Social-Circles Exploration through Interactive Multi-Layered Chord Layout

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ABSTRACT

Due to the usage of social media platforms for different purposes in our current digital social life, people are interested to explore and understand their personal networks (called the *ego networks*) and how their contacts are associated with different social circles on these social media platforms. In this work, we propose an enhanced multi-layered Chord layout to show people' ego networks and the associated social circles in interactive visual forms. This proposed solution enables the users to explore intuitively how their contacts are associated to different social circles through a set of provided interaction and filtering options.

Keywords

Social Networks; Ego Networks; Personal Visualization; Circle Discovery; Chord Layout.

CCS Concepts

• **Human-centered computing** → **Visualization** • **Human-centered computing** → **Social network analysis** • **Information systems** → **Social networks.**

1. INTRODUCTION

Current social media platforms are nowadays an integral part of our digital social life. People are using them for not only to keep contacting with their relatives and friends, but also for many other activities like raising voice for different causes. Therefore, people are interested to view and analyze not only their connections but also the relations between these connections as well as how these connections are associated with different social circles. Such kind of a personal network inside a social network is called the *ego network* [3] or the *personal social network* [8] of the underlying person. In the past, many researchers have talked about the importance of studying and analyzing ego networks [3, 5, 8].

In general, visual representations enable human beings to perceive large amount of data at a glance due to having a strong visual system [7]. Therefore, visualizing people' ego networks in intuitive and interactive forms would help them to explore and understand their personal networks more properly. Many tools have been proposed in the past to visualize social networks at different levels. Few examples are: YASVIS (*http://ww.yasiv.com/*) uses Facebook Graph API to collect friends' information and then visualizes it; however, it lacks the facility of social circle exploration. Genogram

[6] provides pictorial display of a person's family relationships and medical history. Socilab (*http://socilab.com*) shows the user's social network relations on LinkedIn in visual form using the node-link layout; however, it also lacks the support of any social circle exploration. Gephi [1] supports different state of the art layouts to visualize different graphs. Amongst these mentioned tools, only Gephi detects the communities/social circles in the underlying network. However, it detects this based on the network structure using the Louvain method rather than based on nodes' features.

Recently, we developed a visual social tool called PerSoN-Vis [4]. It visualizes intuitively people' ego-networks through the node-link layout and the Chord layout. PerSoN-Vis enables the users to explore interactively their social contacts and the relations between these contacts. However, it lacks in showing the contacts' associations with multiple social circles.

Visual exploration of social circles in ego networks requires to visualize two forms of relations, i.e., the relations between the contacts, and the relations between the contacts and their associated social circles. Hence, for a better exploration it is necessary to show both kinds of relations in the resulting visualization. However, the standard Chord layout [2] shows the relations at only one level. In this paper, we target this limitation of the Chord layout and propose an intuitive solution to show not only the relations between the contacts, but also the relations between the contacts and their associated social circles. This is done by enhancing the standard Chord layout to a multi-layered Chord layout for showing both kinds of relations. Further, we provide intuitive interactions with the resulting visualization for a better and interactive exploration of the underlying ego network and the associated social circles.

2. THE MULTI-LAYERED CHORD LAYOUT

For a proof of concept, we use the data collected from a Facebook app, developed by Mcauley and Leskovec [8]. This data is related to 10 different users, i.e., 10 ego networks. The nodes in these ego networks, representing friends of these 10 users on Facebook, associated to different features representing social circles or sub-circles. In order to protect the users' privacy, Mcauley and Leskovec anonymized these features [8]. We allocated random features to each node instead of anonymous features for a better semantic. Each node belongs to a set of social circles based on the values of these collected features.

In Figure 1, we show a user's ego network in two visual representations, i.e., the standard Chord layout (Fig. 1a) and our proposed multi-layered Chord layout (Fig. 1b). This ego network is consisted of 59 nodes (i.e., the contacts), 146 edges (i.e., the relations between these contacts), 12 social sub-circles under 4 main social circles. Our multi-layered Chord layout consists of three-layered circles instead of just one. The inner circle is same as of the standard Chord layout and shows all the nodes in the

underlying ego network and their relations. The color of the relation indicates the source (green) to destination (red).
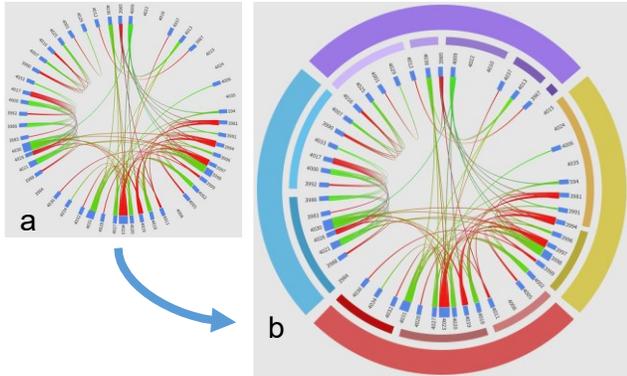

Figure 1. Ego network of a user: (a) using the standard Chord layout (b) using our multi-layered Chord layout.

Here the most outer-layered circle represents the main social circles, associated to the underlying ego network. These social circles (e.g., country, education, music, social cause, etc.) are based on how different contacts are associated with them in the underlying social platform. Many times, social circles have different sub-categories or sub-sub-categories (e.g., different bands under the music social circle). The inner-layered circles represent these sub-categories. In our case, we have only one level of sub-category; therefore, we have only one sub-category layer (see Fig. 1b). The size of these social circles or sub-categories depends on the number of associated nodes. On demand, names of only those social circles and sub-circles are appeared in the view that can be fitted inside the geometry of these circles, in order to avoid cluttering and noise in the resulting visualization. A tool-tip is appeared with the basic information about a circle or node as the user mouse hovers on it.

We provide different filtering and interaction options for better exploration of the underlying ego network and the associated social circles. For example, user can select a particular node representing a contact in the current ego network. This results in making all the non-associated nodes and social circles/sub-circles in grey color (see Fig. 2). All the associated nodes, relations, and social circles/sub-circles remain same, while the relations of all other nodes are disappeared to provide a better resulting view. The selected node in this case becomes green to show the selection more visible.
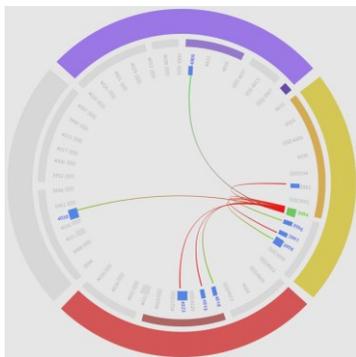

Figure 2. On selecting node id 3994, all the non-associated nodes and social circles/sub-circles become grey in the resulting view.

On the other side, selecting a particular social circle or sub-circle results in showing only the associated nodes and the relations between these nodes. All the other nodes become grey and the relations with them are disappeared (see Fig. 3). On demand, all relations of the associated nodes can be appeared even though they go to the non-associated nodes; however, these non-associated nodes remain grey. Additionally, the underlying ego network can be filtered based on selecting more than one social circles and/or sub-circles (see Fig. 3). In this case, the resulting visualization depends on whether users asked for the union or the intersection of these selected social circles/sub-circles.
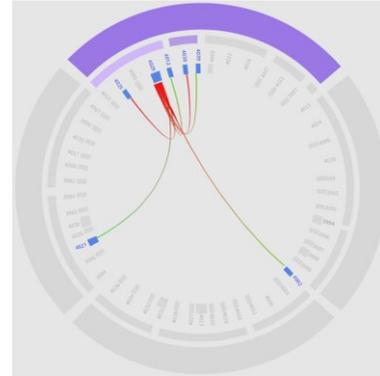

Figure 3. On selecting the intersection of two sub-circles, only those nodes are highlighted that are associated with these two sub-circles.

3. CONCLUDING REMARKS

In this paper, we presented our enhanced multi-layered Chord layout targeting exploration of social circles in people' ego networks. This would help them to better understand and to get inside of their personal networks. In the future, we intend to provide further interaction and filtering options. Also, we plan to perform detailed evaluation studies to empirically check the feasibility and effectiveness of our solution compared to the previous ones. Further, we plan to generalize our solution by making it to accept different kinds of social networks. Moreover, we intend to apply it in other domains to check its applicability.

4. REFERENCES

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