO and CC lists in email archives. To elaborate, the system uses this information to derive a matrix of connections between all the recipients of email messages. In the tradition of social network visualizations, the system uses this matrix as input and attempts to maximize the ideal position of all people: those with tight bonds are pulled towards one another; and those who do not know each other are repelled.

○ **Post History:** It is a visualization that focuses on time and rhythm, where the variations in long-term email exchange are revealed to the user. The system visualizes the amount of email exchanged over time between each different contact i.e. it focuses on the depth of user interactions with each of the contacts in their email world.

B. Visualization with Key Lines

KeyLines is a Javascript toolkit for building custom network visualization applications. Through it, customers can build feature-rich visualization applications that suit their requirements. These applications use either WebGL or HTML5 Canvas to render graphics in the browser – meaning they are highly compatible. They will run flawlessly in all modern browsers, on any device. Sophisticated functionality can be incorporated into these applications, including:

- Social Network Analysis – Degree, betweenness, closeness, shortest path
- Network filtering – filter nodes and links based on any filter logic you choose
- Layouts – precise and powerful layouts
- Data expand – Explore links incrementally with data expand functionality
- Combine nodes – Investigate nodes as well as groups by combining nodes

C. Vizster [3]

In this paper, we will briefly discuss the design of Vizster, a visualization system for exploring online social networks to provide a system by which members of such online communities can explore their social network in the manner that they desire. Vizster is motivated by both social and technological concerns. On the social side, it facilitates the better discovery of people, connections, and communities to promote increased awareness of community structure and information exposure, while preserving and engaging online space. From a design perspective, this case study explores the mutually informing use of ethnographic techniques and visualization design to craft a domain-specific visualization system in a context as much characterized by play as by analysis.

The goal behind Vizster was to build a visualization system that end-users of social networking services could use to facilitate discovery and develop awareness of their online community for giving users easier access to search and group patterns. Vizster presents social networks using nodes that represent members of the system and links that represent the friendship links between them.

VI. Types of Visualization

We can classify the visualization of social networks in four main groups, depending on the main focus of the predominant visual task for which the visualization type is envisioned [7], these are:

A. Structural Visualization

It focuses precisely on structure of network. There are two predominant approaches to structural visualization:

○ *Node-link diagrams:* Easy to interpret and depict explicitly the links between nodes and matrix-oriented methods.

○ *Matrix-oriented diagrams*: They usually make a better use of limited display area.

B. Semantic Visualization

Structural visualizations are less effective when the social network becomes large. For this reason, recent approaches have focused on a different aspect of social networks: instead of highlighting the explicit relationships found in the data, they represent high level attributes and connections of actors and links, either specified explicitly or implicitly.

C. Statistical Visualization

Analysts often explore summary visualizations to understand the distributions of variables of interest. These variables often correspond to network statistics that represent:

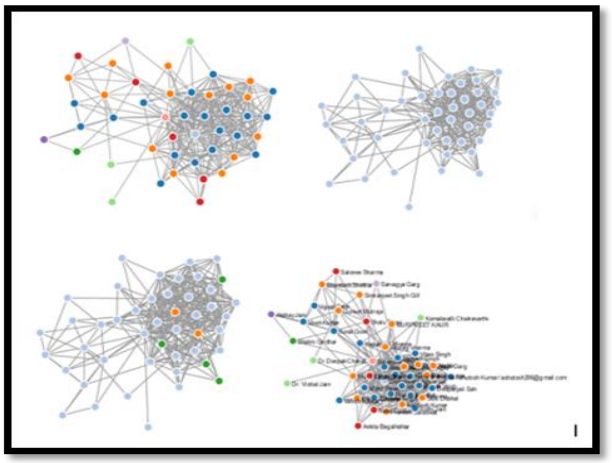
○ Structure of the network: describe the importance across the network

○ Clustering coefficient: indicates how clusterable the nodes in a network are.

VII. Visualizing Significance of Networks Through Socilab.Com

A growing trend in data analysis is to make sense of linked data as networks. Networks are difficult to visualize and navigate, and, most problematically, it is difficult to find task-relevant patterns. Despite all of these challenges, the network perspective remains appealing to sociologists, intelligence analysts, biologists, communication theorists, bibliometricians, food-web ecologists, and many other professionals. Visualizations are useful in leveraging the powerful perceptual abilities of humans, but cluttered presentations, overlapping edges, and illegible node labels often undermine the benefits of visual exploration. Researchers use pictorial images of social networks to help successfully communicate and understand the content of the network and also to aid in uncovering novel, structural patterns within social networks, as well as to guide and confirm statistical metrics.

To illustrate the importance of visualization, we use the socilab.com [8] online tool which provides a nice visualization scheme for faculty at a Management Institute having Linkdin account and depicting their social communications.



VIII. Conclusion

To be more precise, we can say that interactive exploration of networks is a challenging task because it is difficult to find patterns and analyze the structure of networks with a set of nodes / links, so analysts are uncertain about how to explore nodes in an orderly manner. Despite this wealth of social network visualization, we believe there is still a need for new designs and techniques, especially as articulated social networks become increasingly common in web services for signifying various kinds of relationship.

Visualization of profile attributes unique to online social networks is needed, and techniques for incorporating analytical tools within the simplified domain of end-user visualization may prove useful.

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