

KEEPING UP WITH THE INFORMATION GLUT BY
VISUALIZING PATTERNS OF POSTING BY FRIENDS
ON FACEBOOK

A Thesis Submitted to the
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in Partial Fulfillment of the Requirements
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in the Department of Computer Science
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Saskatoon

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ABSTRACT

Users of social networks, such as Facebook, are becoming increasingly overwhelmed by the growing number of “friends” that they are connected to and the “tsunami” of updates generated by them. It is very easy to miss potentially interesting updates, if one does not frequently check her news feed. Also it is hard to get a sense of which friends are active and especially, which are passive or completely gone. Awareness of friends and friends’ activities is one of the utmost importance for a user to build trusted social networks. However, current online social networks provide only very limited clues to support these two kinds of awareness. Therefore, I propose a method to visualize the activity level of friends. It creates a time- and an activity-pattern awareness for the user, as well as an awareness of the lurkers. It also offers options to filter activity streams regarding particular time periods/friends.

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CONTENTS

Permission to Use	i
Abstract	ii
Acknowledgements	iii
Contents	iv
List of Tables	vi
List of Figures	vii
1 Introduction and Literature Survey	1
1.1 Introduction	1
1.2 Literature Survey	2
1.2.1 Online Communities	3
1.2.2 Information Visualization	9
1.2.3 Social Visualization	12
1.2.4 Related Visualization Applications for Facebook	16
1.2.5 Summary of the Literature Survey	19
2 Proposed Approach To Social Visualization	21
2.1 Main idea	21
2.2 Design	23
2.2.1 Avatar Visualization	23
2.2.2 Layout	24
2.2.3 Functions	26
2.2.4 User Interface	27
2.3 Implementation	29
2.3.1 Architecture	29
2.3.2 Implementation	31
3 First User Study	33
3.1 Research Questions	33
3.2 Methodology	33
3.2.1 Sample	34
3.2.2 Scenario	35
3.2.3 Results	37
3.3 Discussion of Results	46
4 Enhancement	49

4.1	Need for Modification	49
4.2	Implementation	50
5	Field Study	55
5.1	Research Questions	55
5.2	Methodology	56
5.2.1	Sample	56
5.2.2	Procedure of the Study	56
5.2.3	Environment Setup	58
5.2.4	Results	63
5.3	Discussion of Results	68
6	Conclusions and Future Work	70
6.1	Summary	70
6.2	Discussion	72
6.3	Conclusions	72
6.4	Contributions	73
6.5	Future Work	74
	References	76
A	Certificate of Approval Study Amendment	79
B	Informed Consent Form	81
C	List of Tasks	84
D	Questionnaire	86
E	Questionnaire for User Interaction Satisfaction 7.0	93

LIST OF TABLES

3.1	The mean and standard deviation (STDEV) values of elapsed time and correct rate (accuracy) using Facebook and Rings - Group 1 (Facebook first, then Rings)	39
3.2	The mean and standard deviation (STDEV) values of elapsed time and correct rate (accuracy) using Facebook and Rings - Group 2 (Rings first, then Facebook (FB))	40
3.3	The differences of elapsed time (one participant)	41
3.4	The differences of correct rate (one participant)	42
3.5	T-test result for elapsed time	42
3.6	T-test result for correct rate	43
3.7	Mean and standard deviation values for each point in Questionnaire for User Interaction Satisfaction 7.0	47
5.1	The results of the daily questionnaire.	64

LIST OF FIGURES

1.1	The procedure of transforming raw data into a graphical representation . . .	9
1.2	Perceptual accuracy	10
1.3	Map of the market	11
1.4	Internet Map	12
1.5	Babble system	13
1.6	PeopleGarden visualization	14
1.7	Floral representation	15
1.8	IBlogVis	15
1.9	Comtella	16
1.10	Facebook Social Graph	17
1.11	Facebook Friend Wheel	18
1.12	Facebook visualizer	18
1.13	Nexus	19
2.1	Different levels in various colors and sizes	24
2.2	User avatar	24
2.3	The layout of the visualization	25
2.4	The layout of the Log-in window	27
2.5	The layout of the Main window	28
2.6	The layout of the List window	28
2.7	The layout of the Friend-selection window	29
2.8	System architecture	30
2.9	Algorithm for generating visualization quickly	30
2.10	Multi-query method with a group of five FQL commands	32
2.11	The code snippet of the HTTP Request in Rings	32
3.1	The number of Facebook friends of study participants	34
3.2	The daily Facebook using hours of study participants	35
3.3	The task sections in the two sets of tasks	36
3.4	The level of usefulness (means)	38
3.5	The comparison of difficulty (means)	38
3.6	The comparison of the elapsed time (means)	40
3.7	The comparison of the correct rate (means)	40
3.8	The level of difficulty for login	43
3.9	The distribution of feedback by participants for level of retrieving speed . . .	44
3.10	The level of difficulty to get a sense of user interface	45
3.11	The level of usefulness	45
3.12	The level of helpfulness	45
3.13	The level of interest	46
4.1	Sub-screens switching combo-box	51
4.2	Different gray levels indicate how interesting the post is.	52

4.3	Avatars with different opacity levels	53
4.4	The content of Tips	53
5.1	The screenshot of the introduction screen in consent form application	58
5.2	The screenshot of the consent form screen	59
5.3	The screenshot of the consent form submitted screen	60
5.4	Questionnaire button in Rings	60
5.5	The feedback of not signed the consent form	61
5.6	The 5 daily questions	62
5.7	The feedback of submitted daily questionnaire	62
5.8	The feedback of finished daily questionnaire today	62
5.9	Four open-ended questions in the final questionnaire	63
5.10	Attitude changes on the five statements over the five daily questionnaires	65
5.11	Username displaying issue	66
5.12	The distribution of session's duration	67
5.13	The overview of all session events	68
5.14	The overview of events for 58 sessions	68

CHAPTER 1

INTRODUCTION AND LITERATURE SURVEY

1.1 Introduction

Meeting new friends, discussing and commenting on stories and tidbits, sharing photos on online-social communities have already become indispensable in our daily lives. Facebook is currently the most popular social network. It provides the user with the opportunity to monitor and comment on updates from her friends, and share her own updates. However, Facebook does not provide awareness tool allowing the users to easily find amongst her friends:

- which are active users,
- which post many popular updates and which do not,
- which was active several days ago,
- which posted recently but whose updates have been missed by the user,
- which stopped sending updates and became a lurker or stopped using Facebook altogether.

This thesis proposes an intuitive and easy to understand visualization method that creates the needed awareness for the user about her social network on Facebook allowing her to answer these questions. Additionally, the implemented visualization application provides navigational and interactive methods to access posts of all the user's friends, so she can browse the feeds of her friends more easily and selectively.

This thesis is organized as follows: chapter 1 presents an overview of the relevant literature in the areas of online communities, information visualization, and social visualization.

Chapter 2 describes the conceptual design and implementation of the proposed approach. The first user study is discussed in chapter 3. Chapter 4 summarizes the issues that surfaced during the first user study and proposes solutions. Chapter 5 presents the second user study, followed by conclusions and future work in chapter 6.

1.2 Literature Survey

An online community is a social network that uses computer support as the basis of communication among members instead of face-to-face interaction [17][3]. Users of former online communities mostly knew each other only online. But more recently, with the advance of social networking sites, online communities, like Facebook, have become a supplemental form of communication between people who know each other in real life. From the official statistics, there are more than 750 million active users on Facebook, and 50% of them log on to Facebook on any given day [9]. A large proportion of the users share updates of their status with friends, including messages about their thoughts, their current location, links to interesting articles or videos, statements of activities (e.g. they have befriended other users, or the messages generated as a side effect of playing games). Such status updates will be called “social data” in this document. A large amount of social data is generated every day. People often miss their friends’ activities due to an information overload, or being away from their social network for a short period of time. Information visualization technology can enable users to see, explore, and understand large amounts of information by using visual representations and interaction techniques. Therefore it is natural to attempt to build a visualization of social data (further called “social visualization”) in an online community/social network site, such as Facebook. That would allow users to review large amounts of social data and discover interesting patterns. This section presents a brief overview of the areas of online communities and information visualization, followed by a literature survey of the area of social visualization focusing specifically on visualization applications for Facebook, the most popular social network at the moment of writing.

1.2.1 Online Communities

Early online communities include mailing lists, Bulletin Board Systems (BBS) or discussion forums, IM groups and chat rooms. A mailing list allows for mass delivery of email messages to many Internet users (those subscribing to the mailing list) [4]. It runs on a mail-server which maintains the list of names and addresses and allows users to subscribe and unsubscribe to the list. There are two types of mailing lists: announcement list and discussion list. An announcement list is used primarily as a one-way channel of information in which only selected people can post [4]. On the other hand, on a discussion list, anyone may post and the messages will be sent to all the subscribers, who may answer by replying to the message, and everyone on the list will see the reply.

In Bulletin Board System, or BBS, users can use a terminal program to connect and log in the system, then perform some functions to upload, download data or programs, read news and exchange messages with others [28][14]. Forums are very similar to BBS, but they run in a web browser. A message posted in a forum is called a “thread” and can be seen as a single conversation. Anyone can reply and thus join a conversation in a given thread [11].

While all discussed communities so far are asynchronous, instant message groups and chat rooms are synchronous. All online users in IM groups or chat rooms can post and receive others’ messages immediately. Chat rooms date back since the time the first computers were networked (these applications, called “Multi-User Dungeons” or MUDs were mostly used for playing games [7]), and have evolved significantly along with the Internet and the Web, giving rise to graphical multi-user environments and massively multi-player online games. Instant messaging tools are still very popular nowadays not only as part of web portals, e.g. AOL, Yahoo Messenger, MSN and Google, but also as part of social network sites and multi-player online games, like Facebook and World of Warcraft.

Generally, most online communities (apart from graphical chat systems and multi-player online games) are text-based systems that provide very limited social cues. Some new versions of these systems allow users to post or upload some pictures or videos as attachments, but text dominates the mode of interaction. The way users become aware of the activities of other users in mailing lists or IM groups is by passively receiving a stream of mails or messages;

there is no other way to browse or explore the space but scrolling up and down the list, which is tedious and time consuming, as well as error prone (easy to miss particular posts). BBS and Forums require participants to login to the system and view posts by their own selection in the hierarchical structure of the threads. However, they cannot view in one place, for example, all the posts made by a particular user, unless the forum has a search function. Yet to use search, the user needs to know what exactly she is looking for (search keyword). So, early online communities do not provide much navigation support to their users.

Content-sharing systems, like Flickr (for photos), and YouTube (for videos), focus on providing a facility for users to share specific type of online resources. Flickr (<http://www.flickr.com>) is an image and video hosting website, web service suite, and online community. Flickr users are allowed to upload images and videos, and to organize them using tags, which can let searchers find resources related to particular topics, such as place names or subject matter [19]. Additionally, tag clouds also provide access to images tagged with the most popular keywords for all the users on Flickr. Thus, Flickr enables users to communicate with each other about shared photos and videos.

Similar to Flickr, YouTube (<http://www.youtube.com>) concentrates on video-sharing. Users on YouTube can upload, share, view, and comment on videos. Another important group of content sharing communities, including social bookmarking sites like Del.icio.us (<http://www.delicious.com>) and Technorati (<http://technorati.com>), other communities, such as CiteULike (<http://www.citeulike.org>), Zotero (<http://www.zotero.org>) and Mendeley (<http://www.mendeley.com>), allow users to share bookmarks to web-pages, to annotate them with tags, to view who shares the same bookmarks, who shares what bookmarks, to search by tag, etc. Communities focusing on travel, such as TripIt (<http://www.tripit.com/>), allow users to share their trip itineraries with their friends, and discover who will be close by when they are in a particular location. Communities specialized in sharing location information from GPS have sprung up more recently, such as foursquare (<https://foursquare.com/>), specialized on users with smart-phones who are willing to share their current locations via GPS or can be identified approximately through the wireless network they are logged in to, and thus users can coordinate more easily their social life and meet friends opportunistically.

In comparison with text-based online communities, content-sharing systems bring in richer and more vivid content to their specific resources (like articles, photos and videos), which can give rise to discussions and other interactions among users.

To help users navigate in the huge amount of shared content, content-sharing systems usually deploy recommender systems to inform users about new resources that they may be interested in. The term “Recommender system” covers a whole range of new technologies that have emerged over the last 10 years. There are two main recommending strategies: one exploits relevant features (e.g. title or tag) of the content (e.g. book, music or film) and maps it to a model of preferences of the users which are learned over time. The other (collaborative) strategy is to correlate past choices of different users, and recommends to the current user items chosen by other users with similar history of choices. User rating systems are deployed by recommender systems to collect users’ feedback on a specific item, which can help the recommender system to sort and find the most popular items and to correlate the choices of different users. Nowadays, recommender systems are widely used in all kinds of content sharing online communities.

Blogs are another type of online communities that allow individuals or organizations to publish posts, including text, images, links, videos, and other media related to the blog’s topic [26]. Usually all the posts are collected on the blog site and are listed in reverse-chronological order on the user’s blog page to enable everyone to find and view a specific post. Similarly, some blog search engines, like Technorati and Google, are tracking more than 112 million blogs, and allow Internet users to search posts by typing keywords [33]. In order to let users engage in communication with each other, most blogs allow readers to leave comments, which has become a very important part of blog systems.

Normally, readers can only choose entries that they are interested to read, but authors cannot push their new posts to their readers, which restricts interactivity among users. To enhance the interactive experience, some widgets on the blog have been designed and implemented to enable users to be aware of others’ activities. For example, a user may focus or follow another user as “friend” in the widget provided by a blog system, and she will get notification when her friend posts something new. In addition to this, RSS Feeds are a technology providing another way to let the reader know about the new posts from the author

that she is interested in. RSS is a family of web feed formats used to publish frequently updated works, such as blog entries, new headlines, audio, and video, in a standardized file format [20]. When a reader subscribes to another user's feed, she could use a RSS feeds reader application or even a widget in a blog system to read new posts. An URL to the origin is usually included in the RSS file, so that any reader could reach the original post to interact with the author via that URL. In summary, widgets, RSS, and comment functionality build another bridge between users in blog systems, and let them communicate with each other more easily.

Social network services, like Twitter, LinkedIn, and Facebook, are online services, platforms, or websites that supply more powerful functions to build and reflect social networks or social relations among people in the virtual world. In other words, a social network service could be used to support online social activities. Usually it provides a user with a space to develop her profile (similar to a homepage), and on which she can post status updates/messages, a list of friends she can manage, a RSS-feed-like functionality that alerts the user's friends of her updates, and vice versa, keeps the user informed about her friends' updates. Next, some of the main social networking services will be presented.

Twitter (<http://www.twitter.com>) offers a social networking and micro blogging service, which enables users to send and read messages (update) called "tweets" [15][18]. Tweets are publicly visible by default. However, senders can restrict message delivery to their friends. Users may subscribe to other users' tweets, which is called "following", and subscribers are called "followers" in Twitter [15]. When a user is logged into Twitter, all new tweets from the people she follows will be displayed as a stream on the user's homepage, where it is easy to view and reply to any tweet. If users find some tweets very interesting, they can use the "Retweet" functionality to share them with their own followers, or even with the general public on Twitter. A Reply function is also supported to let users communicate with their friends for each tweet. The specific feature of Twitter is that each tweet has a length limitation of 140 characters, which enables users to send and receive tweets by Short Message Service (SMS) in certain countries. Supporting SMS, along with the availability of Twitter clients for mobile phones enlarge the scope of the online community, and users do not need to sit before computers to read and type updates. From its creation in March 2006, Twitter

has gained huge popularity worldwide and currently has more than 175 million users. It is generating 65 million tweets and handling over 800,000 search queries per day [15]. To make it more attractive and easy to use, Twitter has provided an API set for developers to design third party applications using the social data shared on Twitter.

LinkedIn (<http://www.linkedin.com>) is a business-oriented social network site, and it is mainly used for professional networking [30]. The goal of this website is to allow a user to maintain a list of people (contact network) she knows and trusts in her business or organization. The list can be used to gain an introduction to reach a person a user wishes to know through a mutual, trusted contact [27]. A contact network could be consisting of users' direct connections, the connections of each of their connections (called "2nd-degree connections") and also the connections of the second-degree connections (called "3rd-degree connections"). LinkedIn is not only for individuals, but also for businesses. A business manager or administrator could create a business profile page for their company, and post job opportunities to let job seekers know. Similar to Twitter, all the activity messages from the person/business are broadcasted to all followers as a notification (sent by email) and are available in a stream of activities when a follower logs in to her homepage on LinkedIn. Followers can also interact through functionalities, such as "Like" and "Comment", to provide feedback to the posts from their friends, or send a message directly to them. LinkedIn also supports recommendations, allowing users to find a trusted person in their network to endorse her with a short comment. As of January 2011, LinkedIn reports more than 90 million registered users, spanning more than 200 countries and territories worldwide [21]. Similar but smaller professional social networks are XING (<https://www.xing.com/>) and Spoke (<http://www.spoke.com/>).

Facebook (<http://www.facebook.com>) is one of the currently most popular online communities [5][12]. It combines the features of blog, content sharing, recommender, and communication system to support rich social activities. Users on Facebook create a profile page, and add others as friends to exchange messages, share photos, videos, and other Internet resources [1]. This allows a user to keep current with her friends' activities by looking at her own Facebook News Feed page, and can interact with others about a specific item (through the "Like" button, commenting on the item or sharing the item herself, just like "Retweet"

on Twitter). An original aspect of Facebook is that users can create, join, and invite friends to common interest user groups, organized by workplace, school, college, interests or other characteristics [1]. The Facebook platform also provides a set of APIs and tools which enable developers to design and implement a variety of third party apps and websites based on Facebook data to enrich social interactivity for users. Online game developing companies, such as Zynga, have tapped into the huge user base of Facebook offering multi-player games that users can play online with their Facebook friends. From the official statistics, there are more than 750 million active users on Facebook, and 50% of them log on to Facebook on any given day. Entrepreneurs and developers from more than 190 countries build apps and websites with Facebook Platform, and people on Facebook install 20 million applications every day [9].

Among all reviewed online communities so far, Facebook supports the most extensive social activities providing a kind of digital mapping of people's real-world social lives. It is also the currently most popular social networking site. Therefore Facebook was selected as a target community for this research.

All online communities discussed above, especially social networks, are very popular. A large amount of social data is being generated every day, which triggers an information overload for their users. For example, the average user on Facebook has 130 friends, which normally generate a rich stream of social data available to the user whenever she logs in to her homepage on Facebook. However, it is very easy to miss something important or interesting, if one has not logged in for one or two days, and a lot of updates were shared by her friends during this period. Also it is not easy to find out if a particular user has posted something recently, or who is generally active on Facebook and who is just a lurker. Therefore, it is necessary to provide a better way to organize and present social data to make users be aware of the pattern of online social activities. Information visualization technology is able to provide some effective approaches for presenting large amount of data in a graphical style, which can help users get insights into the data, discover patterns and find information of interest easily. Some of these approaches will be reviewed below.

1.2.2 Information Visualization

Information visualization can be defined as a procedure of transforming data into a graphical representation, which would be able to help users get insights into the data [31]. The whole transforming procedure could be modeled through a sequence of successive stages: preprocessing and data transformations, visual mapping, view creation (Figure 1.1) [22].

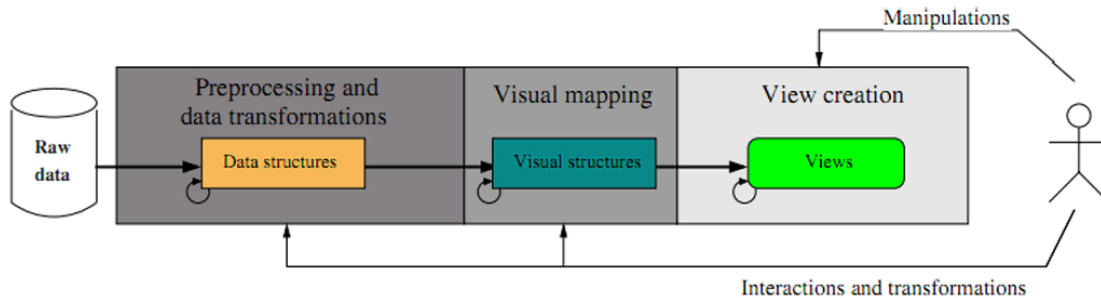


Figure 1.1: The procedure of transforming raw data into a graphical representation [23].

At the very beginning of the transforming process, raw data is the data collected from the natural world around us. This data can be generated by tools, equipments, organizations, or computer systems, such as weather forecast data, population statistics data, and online social data. Usually, these collections of data are supplied to us with an unacceptable logical structure, with which the collections cannot be used directly. In other words, to be able to process these data using computer software, we have to apply to them an organized logical structure [22]. In some cases, the raw data, e.g. online social data generated by online communities, is already available in electronic format with a well-organized structure and stored in a database, then what needs to be done is extracting, or retrieving, and then converting the data into the structured format used by the visualization software. To enrich the data structures with additional information, filter operations to get rid of unnecessary data and calculations for obtaining new data, can be performed [22].

Secondly, the visual structures corresponding to the data we want to represent must be defined, which is called visual mapping. In this process, three structures should be defined: spatial substrate, graphical elements, and graphical properties [22]. The spatial substrate defines the dimensions in physical space where the visual representation is created. The

spatial substrate can be described in terms of axes. In Cartesian space, the spatial substrate corresponds to x- and y-axes in 2 dimensions, and to x- , y- and z- axes in 3 dimensions. Each axis can be of different type, depending on the type of data that we want to map on it. Particularly, an axis can be quantitative, when there is a metric associated to the values (e.g. price, weight, length) reported on the axis; ordinal, when the values (e.g. book ratings) are reported on the axis in an order that corresponds to the order of the data; and nominal, when the region of an axis is divided into a collection of sub regions without any intrinsic order. The graphical elements are everything visible that appears in the space. There are four types of graphical elements: points, lines, surfaces, and volumes [22]. The graphical properties are properties of the graphical elements to which the retina of the human eye is very sensitive, like size, orientation, color, texture, and shape. These graphical properties will be applied to the graphical elements to help users to establish the properties of the visual layout [22]. In terms of human’s visual perception, some graphical properties are more effective than others to represent quantitative values [6]. Cleveland and McGill carried out a study to evaluate the accuracy with which people are able to perceive quantitative values mapped to different properties, graphical elements, and spatial substrates. The result indicated that what users perceive most accurately is the difference of values represented by different position. In contrast, color and texture differences are perceived with the least accuracy (Figure 1.2).

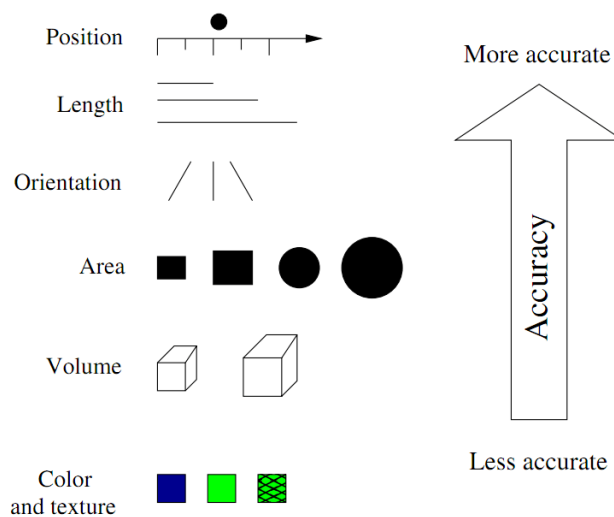


Figure 1.2: The perceptual accuracy of various graphical representations for quantitative data [24].

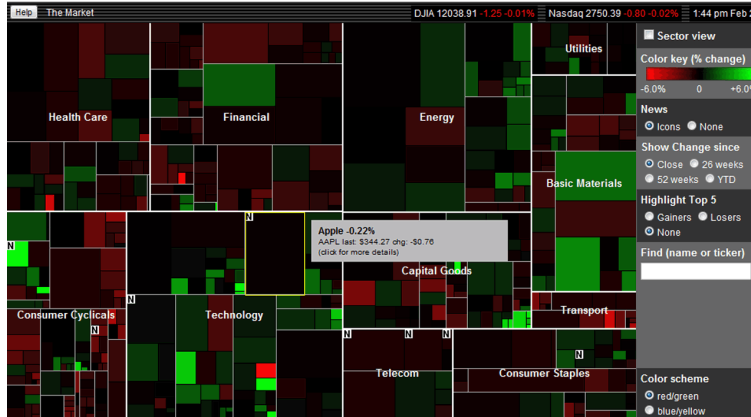


Figure 1.3: Map of the market (Retrieved on Feb 22, 2011 from <http://www.smartmoney.com/map-of-the-market/>).

The last step of the transforming process is the view creation. Views are the result of the mapping of data structures to visual structures, generating a visual representation in the physical space [22]. In other words, views are what we see displayed on the computer screen. Computer presentation technologies, such as Flex, Java Swing, and GDI+, could be used to display the final result on the screen. With the graphical result on the screen, people may get insights into the data at a glance, without too much cognitive effort.

Currently, information visualization has been widely applied to ease information exploration and retrieval in various ways. Map of the market (Figure 1.3), for example, presents stock data for more than 500 stocks with tree maps, which can help users to monitor and keep tracking a large set of dynamic data. Tree maps display hierarchical (tree-structured) data as a set of nested rectangles. Each branch of the tree is given a rectangle, which is then tiled with smaller rectangles in it, representing sub-branches. A leaf node’s rectangle has an area proportional to a specified dimension on the data [29]. For Map of the market, companies are grouped by their sectors as sub-branches of the tree, and each company (node) is visualized as a rectangle. The color and the size of a rectangle indicate a company’s market capitalization and its stock price performance. This visualization reduces user’s cognitive effort by transforming complex data into graphical representations that are easy to understand.

Internet Map (Figure 1.4) is another famous information visualization example. It presents a partial map of the Internet based on the January 15, 2005 data found on opte.org. Each node represents an IP address. Each line connecting two nodes shows the network delay

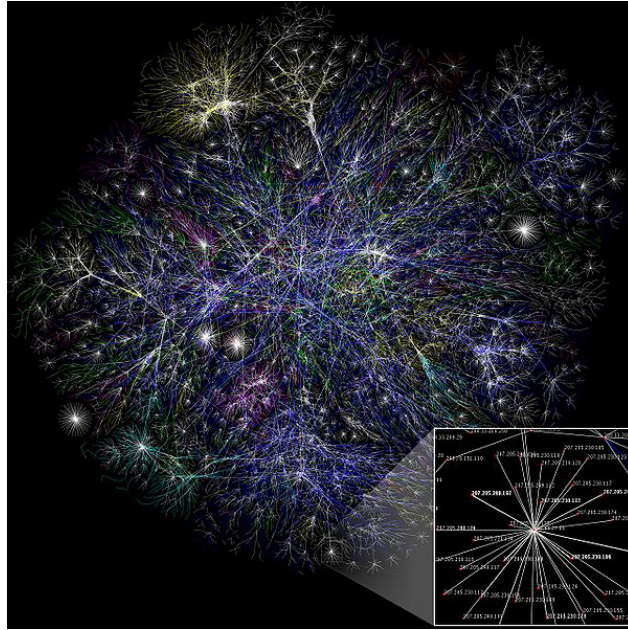


Figure 1.4: Internet Map (Retrieved on Feb 22, 2011 from <http://en.wikipedia.org>).

between them. The color of the line depends on the location of domain (some domains denote countries). For example, dark blue indicates the “.net” domain network, the domain for Canada (“.ca”), and for United States of America (“.us”); yellow represents the domain for Japan (“.jp”), China (“.cn”), China Taiwan (“.tw”), Australia (“.au”), and Germany (“.de”). This whole graph draws less than 30% of the Class C networks (IP address from 192.0.0.0 to 223.255.255.255) reachable by the data collection program in early 2005 in a tree graph, which provides a general awareness about the structure of internet.

1.2.3 Social Visualization

Social visualization can be defined as the visualization of social data for social purposes [16]. In other words, social visualization uses information technology and focuses on people, groups, conversational patterns, interactions and relationships with each other and with their community [16]. Social data may be collected from different sources such as online communities (e.g. IM logs, email archives, discussion threads, updates on social networks, etc.) and also the physical world (e.g. movement and location data captured by camera, GPS, mobile devices, etc), and then be processed to generate visualization according to the transforming procedure discussed in the previous section. The visualization of these kinds of

social data can be used for increasing awareness of one’s social activities and environment, motivating users to participate in social communities, and coordination. There are various approaches and techniques that have been used in the social visualization.

The Babble system (Figure 1.5) [8] integrates the social visualization technology into an online chat room system. It was designed to serve the communication for small- to medium-sized group, and to provide clues about the presence and activity of a person in the current conversation. Each person in the system is represented by a dot of different color. The gray circle in the center of the visualization is defined as the proxy of the current chat room. All users, who have already logged in to the system, but not in the current chat room, will be positioned outside the gray circle. The dots located inside the circle denote users who are in the current room. When people are active in the conversation, meaning they either “talk” (type) or “listen” (click and scroll), their dots move to the center of the circle, and then drift back out to the edge when they stop talking for 20 minutes. This way, everyone in the system is able to get the awareness about others’ activities, which is good for the group coordination. This approach has also been used for some other online activities, such as online lecture and auction.

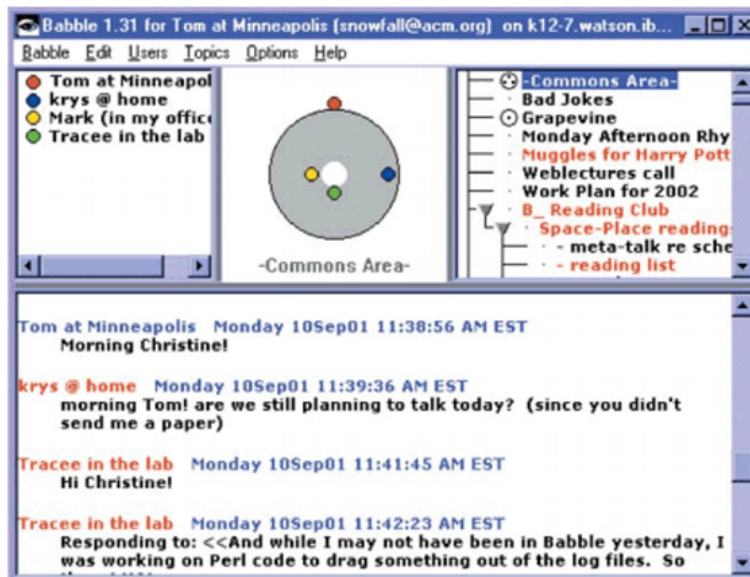


Figure 1.5: Babble system.

Data portrait is another useful method for social visualization. For example, both PeopleGarden [36] and another floral representation [37] use this method to present social data.

PeopleGarden (Figure 1.6) is designed for online interaction environments such as web-based message boards, chat rooms, etc. In PeopleGarden, a flower metaphor, including magenta petal (for initial post) and blue petal (for response) has been used for each user in the system. The dots on the petal indicate the number of answers to this post. The height of the flower reflects how long the user has been in the system. The faded petal means that one is an old post. To visualize a group of users, all the flowers for the users in this group can be drawn together on the canvas, which looks like a garden. So the posted status could be easily noticed at a glance from the group visualization. For example, a garden with more bright flowers indicates a discussion group with more new posts. It looks healthier than the one with mostly old posts. And the number of petals can also reflect how active the group is. Additionally, people may be motivated by the visualization to get more petals for their flower.

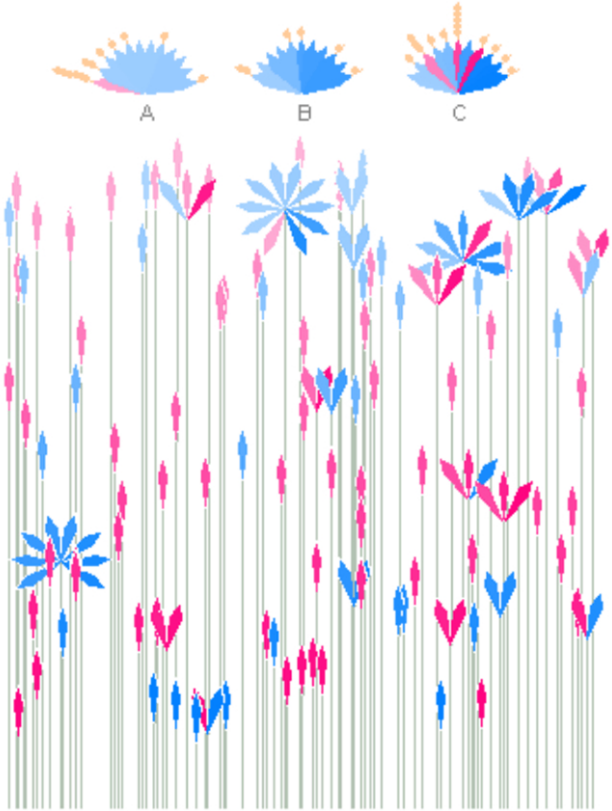


Figure 1.6: PeopleGarden visualization.

Similarly, another floral representation (Figure 1.7) has been designed for online communication. In the representation, one flower represents a person, while the number of petals

equals the number of messages this person has posted. The number of leaves indicates the number of threads in which she has participated. And the height of a flower represents how long she has stayed in the community.

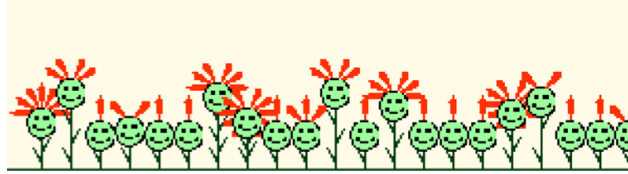


Figure 1.7: Floral representation.

IBlogVis (Figure 1.8) [34] uses footprints method to help a user find interesting articles when she is browsing blog archives. In IBlogVis, according to the time of posting, each blog entry is displayed as a point on the time line located in the middle of the page. The vertical line above each point (each blog entry) represents the length of each entry, and the vertical line below each point represents the total length of comments this entry has collected. The circle's radius on the end of this line indicates the number of comments for each entry. A user can also click on an entry to view its content. This visualization application provides a rich overview of a blog. The history of social interaction (footprints) can help users identify potentially useful/interesting entry in a blog.

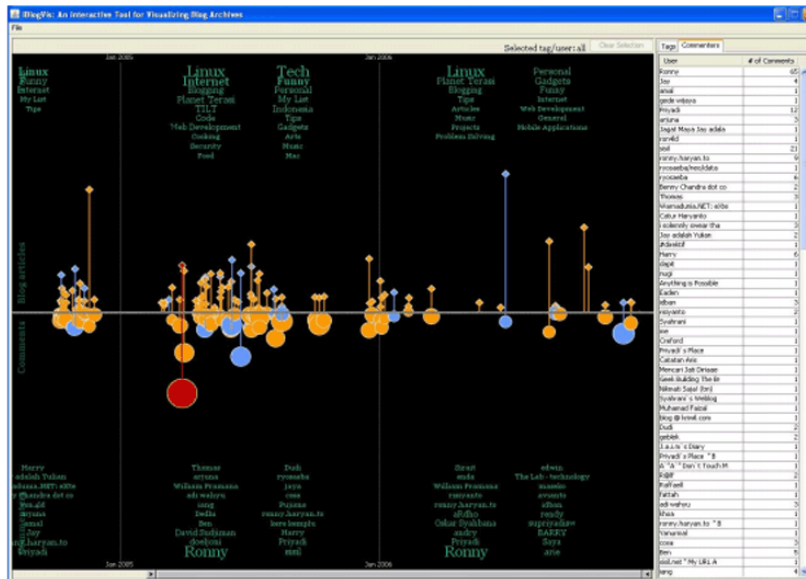


Figure 1.8: IBlogVis.

Motivational social visualization is an important category in social visualization. Its main purpose is using social visualization to motivate participants. For example, Comtella (Figure 1.9) [32] is a file-sharing community. The visualization in Comtella uses a metaphor of a night sky. The size of the star indicates a user's number of contribution (files shared in the Comtella community). A red star represents a user who has shared more new files than the number of downloaded files from other users, and a yellow star represents a user who downloaded more files than she has shared in the community. The big yellow star represents the “best user” who shares more than everyone else and has contributed new things to a community. Therefore, the visualization encourages social comparison among users to increase the diversity of resources in a community.

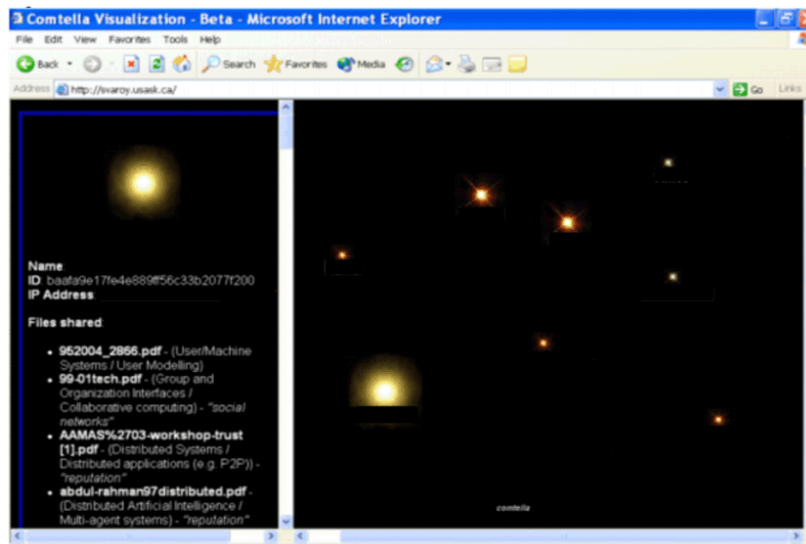


Figure 1.9: Comtella.

In general, the social visualization approaches discussed above have been applied to various online communities for different purposes. Facebook, as one of the most popular online communities, also has some visualization applications to help users explore Facebook social data. In the next section, some of these applications will be discussed.

1.2.4 Related Visualization Applications for Facebook

Currently, a large amount of social data is being generated by Facebook users. To better understand the meaning behind these social data, third-party applications were developed

to visualize Facebook social data in a graphical way. Several useful and successful Facebook visualization applications will be introduced.

Facebook Social Graph (<http://www.mihswat.com/labs/app/facebook-social-graph>) is one of the most popular social network visualization applications (Figure 1.10). The visualization in Facebook Social Graph shows how a user's friends connect to each other forming interconnected clusters (only the direct friends of a user are shown, but not the friends of friends), and it lets a user explore her social network by zooming in and out and panning the canvas. In this visualization, each node represents a user, and the line between nodes shows the relationship. All the nodes and connections are organized in a force layout. Placing the mouse pointer over a node can highlight all the mutual friends of the selected person and the current user. A pink circle emphasizes a social cluster (a group of mutually interconnected users) in the user's social network. This visualization can increase the user's awareness of her social network, which is difficult to be noticed from exploring friends on Facebook. Furthermore, being aware of social clusters can help the user predict how information flows among her friends.

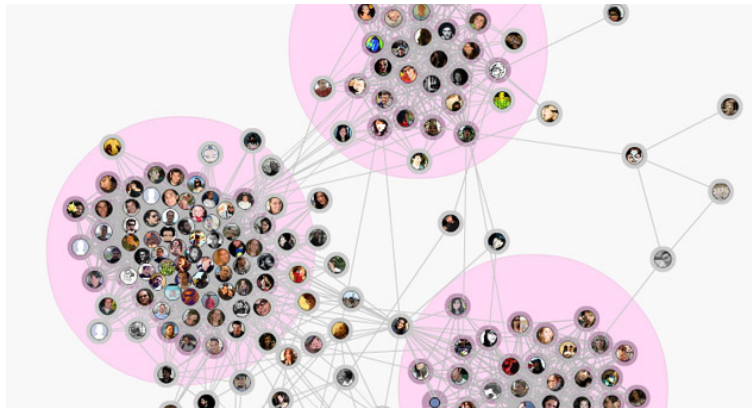


Figure 1.10: Facebook Social Graph.

Facebook Friend Wheel (<http://thomas-fletcher.com/friendwheel>) takes a user's friends, then links and groups them together to form a colorful circular graph [10] (Figure 1.11). Each node represents one friend, and a line connecting two nodes means that they are friends with each other. Different colors of node reflect different social clusters in the user's social network. All the nodes are organized in a wheel style, which can display the relationships more clearly. Similar to Facebook Social Graph, Facebook Friend Wheel only

reveals the network of the user's direct friends, and provides the social map for getting social network awareness.

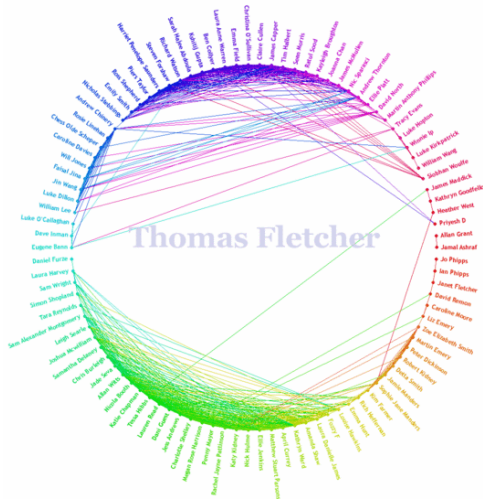


Figure 1.11: Facebook Friend Wheel.

Facebook visualizer (<http://vansande.org/facebook/visualiser/>) is a tool to graphically discover social network with a filter functionality including gender and relationship status (Figure 1.12). The major difference with the previous two Facebook visualization applications is that the application is interactive and allows the user to define filters to customize the display of a user's friends, so a specific group of friends can be hidden or shown to reduce the graph's complexity.

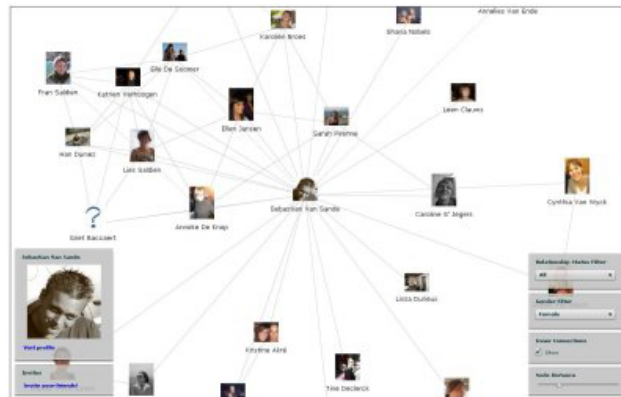


Figure 1.12: Facebook visualizer.

Nexus (Figure 1.13) (<http://nexus.ludios.net/>) can calculate friend similarity by parsing profiles (through the Facebook API), and highlight links between friends who share

the same interests and groups. This visualization in Nexus aims at classifying friends with same interests and groups, increasing the awareness of a user about the people in her social network.



Figure 1.13: Nexus.

1.2.5 Summary of the Literature Survey

As we discussed in section 1.2.1, users in online communities are facing information overload because of the large amount social data generated day by day. It is becoming increasingly difficult to navigate a stream of updates, to ensure no important updates have been missed and to explore the meaningful and interesting patterns or phenomenon behind the social data. Information visualization technology can provide some effective approaches for presenting large amount of data in graphical style, which can help users get insights into the data. Currently, some third-party applications are using information visualization methods to present social data for online community users, and most of them (e.g. Facebook Social Graph, Facebook Friend Wheel) focus on reflecting the social network structure. There is still no effective way to allow users to find some important posts that they may have missed if they have not logged in for a couple of days, to find out whether a particular user has posted something recently, or who is generally active on Facebook and who is just a lurker. This kind of awareness is useful not only for a user to build a trusted social network, but also for a community to understand its members' participation. Therefore, this research

proposes an interactive visualization approach that allows discovering the time patterns and the main current contributors, as well as the lurkers, and to browse their Facebook streams in an alternative way.

CHAPTER 2

PROPOSED APPROACH TO SOCIAL VISUALIZATION

2.1 Main idea

The main idea of this research is to create a web-based social visualization application for Facebook social data, which is able to create an awareness of the evolving posting patterns of a user's friends on Facebook. Facebook currently presents all the friends' updates in a stream, organized in a reverse-chronological order. Users log in periodically and browse the updates of their friends going back in time. However, this way of browsing has limitations:

1. It is often overwhelming to view the posts, especially if the user has not logged in for a long time, or if there has been a very active period of posting by some of the user's friends.
2. It is very easy to miss posts that could be potentially interesting, i.e. from the friends a user cares about. While Facebook provides the option to check the updates of a specific friend, it is not easy, since only a few friends are presented at a time on the screen, and to find a particular friend, a user has to search for him/her. This does not fit in the casual browsing pattern in which users normally explore Facebook, and often the results from such a search would be disappointing, since the friend in question may not have posted anything recently.
3. It is impossible to get an overall picture of who has posted updates recently, how recently, how many updates, and which of the friends have not been active. The focus of attention of a user falls naturally on the friends whose updates can be seen in the current stream, with perhaps one or two clicks back in history.

For these reasons, it is important to make users visually aware of:

1. Who has posted and at what time;
2. The number of posts, i.e. how active the user has been recently;
3. How interesting/popular the posts are, i.e. how many likes and comments were received by each post.

The goal of the proposed visualization is to ensure an alternative way of browsing the stream of updates on Facebook, which allows the user to see which of her friends has been active recently and to check selectively the latest updates posted by her friends (instead of scrolling down through all the updates in the stream). This will reduce the cognitive overload of the user and will allow her to quickly check posts by particular friends, to be aware of (and possibly ignore) the most active users, and also to be aware of the users who are not posting and may be potential lurkers. In order to help users recognize their friends more easily, the profile picture and username of each friend on Facebook should also be displayed on the visualization.

There are several requirements that have to be considered in the design. It is important to consider the scale of the visualization, i.e. how many friends it has to display. From the official statistics of Facebook, the average user has about 130 friends. Therefore, the visualization should be capable to arrange and display at least 200 users at the same time on the screen.

Additionally, the visualization should provide the option to easily locate a friend (since it could be challenging to identify a particular individual among 200 others) by providing a “search friend” option. A user should be able to see the most recent posts of each friend in such a way that it does not obstruct viewing the visualization as a whole. Jumping to the Facebook page of a friend when a user clicks on her profile picture or one of her posts, should also be supported, so that a user can interact with her friends on Facebook in the usual way, by posting comments to their friends’ updates etc.

2.2 Design

The prototype design includes the prototype of each individual user’s representation in the visualization (for simplicity, it will be called “avatar”), visualization layout, functions, and application user interface. The avatar focuses on how to reflect the number of posts from a user during last 30 days in the visualization. How to arrange a large quantity of avatars in a neat and appealing way is the goal of visualization layout. The application user interface and functions aim at providing an easy way for the user to navigate in the visualization and access the usual Facebook content through it.

2.2.1 Avatar Visualization

In the visualization, each user is represented as a spiral (also called “screw”). The number of the posts in last 30 days is scaled into one of the six different levels of contribution (from level 0 to level 5). To visualize these levels, different sizes of spirals are applied to represent the six levels (Figure 2.1). Considering that it would be hard to distinguish six different sizes of spirals on a screen possibly crowded with many spirals representing hundreds of users’ friends, it was decided to use an additional symbol variable - color, to differentiate the level of contribution of the user represented by an avatar. The color variable duplicates the meaning of the size variable, but it is easier to distinguish the different levels of contribution. Yet, there is obviously a risk with overloading the representation of just one feature (the level of contribution), since it may lead to confusion in some users. For this purpose, a legend is provided, so that users can find at any time the meaning of the different sizes and colors of their friends’ avatars. In addition to this, the related usability research shows that approximately 10% of human males, along with a rare sprinkling of females, have some forms of color blindness [35]. Thus, the six colors are carefully chosen and tested under all the forms of color blindness on Colblindor (<http://www.colblindor.com>).

In order to help users recognize their friends more easily, the profile picture and the username of each user on Facebook are displayed in the spiral, along with the number of posts the user has contributed during the last 30 days (Figure 2.2).

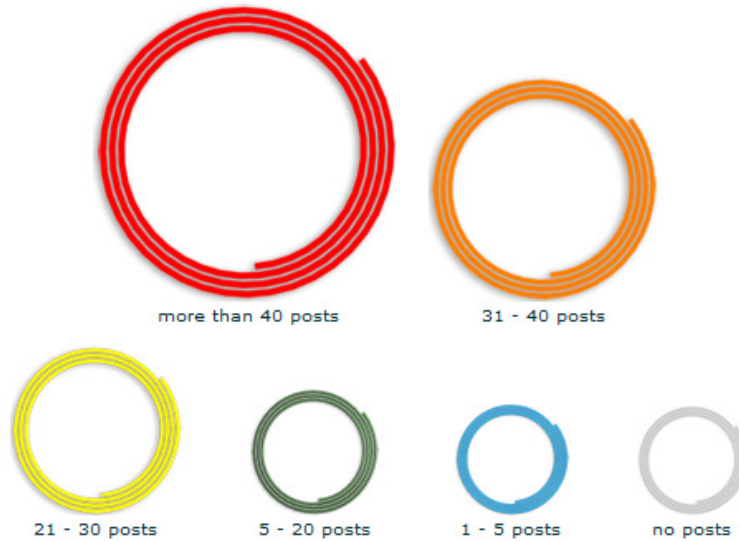


Figure 2.1: Each level of quantity is indicated with a specific color and size.



Figure 2.2: The profile picture and the username are displayed in the spiral.

2.2.2 Layout

As mentioned in section 1.2.1, according to the official statistics of Facebook, an average user has about 130 friends. However, there are users who have more than one thousand friends. Considering the acceptable loading time, the unavoidable timeouts of the Facebook API, and the resulting crowded screen, it is impossible to display all the friends of such a user on the screen at the same time. Therefore, a constraint has been added, to limit the maximum number of friends that will be displayed to 200. If a user has more than 200 friends on Facebook, the user may choose up to 200 from her friends that will be shown. Then the visualization will only display these selected 200 friends after an acceptable loading time.

In order to present how much time has elapsed since the latest post by a specific friend, the background layout was designed as a set of concentric rings, where the friends who have posted most recently are displayed in the center, and people who have posted long time ago

will be shown at the periphery. There are several rings on the screen to indicate different time periods in the past. The rings, from the center to the periphery, show the last 3 hours, last 12 hours, last 24 hours, last 3 days, last week, last 30 days, and no posts. Each avatar (spiral) representing a Facebook friend is placed on a specific ring according to the post-time of her latest post (Figure 2.3). For example, a user will show up at the very center in the visualization if she posted something in the last 3 hours. If she stops posting anything from then on, her spiral will keep drifting to the periphery in the visualization.



Figure 2.3: The layout of the visualization.

Since research shows that humans naturally tend to focus their attention to the center of an image, the user’s attention will focus on the most recently active users, similar to the default display option in most streams (the most recent at the top). This design also naturally focuses the attention of the user to the center (the “Bull’s Eye”), where the action is, and the most recent posts are. By exploring the visualization, the user will become aware of who among her friends were active during the last 30 days, who posted recently and who

has been active several days ago, who has stopped posting updates and has possibly become a lurker, who posts regularly many updates and who tends to post only occasionally.

The concentric ring design allows for scalability, since naturally there will be fewer people who posted very recently and the space in the center is limited, while there will be many more people who have posted in the past, the more distant the past, the larger the ring and more space available to accommodate more avatars without being crowded.

2.2.3 Functions

The functions in the implementation for the visualization aim at helping a user to navigate the visualization and access the posts of certain friends more easily. The proposed functions are: search people, filter, and search post by post-date.

It is easy to imagine that it would be hard for a user to find a specific friend quickly in the visualization, especially when she is facing hundreds of avatars on the screen. Therefore, a function allowing a user to search for people should be provided. It should allow a user to type a part of (or full) username and it should not be case sensitive. Then the visualization should highlight the avatar of the friend that is found as result of the search.

Sometimes, a user may want to see a specific group of friends, instead of all her friends on the screen. A “filter” functionality is needed to meet this requirement. The options for filter include all friends, the friends but without lurkers (no lurkers), and the friend list that a user has created on Facebook. The “No lurkers” option can hide all the friends of the current user who have stopped posting things for longer than 30 days (otherwise they would be cluttering the periphery of the visualization). The “Filter” option allows the visualization to display in a menu all the friend lists that the user has defined on Facebook, so that she can select and display one of them on the screen. The function “Search by post-date” needs a start date and an end date as input from the user. Then all the posts during that period will be listed, which provides an alternative way for users to find specific posts according to a post-date.

2.2.4 User Interface

To meet the requirements of the design described in the previous two sections, a web-based application was designed and created. It has four major windows: a Log-in window, Main window, List window, and a Friend-selection window.

The Log-in window allows a user to connect to her Facebook account. It shows the application logo and a Connect button (Figure 2.4). The Connect button can direct a user to the Facebook login window following the OAuth 2.0 protocol.

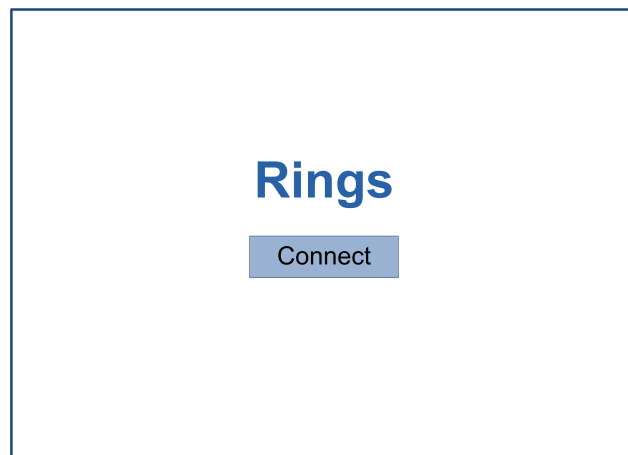


Figure 2.4: The layout of the Log in window.

The Main window of the application consists of two parts: the visualization canvas, and a functionality panel (Figure 2.5). The canvas is used to draw the graphical visualization. All rings that indicate different time periods and spirals that represent all the users are drawn on the canvas. The functionality panel offers some functions, such as search people, filter, and search post by post-date, which can help users to better navigate the visualization. In order to minimize the area of that panel, a tab-group component with three tabs is used to contain different functions. Additionally, the “Update” button and the loading progress bar let the user update the visualization manually at anytime, and be aware of the loading progress.

The List window is designed to provide a user with the option to select a period of time for which she wants the application to display the Facebook friends’ activities in a stream, and a “Get” button. After clicking on the “Get” button, all the friends’ updates during that selected period, including profile picture, username, preview of each post, post date, and a

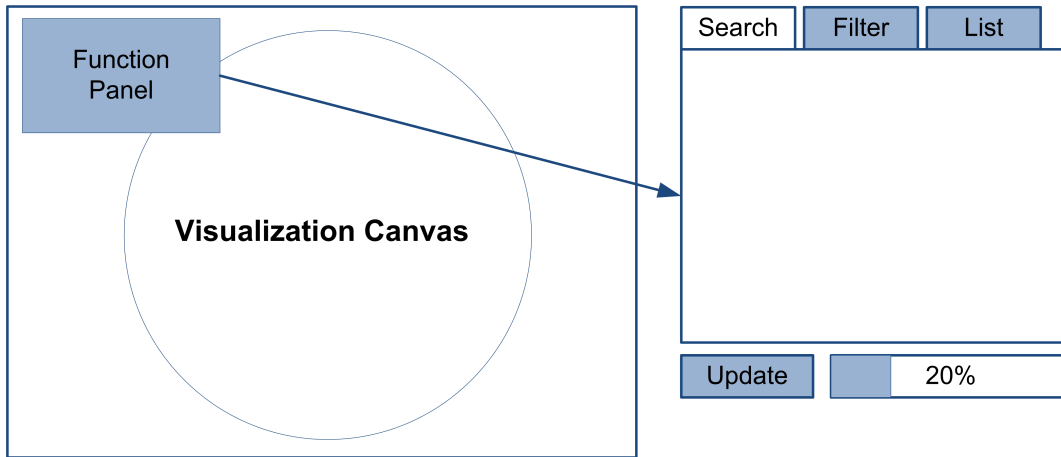


Figure 2.5: The layout of the Main window.

hyperlink to origin for each one, are retrieved and listed as a stream, just like the one on Facebook News Feed page (Figure 2.6).

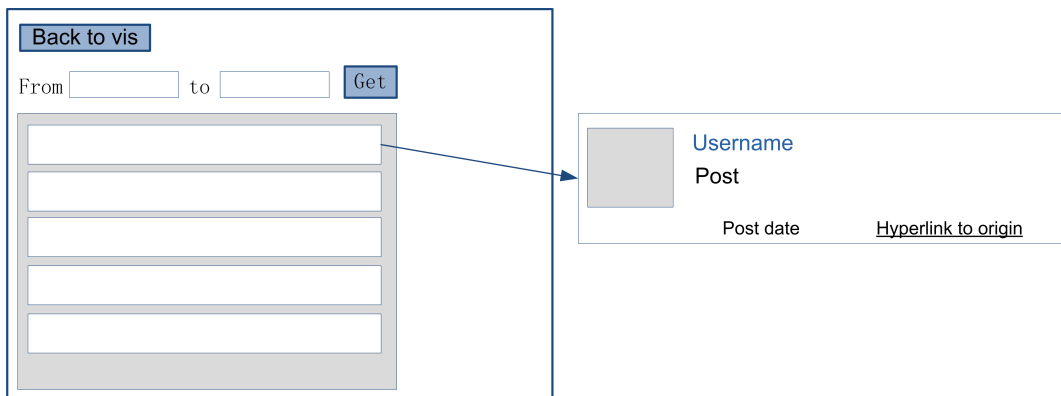


Figure 2.6: The layout of the List window.

The Friend-Selection window only shows up when the number of friends exceeds the maximum number (200) in order to ensure acceptable performance. Its purpose is to let a user select friends (no more than 200) that will be displayed in the visualization. The layout contains the list of all the friends, the list of friends that are selected currently, two buttons allowing users to add and remove friends from the selected list, and a “Continue” button, which applies the changes to the list of selected friends (Figure 2.7). Multi-selection is enabled for both lists to let the user select several friends at one time, and move the selected friends between the list of all the friends and the list of currently selected friends. When the changes are applied, the application retrieves data from the Facebook server that relates to

the selected friends.

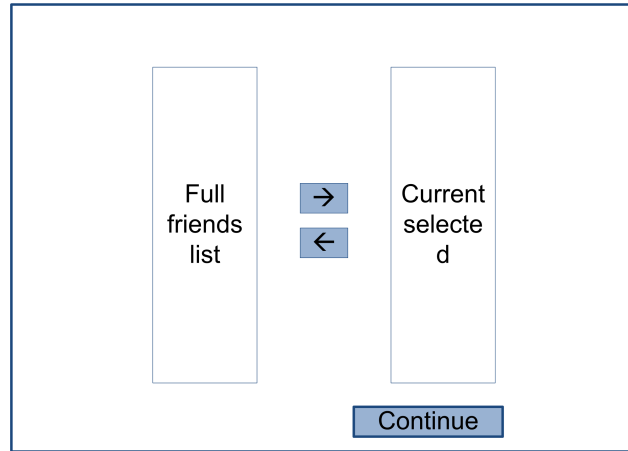


Figure 2.7: The layout of the Friend-selection window.

2.3 Implementation

2.3.1 Architecture

The proposed design is implemented as a web-based application, named “Rings,” which runs in a web-browser. The whole system can be divided into four parts: the front-end (client) application (Rings), the application server (back-end program), a database on the server-side and the Facebook server, from which the Facebook data is retrieved via its API (Figure 2.8).

The Rings client application generates the visualization, and provides all interactive functions to a user. It retrieves all the needed data from the Facebook server according to a user’s command, processing and presenting them to a user in the visualization. Considering that the Facebook server is always busy and slow, it is important to ensure that there are no big delays in acquiring the data, since a user may not have the patience to wait too long. For this purpose, Rings always generates first a view based on the old data (cache) from the user’s last access to the application (if she is not a first-time user), and then refreshes this data periodically, to avoid showing the user a “white screen” while loading her data from Facebook. Rings is in charge of maintaining the cache data for each user through the application server. When Rings gets started, it first checks on the application server for

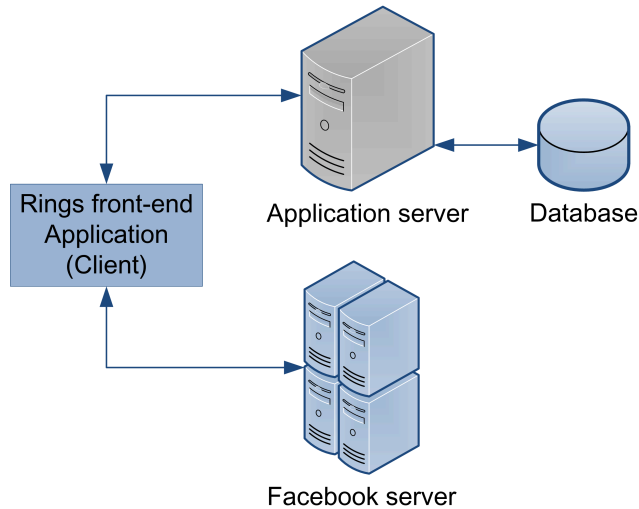


Figure 2.8: System architecture.

the current user’s cache data. If that cache data is found in the database, it is retrieved from the application server, then is loaded and visualized by Rings at very fast speed. After that, Rings connects to the Facebook server to check whether the current user’s cache data has changed. If there is not yet any cache data for the current user in the database on the application server (when Rings is started for the first time), Rings ignores the step of loading data from the application server, but retrieves the user’s data directly from the Facebook server, and uploads all the data to the application server as the cache data. To keep the user data current, Rings keeps requesting the latest stream data from the Facebook server iteratively. If any change is noticed, Rings synchronizes the changes with the application server to maintain the user’s cache data up-to-date in the database (Figure 2.9).

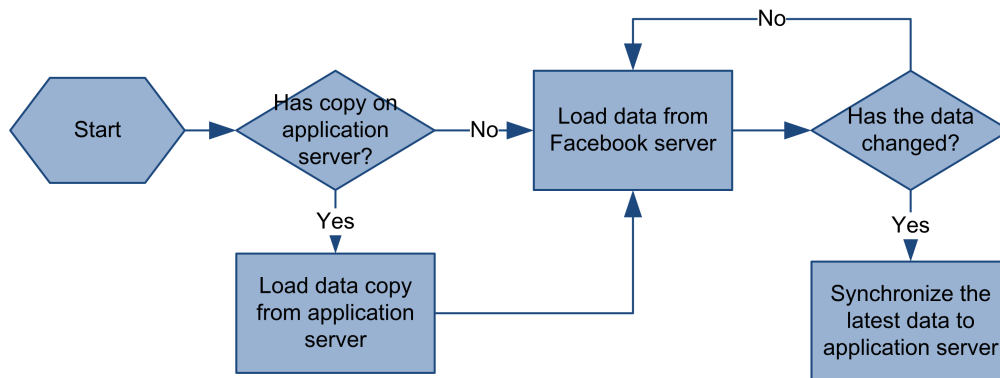


Figure 2.9: Algorithm for ensuring fast generation of the visualization and keeping the user data updated on the server.

2.3.2 Implementation

The front-end (client) application is implemented with Adobe Flex, and it runs in a web-browser with Flash player plug-in.

To retrieve data from the Facebook server, Rings has to get authorization and obtain an access token from the Facebook server first. Facebook Platform uses the OAuth 2.0 protocol for authentication and authorization, and two different OAuth 2.0 flows for user login are supported: server-side and client-side. Since Rings is designed to retrieve the social data directly from the Facebook server, the client-side flow is utilized. The implementation of the OAuth 2.0 on Facebook Platform involves three different steps to get authorization: user authentication, app authorization and app authentication. User authentication requires the username and password of the current user who is trying to connect Rings with her Facebook account. App authorization and app authentication ensures that the user knows exactly what data and capabilities they are providing to Rings. Once these steps are complete, Rings is issued an user access token that enables Rings to access the user's information and take action on her behalf.

With the valid access token, Rings uses the Graph API and REST API to retrieve data from the Facebook server via HTTP Request. Graph API is utilized to get the current user's profile information and all her friends' Facebook IDs and usernames. The data-retrieve method in the REST API is able to load all the friends' posts in a SQL style command (FQL). All the results provided by the Facebook server are in XML format.

Considering the average number of friends that Facebook users have (130), Rings will retrieve a large number of posts/updates from the streams of all of the user's friends. There are two options provided by the Facebook Platform to deal with this situation: fetching one user's stream each time with FQL Query, or fetching a group of users' streams with FQL Multi-query at one time. In order to find the best solution, several experiments were carried out, and the results indicated retrieving data from the Facebook server with FQL Query separately for each user was inferior: disconnections occurred and the retrieval speed was low. The Multi-query method, which puts several FQL commands in a group and gets all the data back together was faster and experienced disconnections far less frequently.

Therefore the Multi-query method with a group of five FQL commands is applied to load a large quantity of stream data (Figure 2.10).

```
{ "ID1":"SELECT post_id, created_time, ... FROM stream WHERE source_id=ID1 and ... ORDER BY created_time DESC",  
  "ID2":"SELECT post_id, created_time, ... FROM stream WHERE source_id=ID2 and ... ORDER BY created_time DESC",  
  "ID3":"SELECT post_id, created_time, ... FROM stream WHERE source_id=ID3 and ... ORDER BY created_time DESC",  
  "ID4":"SELECT post_id, created_time, ... FROM stream WHERE source_id=ID4 and ... ORDER BY created_time DESC",  
  "ID5":"SELECT post_id, created_time, ... FROM stream WHERE source_id=ID5 and ... ORDER BY created_time DESC",  
}
```

Figure 2.10: Multi-query method with a group of five FQL commands.

As mentioned earlier in last section, the application server stores the cache data for each user who has used Rings before, which can speed up the data loading when a user gets connected to her Facebook account from Rings. So Rings should be able to communicate with the application server. Rings posts all the parameters to the PHP script on the application server via HTTP Request (Figure 2.11), and the server pushes the result back to Rings in the XML format.

```
<mx:HTTPService id="getCurUser" method="POST" url="http:...getCurUser.php" result="getCurUserHandler(event)">  
  <mx:request xmlns="">  
    <mx:cuid>  
      {thisUserID}  
    </mx:cuid>  
    <mx:cuname>  
      {thisUserName}  
    </mx:cuname>  
  </mx:request>  
</mx:HTTPService>
```

Figure 2.11: The code snippet of the HTTP Request in Rings.

The Back-end program (the application server) runs in the Wamp Server environment (Apache, MySQL, and PHP on Windows), and consists of the PHP script application and the MySQL database. The PHP script application receives commands and parameters from Rings, then processes and stores the data to the database, or retrieves data from database and sends them back to Rings.

CHAPTER 3

FIRST USER STUDY

3.1 Research Questions

The Rings application is designed as a visualization tool to help the user explore her Facebook updates, which is supposed to provide an increased awareness of specific friends' Facebook activities. The first user study aims at testing the following three research questions:

1. Whether the information provided by the visualization in Rings allows an increased awareness of specific friends' Facebook activities (i.e. who are the active users, who are lurkers, etc) or not?
2. Whether the information and functions provided by the visualization are useful for the user's daily Facebook browsing or not?
3. Whether the user interface is convenient and usable and the performance of Rings is good or not?

3.2 Methodology

The first user study was done in a lab, and contained two sets of tasks: tasks for Facebook and tasks for Rings. Participants were asked to complete both sets of tasks. The whole study process was under the researcher's observation, recorded by screen capture software and Smart Pen, and timed by a stopwatch. A questionnaire with rating and open-ended questions was also provided to each participant to seek further feedback.

3.2.1 Sample

Testing the research questions mentioned in section 3.1 is not the only one goal in the first study. Professional suggestions about the user experience and the visualization layout are also desired. Therefore, email invitations were sent to students of two research labs, the MADMUC Lab and the Human Computer Interaction Lab, at the Department of Computer Science, University of Saskatchewan. Additionally, two graduate students from other labs were willing to participate in the user study. Finally, there were eleven participants recruited, including six (6) students from the MADMUC Lab, three (3) students from the HCI Lab, one (1) from the Bioinformatics Lab, and one (1) from the Agents Lab. All of them have strong computer background and advanced computer skills.

Because Rings is designed and implemented as a Facebook application, a diversity of participants in terms of Facebook experience was obtained to allow a better sense of how they use Facebook normally with their variety of Facebook experience levels. Two parameters were used to identify the Facebook experience level for each user: the number of Facebook friends they have, and the daily number of hours they usually spend on Facebook. Among all the participants in the first user study, more than half of the participants (6 out of 11) have 100-299 friends, followed by two (2) participants who have 50-99 friends and two (2) participants who have less than 50 friends. One (1) participant has more than 300 on Facebook (Figure 3.1).

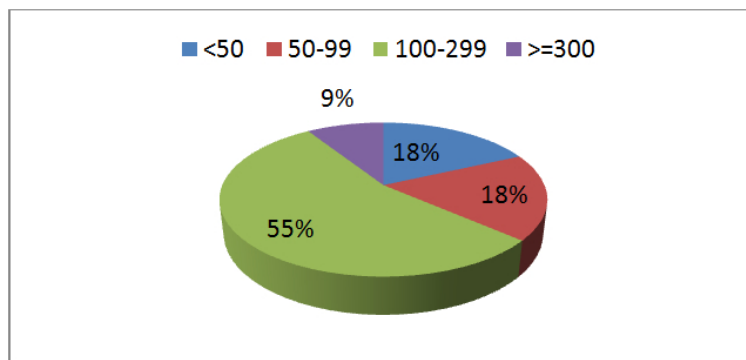


Figure 3.1: The number of Facebook friends of study participants.

For the number of hours spend daily on Facebook, eight (8) participants browse Facebook less than one hour per day. One (1) participant spends 1 to 2 hours, followed by two (2)

participants who use Facebook more than 2 hours daily (Figure 3.2).

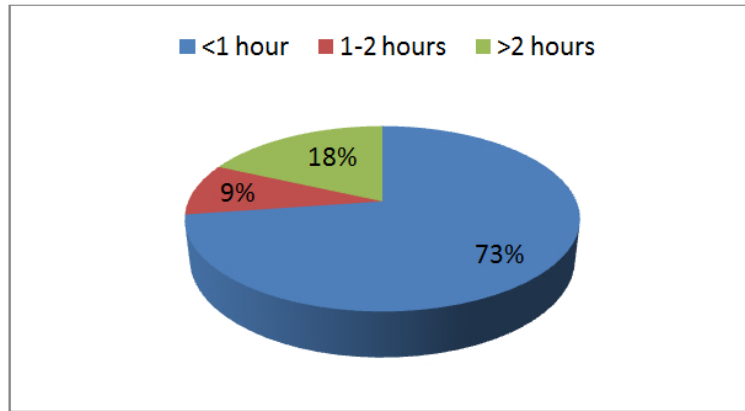


Figure 3.2: The daily Facebook using hours of study participants.

3.2.2 Scenario

All the participants were invited to a quiet and small office to avoid unwanted interruption. Before the study started, each participant had to read and sign the consent form (Appendix B) for participating in the study. Then the participants were asked to fill a brief questionnaire about personal information, including gender, number of Facebook friends, daily Facebook browsing hours, and computer skill. After that, the researcher introduced some terms, features (i.e. “lurker”, friend-list feature on Facebook) that participants may not know, matters that needed attention, the flow of this study, and informed participants that the entire study would be captured with audio and screen recording.

During each study session, a participant needed to complete two sets of tasks: tasks to be completed on Facebook and tasks to be completed using Rings (Appendix C). The whole process of task completion was observed by the researcher. To avoid differences in the amount of information that they had to tackle, which would have been unavoidable if the participants were to use their own Facebook accounts, all the participants were asked to use the same example Facebook account (it was a real account with 198 Facebook friends), for both sets of tasks (the Facebook task set and the Rings task set).

Among these two sets of tasks, there is one section, which comprises the seven core tasks, in the task set for Facebook. Three sections, the task about the login of Rings, tasks about

the user interface, and the seven core tasks, were included in the task set for Rings (Figure 3.3).

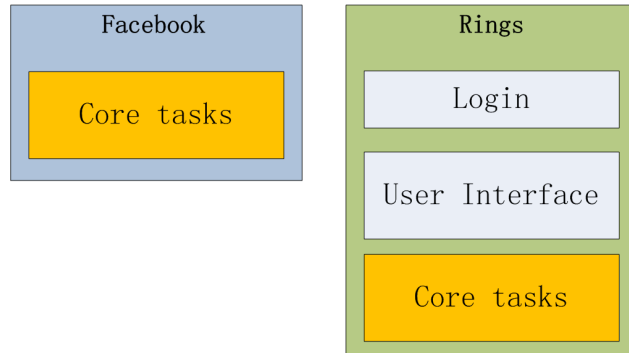


Figure 3.3: The task sections in the two sets of tasks.

The goal of the seven core tasks was to evaluate and compare the user performance on each of these tasks using Facebook and Rings, along three parameters: time needed to complete the task, rate of correct response (task performance), and level of difficulty (a subjective user measure of how difficult the task is). The result of the comparison can be used to test the first research question. After completing these seven tasks using Facebook, the participants were asked to state how useful or related each task was (level of usefulness) to their daily Facebook browsing, which can answer the second research question.

One complication arises due to order effects (the order in which the participants perform the two sets of tasks), which can confound the accuracy of the results. There was one kind of order effect expected for the first user study: the experience, as well as the answers that a participant got from the first part of the experiment (using Facebook or Rings) might affect the result when she was working on the same task in the second part (using Rings or Facebook). For example, a participant was asked to find 3 users who had never posted anything in the past 30 days, which was hard to finish with the normal Facebook interface, but was much easier to do if the participant used Rings. If the participant first completed the set of tasks with Rings, she might remember the answer to each task, and took a shorter time to finish the same task using Facebook.

To deal with the order effects, a balanced within-subjects design was utilized in the first user study [13]. All the participants were divided into two groups. The first group completed the 7 core tasks using Facebook first, and then finished the same tasks with Rings. For the

other group, participants completed all the tasks in Rings first.

In the task set for Rings, the sections about login and user interface were used to test the third research question (Appendix C, Tasks for Rings). Following and working on these tasks can also help participants to get familiar with the interface and functions provided by Rings.

After each sub-session during the first study, a questionnaire related to the tasks was provided to collect general opinions about how easy it was to finish each part of tasks, comments, and suggestions. Some questions in the questionnaire are open ended, which enables participants to describe their own ideas or suggestions without any restriction (the entire questionnaire is shown in Appendix D). Additionally, the Questionnaire for User Interaction Satisfaction 7.0 (Appendix E) was used to collect feedback about the overall user reactions, screen, terminology and system of information, and system capabilities.

A pilot study with two volunteers was conducted to find shortcomings and issues of the designed study, as well as bugs of Rings. The bugs and issues collected from the pilot study were fixed before the formal study started.

3.2.3 Results

Results for the core tasks

For the seven core tasks, the levels of usefulness for all the tasks were calculated and analyzed to test whether the information and awareness provided by the visualization in Rings are helpful or useful for daily Facebook browsing (the second research question). The level of difficulty, the elapsed time, and the correct rate were compared to test the first research question.

From figure 3.4 we can find that most (six) of the tasks were stated as neutral (level 3) or useful (higher than level 3) for daily Facebook browsing. Only one task, task 3 (the lurker awareness provided by Rings), was rated lower than 3 indicating that most of the participants thought the awareness of lurkers was not so useful for daily Facebook browsing.

As discussed in section 3.2.2, one order effect was expected before the first user study: the experience, as well as the answers that a participant got from the first set of tasks

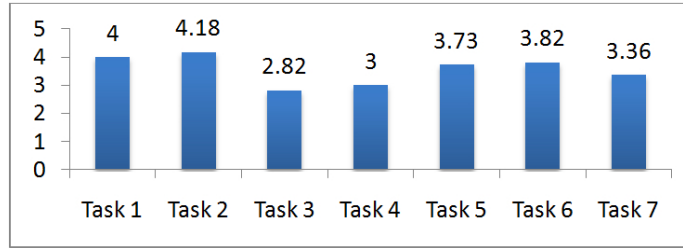


Figure 3.4: The level of usefulness (means).

(using Facebook or Rings) might have affected the result when she was working on the same task in the second part (using Rings or Facebook). According to the real observation of the first eight sessions of the first user study, the major order effect did not appear among the first seven participants (including four participants who completed the seven core tasks using Facebook first, then used Rings, and three participants who used Rings first and then Facebook). However, that order effect was recognized during the eighth study session. That user finished all the seven tasks smoothly using Rings first, but then got trouble on a task using Facebook. Hence, she just wrote down the answer that she got using Rings in the previous section, without actually working on that task using Facebook. Therefore, all the following three participants were asked to use Facebook first then use Rings to complete the seven tasks.

Figure 3.5 presents the comparison of the level of difficulty (means) for completing each task using Facebook (blue bars) and Rings (red bars). The results clearly show that Rings provides an easier way for participants on searching specific task information.

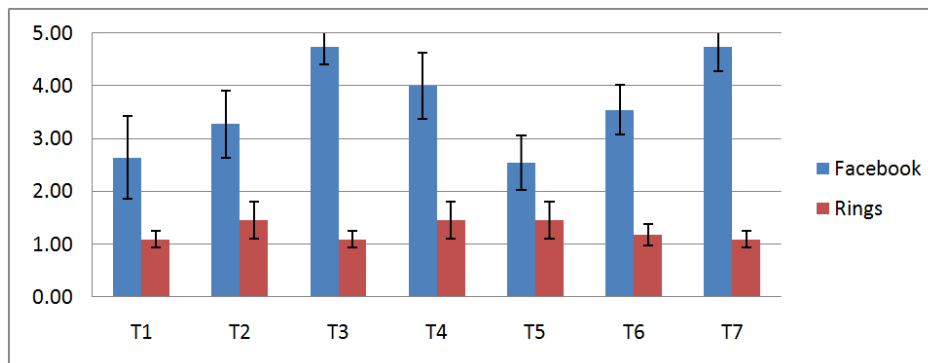


Figure 3.5: The comparison of difficulty (means).

The elapsed time (mean) and correct rate (mean) for each task with Facebook and Rings

are compared to reflect the difference between two methods (Table 3.1 and Table 3.2, Figure 3.6 and Figure 3.7). From the overview of the data shown in the tables and figures, one can see that the participants used less time to finish each task using Rings, and the correct rates (accuracy) of the answers they found with Rings were higher than those found using the normal Facebook page for most of tasks. The participants got all the correct answers with both methods on task 6, but more time was used to complete that task. All the participants thought it was really difficult to get idea for the answer of task 7, since there is no effective way for users to search posts by post-date on Facebook News Feed page. Therefore, an estimated time, 1000 seconds, and a correct rate, 0, are assigned to all participants for this task.

Table 3.1: The mean and standard deviation (STDEV) values of elapsed time and correct rate (accuracy) using Facebook and Rings - Group 1 (Facebook first, then Rings)

Task	Group1 (Facebook (FB) first, then Rings) 7 participants							
	Time with FB (s)		Time with Rings (s)		Accuracy with FB		Accuracy with Rings	
	Mean	STDEV	Mean	STDEV	Mean	STDEV	Mean	STDEV
T1	83.29	29.36	46.29	18.55	0.77	0.29	1.00	0.00
T2	135.57	45.03	78.14	21.26	0.77	0.27	1.00	0.00
T3	187.57	84.62	38.14	13.61	0.86	0.38	1.00	0.00
T4	294.00	167.03	80.43	23.11	0.86	0.15	0.94	0.15
T5	180.14	71.83	109.57	55.48	1.00	0.00	1.00	0.00
T6	109.29	30.10	52.57	16.08	0.89	0.13	1.00	0.00
T7	1,000.00	0.00	26.14	8.63	0.00	0.00	1.00	0.00

Table 3.2: The mean and standard deviation (STDEV) values of elapsed time and correct rate (accuracy) using Facebook and Rings - Group 2 (Rings first, then Facebook (FB))

Task	Group2 (Rings first, then Facebook (FB)) 4 participants							
	Time with Rings(s)		Time with FB (s)		Accuracy with Rings		Accuracy with FB	
	Mean	STDEV	Mean	STDEV	Mean	STDEV	Mean	STDEV
T1	27.75	18.95	79.25	32.19	1.00	0.00	0.88	0.25
T2	98.75	33.88	187.25	25.70	0.98	0.04	0.73	0.27
T3	44.75	20.21	199.25	104.04	1.00	0.00	0.92	0.17
T4	103.00	68.88	234.00	210.67	0.85	0.19	0.80	0.28
T5	131.00	27.87	166.25	37.81	1.00	0.00	1.00	0.00
T6	52.75	10.34	135.25	111.31	0.94	0.13	0.94	0.13
T7	34.50	6.45	1,000.00	0.00	1.00	0.00	0.00	0.00

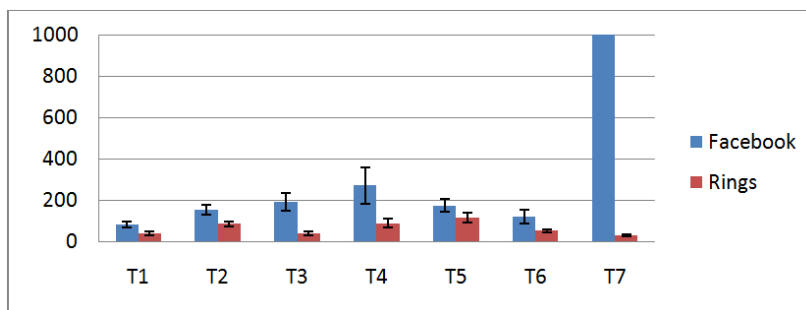


Figure 3.6: The comparison of the elapsed time (means).

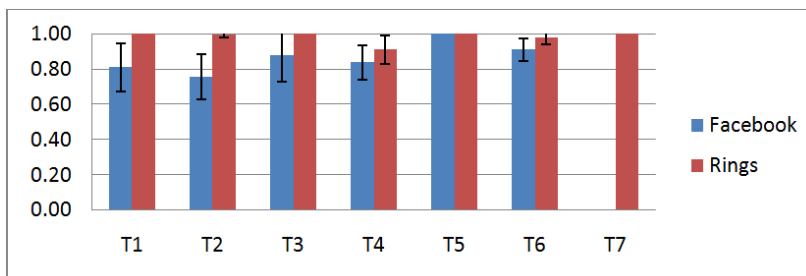


Figure 3.7: The comparison of the correct rate (means).

Testing statistically if these data confirm the research questions can yield a more convincing results. Hence, the t-test method was applied on the elapsed time and correct rate for all the seven tasks. The t-test is one of the most commonly used procedures for hypotheses testing. There are 4 frequently used t-test methods: one-sample location test, paired two-sample for means, two-sample assuming equal variances, and two-sample assuming unequal variances [25]. In this user study, the 11 participants have varied backgrounds (computer skills, Facebook experience, familiarity with tasks), and the samples from participants using Facebook (and Rings) do not follow the same distribution, which means they are not comparable. However, the differences of elapsed time and correct rate between using Facebook and Rings are only caused by the difference between Facebook and Rings. Thus, the difference between the values of elapsed time and correct rate over the different tasks using Facebook and Rings are comparable and the paired two-sample for means method can be applied to test the research questions.

Before applying t-test, the samples of elapsed time and correct rate for each task using the two different methods (Facebook and Rings) from each of the participants should be aligned and listed, which can show the differences between two methods more clearly. For the elapsed time (Table 3.3), column “Facebook” in the table shows all the times elapsed using Facebook, and column “Rings” shows the times using Rings. Obviously, the difference in elapsed time between using Facebook and Rings for each task can be calculated ($t_{Facebook} - t_{Rings}$) and listed in column “Diff”.

Table 3.3: The differences of elapsed time (one participant)

		Facebook	Rings	Diff
ID1	T1	102	65	37
	T2	185	60	125
	T3	94	37	57
	T4	60	75	-15
	T5	52	63	-11
	T6	73	45	28
	T7	1000	9	991

Similarly, the difference ($c_{Facebook} - c_{Rings}$) of correct rate for each task between using Facebook and Rings is shown in Table 3.4.

Table 3.4: The differences of correct rate (one participant)

		Facebook	Rings	Diff
ID1	T1	0.57	1	0.43
	T2	1	1	0
	T3	0	1	1
	T4	0.8	1	0.2
	T5	1	1	0
	T6	0.75	1	0.25
	T7	0	1	1

Two sub-hypotheses, H_{t_0} and H_{t_1} , are defined to test whether the participants completed the tasks in shorter time using Rings than that using the normal Facebook News Feed page:

$$H_{t_0} : \text{mean_diff}_{time} \leq 0$$

$$H_{t_1} : \text{mean_diff}_{time} > 0$$

H_{t_0} represents using Facebook is faster than using Rings to complete each task, while H_{t_1} , indicates the opposite opinion, which means using Rings is faster than using Facebook. To test which hypothesis is correct is to calculate the critical value ($t \approx 6.05$), and to compare t with t critical (≈ 1.67 , in the case of $\alpha \approx 0.05$). t is greater than t critical, which means H_{t_0} should be rejected and H_{t_1} should be accepted. In other words, using Rings to complete all the seven tasks is faster than using Facebook, and the result is significant, or not due to chance, with 95% confidence (Table 3.5).

Table 3.5: T-test result for elapsed time

	Elapsed time with FB	Elapsed time with Rings
Mean	285.44	64.25
Variance	95770.17	1690.50
Observations (Samples)	77	77
Hypothesized Mean Difference	0	
df	76	
α	0.05	
t Stat	6.05	
P($T \leq t$) one-tail	2.50E-08	
t Critical one-tail	1.67	

In the same way, whether completing tasks with Rings can get higher correct rate or not,

can be tested by two hypotheses:

$$H_{c0} : \text{mean_diff}_{crate} \geq 0$$

$$H_{c1} : \text{mean_diff}_{crate} < 0$$

Table 3.6 shows the t-test result on the parameter of correct rate. t can be calculated as about -5.60, and t critical is about 1.67. Thus, H_{c0} should be rejected, and H_{c1} should be accepted, which indicates using rings to complete tasks can gain higher correct rate.

Table 3.6: T-test result for correct rate

	Elapsed time with FB	Elapsed time with Rings
Mean	0.74	0.98
Variance	0.14	0.01
Observations (Samples)	77	77
Hypothesized Mean Difference	0	
df	76	
α	0.05	
t Stat	-5.60	
P($T \leq t$) one-tail	1.60E-07	
t Critical one-tail	1.67	

Results of login

All participants thought it was easy (3 participants) or extremely easy (8 participants) to get connected with Facebook on the login screen (Figure 3.8).

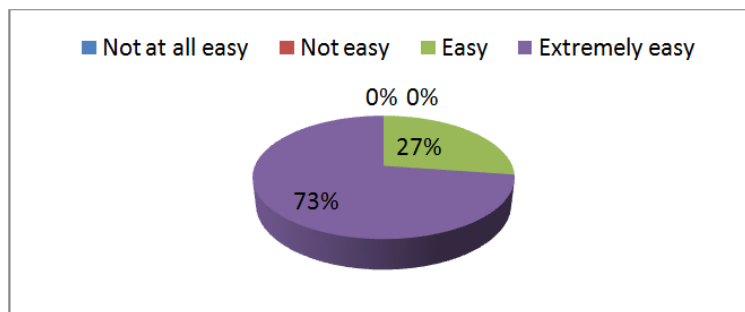


Figure 3.8: The level of difficulty for login.

Figure 3.9 shows the user feedback about the speed of retrieving user data from Facebook on the login screen. The answer options for the level of speed were on a likert scale of 1

(slow) to 9 (fast). Seven (7) out of 11 (63.6%) participants felt retrieving the stream of data about the 198 friends (that the Facebook account they were accessing had) from the Facebook server was fast (greater than or equal to 7). Two (2) participants rated the speed as 3, indicating that they were not so satisfied with the retrieving speed. Another 2 users chose the medium level (4 and 5) for the speed.

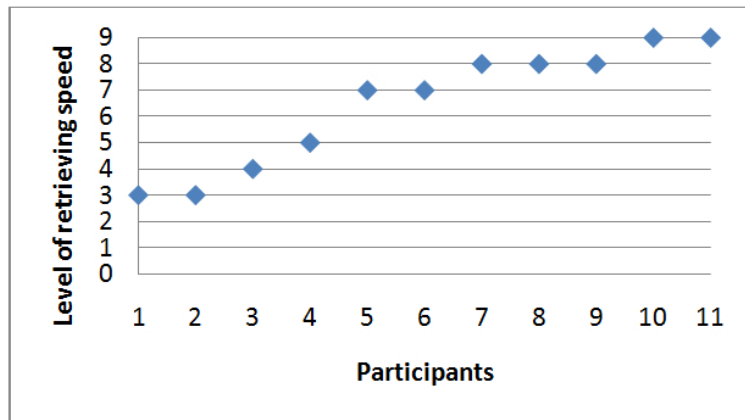


Figure 3.9: The distribution of feedback by participants for level of retrieving speed (sorted by the level of speed).

Evaluating the user interface

To evaluate the user interface, an initial list of 15 tasks (second part of Appendix C) involving specific functions of the user interface of Rings, was provided to all participants. The purpose of completing these tasks was to let users get familiar with the user interface, so that they could make a better use of Rings while working on the 7 core tasks. After finishing these 15 tasks, the questionnaire asked each participant how difficult it was to get a sense of user interface. There are four options for this question: not at all easy, not easy, easy, and extremely easy. Four (4) participants (36%) felt that it was very easy to get sense of the user interface, and the other 7 participants thought that it was easy (Figure 3.10).

Other results

Some overall questions about Rings were asked at the end of questionnaire.

Figure 3.11 shows that 7 participants (64%) stated that the information and functions

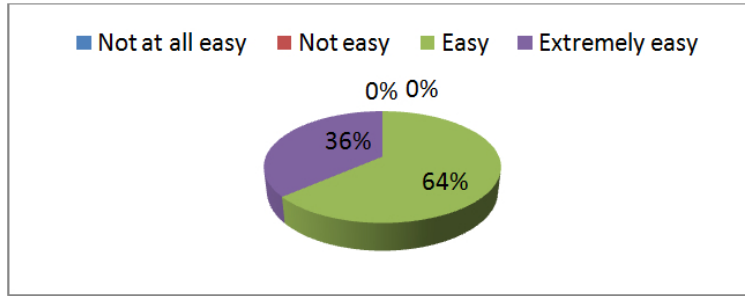


Figure 3.10: The level of difficulty to get a sense of user interface.

provided by Rings are extremely useful while exploring Facebook. The remaining 4 participants considered that information and functions provided by Rings are useful.

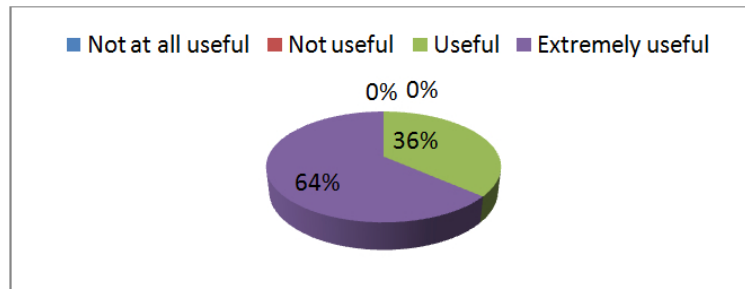


Figure 3.11: The level of usefulness.

Furthermore, 9 participants stated that Rings did extremely well in allowing users to do things that could not be done easily with the normal Facebook pages, and 2 persons chose the option of Rings did well (Figure 3.12).

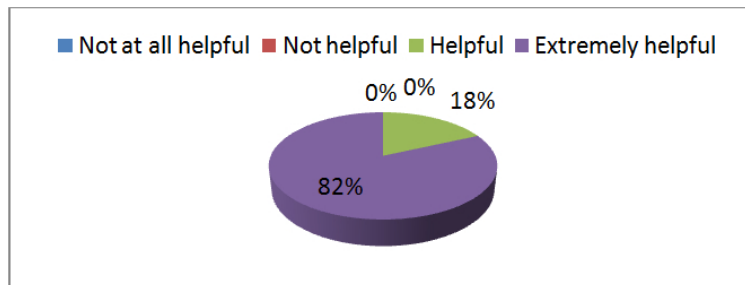


Figure 3.12: The level of helpfulness.

Finally, when asked whether they would be interested in using Rings if was publicly available on Facebook, 6 participants were very interested, and 5 were interested in using it (Figure 3.13).

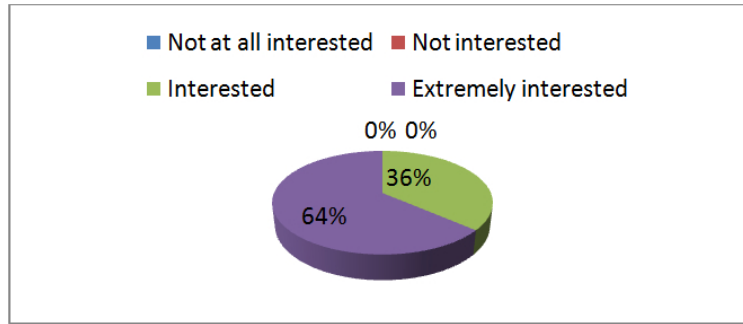


Figure 3.13: The level of interest.

Results of Questionnaire for User Interaction Satisfaction 7.0

The Questionnaire for User Interaction Satisfaction 7.0 (Appendix E) was used to evaluate Rings from 4 different aspects: overall user reactions, screen, terminology and system of information, and system capabilities. The means and standard deviation values for each point in that questionnaire are shown in Table 3.7.

3.3 Discussion of Results

The results show that the participants found it was easier to complete the seven core tasks using Rings than using Facebook. The collected objective data (elapsed time and correct rate for each task) also proves that using Rings to finish the seven core tasks took a shorter time and resulted in a higher correct rate in comparison to using directly the Facebook page. The awareness provided by the visualization, and the functions provided in Rings were found useful by the participants for daily Facebook browsing. Moreover, the feedbacks about the user interface and user interaction show that it was easy to be understood and used, and the performance (speed of retrieval) was satisfactory. So the research questions can all be answered by the results in the first user study:

1. The information provided by the visualization in Rings allows an increased awareness of specific friends' Facebook activity (i.e. who are the active users, who are lurkers, etc).

Table 3.7: Mean and standard deviation values for each point in Questionnaire for User Interaction Satisfaction 7.0

			Mean	STDEV
Overall User Reactions	Overall reactions to the application	Terrible (1) to Wonderful (9)	8.36	0.81
		Frustrating (1) to Satisfying (9)	8.20	1.03
		Dull (1) to Stimulating (9)	8.36	1.21
		Difficult (1) to Easy (9)	8.36	0.67
		Inadequate Power (1) to Adequate power (9)	7.73	1.27
Screen	Characters on the computer screen	Hard to read (1) to Easy to read (9)	7.91	0.94
	The color scheme of the application	Ugly and hard to see (1) to Beautiful and easy to see (9)	8.55	0.69
Terminology and System of Information	Use of terminology throughout system	Inconsistent (1) to Consistent (9)	8.45	0.93
	Messages which appear on screen	Confusing (1) to Clear (9)	8.09	1.14
System Capabilities	System speed	Too slow (1) to Fast enough (9)	7.91	1.04
	The system is reliable	Never (1) to Always (9)	8.45	0.52
	Provides useful feedback	Never (1) to Always (9)	8.45	0.93
	Ease of operation depends on your level of experience	Difficult (1) to Easy (9)	8.27	1.01

2. Most of the information and functions provided by the visualization are useful for the user's daily Facebook browsing.
3. The user interface is convenient and usable and the performance of Rings is good.

CHAPTER 4

ENHANCEMENT

The results of the first user study were very encouraging. However, they suggested also some problems with the design and some directions for improvement, which needed to be addressed before launching a second user study with real users on Facebook, rather than computer science students.

4.1 Need for Modification

According to the users' feedback and observations during the first user study, several problems in the design of the visualization were discovered:

1. As discussed in section 2.2.4, the friend-selection window will show up only if the current user has more than 200 Facebook friends. The purpose of this feature is to provide a method for users to select a smaller subset of her friends for which the retrieval of data from Facebook will not take too long. However, the feedback from participants and observations during the user study show that users were confused when they saw this window show up at the very beginning of their interaction with Rings. They had no idea about why they had to choose no more than 200 friends, even though there was a detailed description available on the top of the window. Additionally, this pattern required the user to select friends only by viewing a list of their Facebook names, before getting any other hints about these friends' activities. Therefore, since the user may not be aware of whom she needs to keep update, and who has posted something recently, she may select a large number of friends who are not active. Finally, the components in the friend-selection window (i.e. entire friend list, current selection, and buttons)

were not so functional to provide a convenient way (i.e. search friend by name) for the user to select no more than 200 friends if they have several hundreds of friends.

2. The version used for the first user study could not offer information about which user has some interesting/popular posts, and how interesting/popular the posts are. The user could only keep up with the posts updated in the last 30 days, but could not locate interesting posts at a glance.
3. The friends' avatars (spirals) were placed almost randomly on the screen. The angle parameter was not utilized properly. Hence, the friends looked ungrouped.
4. There was only one tip about the meanings of the colors and the size for each spiral, which did not provide sufficient information. And the "Show tips" button was not highlighted to attract user attention.
5. Rings would show "Other activities" if the post did not contain any text in the "message" field, which means only status updates and shared resources with explicit message attached by the user could be displayed properly, while any other activities, such as shared links of photos where the user left blank the message field, were displayed as "Other activities", along with updates generated by games, such as Farmville. This provides very limited information for the user to figure out what the posts are. It would be much better to show a more meaningful entry, such as "Shared link" or "Shared photo".

4.2 Implementation

To address these issues, several parts of Rings were redesigned and re-implemented to improve the usability and usefulness of Rings:

1. The friend-selection window was taken off, and a sub-screen strategy was applied in case the current user has more than 200 Facebook friends. Rings retrieves all the Facebook friends of the current user when the application gets started. If the total number of friends is greater than 200, all the friends are divided equally into several groups, with

maximum capacity of each group 200. For example, if there are 250 friends, all the friends will be put into two groups, with 125 friends for each group. There will be three groups if the user has 420 friends (140 friends in each group). If the number of friends is less than 200, only one group is generated, and all the friends are inserted into that group. Then, Rings retrieves all the posts from the last 30 days from all the friends in the first group via the multi-query method provided by the Facebook API, and then creates the visualization with these retrieved posts. The user interface of Rings provides a combo-box with all the group entries (Screen 1, Screen 2, etc.) and a brief description about this feature (Figure 4.1). The user can switch to another group by selecting a different group name in the combo-box, and then Rings displays the visualization of that group.

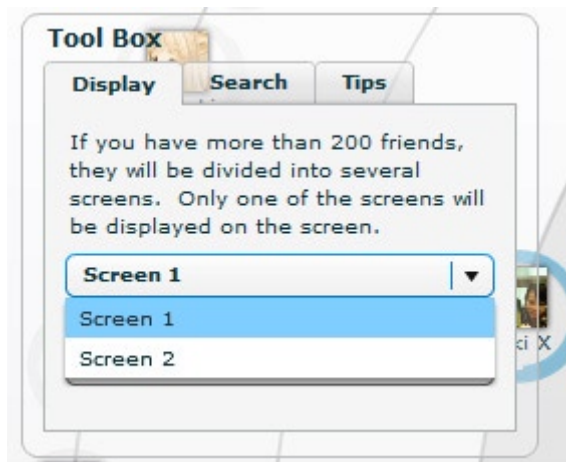


Figure 4.1: Sub-screens switching combo-box.

2. To reflect how interesting/popular the post is, the numbers of likes and comments for each post are utilized. Obviously, the more likes and comments the post has, more interesting that post is. According to the total number of likes and comments, each post will be classified into 5 different popularity levels displayed with different emphasis on the screen by means of different shades of gray. All the 5 levels are presented with 5 different gray colors [2]. For example, a post with many likes and comments is shown in solid black color, while a post with no likes or comments is shown in light-gray color. Additionally, to indicate the exact numbers of likes and comments, a bracket with two numbers is added at the very beginning of each post in the floating window if there are

some likes and comments for this post. For instance, [L:4 C:3] means there are 4 likes and 3 comments on this post (Figure 4.2).



Figure 4.2: Different gray levels indicate how interesting the post is.

This strategy is also applied to the avatar visualization (spiral/screw) on the screen to provide awareness for the user to see at a glance which Facebook friends have some interesting/popular posts. As discussed in the last paragraph, each post is classified into one of the five different popularity levels according to the total number of likes and comments. Similarly, the avatar visualization is also classified into one of the five different levels according to the highest popularity level of posts that the user has got and five different opacity levels are used to present the five different popularity levels of that user. For example, if a user has a post at the most interesting level (in black color), her avatar visualization will be displayed in the highest opacity level of the corresponding color of the avatar (will look most solid). If all the posts of the user have no comments or likes at all, that avatar will be shown in the most transparent opacity level (Figure 4.3).

3. More tips have been designed and added into the "Tips" window (Figure 4.4). These tips cover all the important points of the user interface of Rings. In order to provide a better sense of Rings for a user who has no experience with it, the Tips window will be automatically popped up at the first time a user starts Rings.

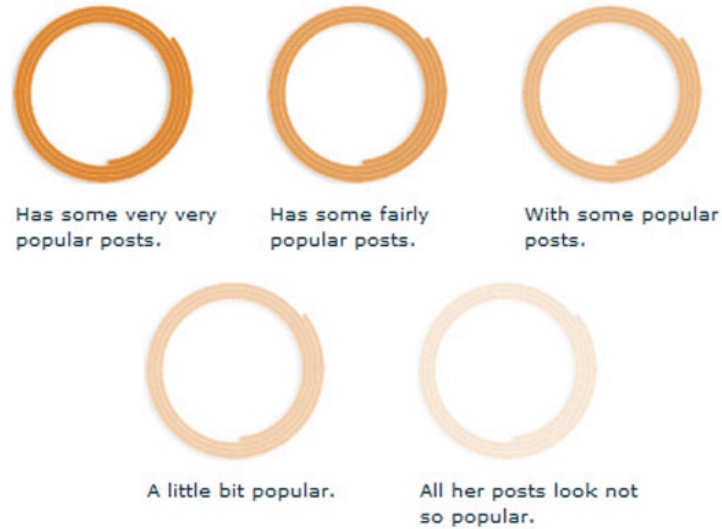


Figure 4.3: Avatars with different opacity levels.



Figure 4.4: The content of Tips.

- To fix the “Other activities” issue (discussed in the last section), Rings parses the “attachment” field in the retrieved posts (available through the API). This allows Rings to find out what type the attachment is for a specific post. For example, if someone

on Facebook shared a video-clip, the type of attachment will be parsed as “video”, and in Rings, that post will be displayed as “Shared video” instead of “Other activities”. Similarly, Rings is able to recognize “Shared photo”, “Shared link”, “Shared flash”, “Shared mp3”, and “Added photos (for multiple photos or a photo album),” which gives more information about the content of a specific post.

5. Keeping a full user data cache on our server aims at providing a faster loading speed than that from the Facebook server directly. However, with the development of Rings, the maintenance for that data cache has become harder and harder. Also some major bugs were exposed during the development process. Hence, the evaluation about whether the time for retrieving about 200 friends from the Facebook server directly was too long or not was carried out in the first user study. The user feedback showed that the average rating for the speed of retrieving is 6.45 (“1” stands for slow, and “9” for fast), and it was considered acceptable. Therefore, the user data cache was taken off from Rings, and Rings now always retrieves fresh data from the Facebook server directly every time when it gets started.
6. The retrieving strategy had been modified due to the new constraints imposed by the Facebook server. Facebook just applied new constraints on the calling stream through the Facebook API. The rate of the calling stream should be no more than 600 times per 10 minutes. The previous version of Rings automatically checked for new posts every 5 minutes by calling streams, and it also provided a “Update manually” button for the user to update the visualization at any time, which could easily cause the times of calling stream to exceed the limit (600 times per 10 minutes). To fix this issue, the “Update manually” button is disabled, and the interval of checking for updates (auto-refreshing) has been extended to 10 minutes.

CHAPTER 5

FIELD STUDY

In comparison with the first user study which was done in a lab, under observation, and using the same fictitious Facebook account to log into for all participants, the second user study is a field study, which aims at evaluating the modified system in a real use situation. Facebook users were recruited online, they participated in the study remotely, using their own accounts and provided feedback after a longer period of using Rings.

5.1 Research Questions

To obtain stronger results hopefully confirming the question that the Rings visualization increases Facebook user awareness of the activities of their friends, a larger-scale user study was performed involving more Facebook users in real use situations. There are three research questions that were defined to be tested during this study:

1. Whether Rings is able to provide an increased awareness about friends' activities (i.e. who has posted very recently, who are the active users or lurkers) and who has posted interesting updates or not?
2. Whether the user interface of Rings is easy to understand and use?
3. Do users intend to continue to use Rings as an interface to Facebook beyond the duration of the study?

Additionally, further feedback about the information and functions provided by Rings was also solicited in the second user study.

5.2 Methodology

The second user study is a continuous remote study. Users participated in the study by using Rings as they would normally use other application. After each session of using Rings, all the participants were asked to fill a brief questionnaire. Additionally, some kinds of user activities in Rings were logged to provide an insight of how participants used Rings.

5.2.1 Sample

The invitation message of the field study was sent via Dr. Julita Vassileva (203 friends) and the researcher's (224 friends) Facebook wall pages, and it was also shared further by some of their friends by inviting their own Facebook friends. Another invitation email was also sent to the students of the MADMUC Research Lab, University of Saskatchewan. Since both Dr. Vassileva and the researcher are in the area of computer science, there is a possible bias in the recruitment: some of the Facebook users who received the invitation message have computer science background. The invitation offered two options: trying out Rings without participating in the study and using Ring as participant in the field study (after accepting a consent form). Twenty-one (21) users, including seven (7) participants from the MADMUC Lab, one (1) from the HCI Lab, three (3) of them from other labs in the Department of Computer Science, and ten (10) unfamiliar Facebook users, agreed with the consent form to participate in the second user study.

5.2.2 Procedure of the Study

All the participants for the second user study were directed to the online consent form containing a brief description of the goal of the second user study, a brief description of Rings and how it works, the procedure of the study, and the procedure for data collection and privacy. Participants could continue with the study only if they signed the digital consent form by clicking on the "Agree" button. Then they were informed to use Rings for at least five days (one time each day, and at least 8 minutes for each time). After using Rings for 8 minutes, a button linking to the daily questionnaire appeared at the top-right corner of

Rings, and kept blinking to attract user's attention. The user needs to click on that button, and then fill the brief questionnaire. The questionnaire contained 5 statements to which the users had to indicate their level of agreement or disagreement (varying on a scale of 5 levels from "strongly disagree" to "strongly agree"):

1. Rings gives me a good idea of who has posted recently on Facebook.
2. Rings makes it easy to find the most interesting stuff posted by my friends.
3. Rings makes me aware of who is very active on Facebook and who is merely lurking.
4. The Rings interface is easy to understand.
5. I intend to continue to use Rings as an interface to Facebook in the future.

The rationale for making the participants answer these 5 questions daily is that we expect to see attitude change, as users gradually explore the functionalities of Rings and become familiar with the system. After the participant had filled 5 times the short questionnaire (in different days, after using Rings for at least 8 minutes), a final questionnaire became available, containing 4 open-ended questions provided to solicit further user suggestions or comments:

1. What types of information were expected but not shown in Rings?
2. Was there any other functionality not provided by Rings that could be there?
3. Is there anything that you thought inconvenient or uncomfortable in Rings?
4. Any other comments or suggestions?

Session data was logged to give insight into the user's activities that were performed in Rings. When the user started Rings, a session record, containing the session start time and duration (in seconds), was inserted into database. Several kinds of user activities in each session in Rings, such as viewing the information in the floating window containing the updates for a specific user, clicking on a post to jump to that post on Facebook, clicking on the profile picture to jump to the profile page on Facebook, searching people, and searching a post by post-date, were logged.

5.2.3 Environment Setup

Since the second user study was an online study, online consent form and questionnaire features were provided. Considering the independence of Rings, two separate applications, online consent form application and online questionnaire application were designed and developed to support the remote study.

Consent Form application

When the user accesses the consent form application, a brief description about this study, including a definition of Rings, how Rings works, the goal of this user study, and details about data collection and privacy is displayed first to inform the user about this online user study (Figure 5.1). The user needs to click on the “Continue” button to go on with the study.

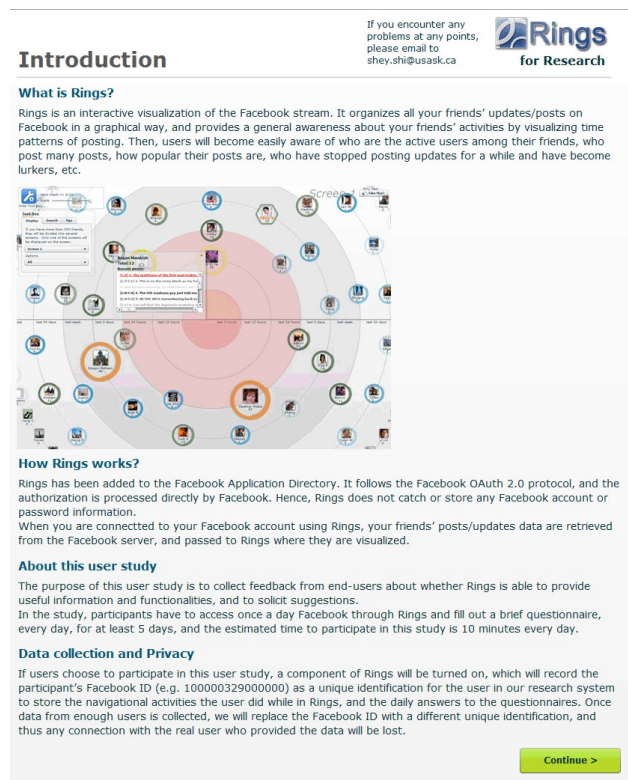


Figure 5.1: The screenshot of the introduction screen in consent form application.

Then the online consent form is provided. The participant reads the information, and checks the checkbox to consent to participate in the user study, and then clicks on the

“Continue” button to submit the consent information (Figure 5.2). If the user has already agreed with the consent form before, clicking on the “Start Research Version of Rings” will direct her to the research version of Rings to continue her study. If the user is not willing to participate in the study, she can access the normal version (which does not log the user’s activity or present questionnaires) by clicking on the white “Start Normal Version of Rings” button.

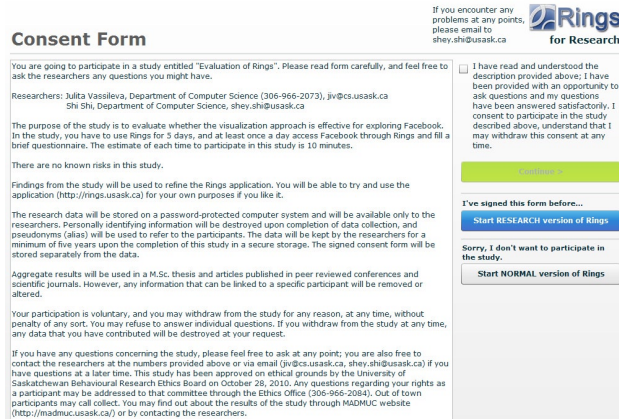


Figure 5.2: The screenshot of the consent form screen.

If a user clicks on the “Continue” button, she needs to get connected with her Facebook account using her Facebook username and password. Then the consent form application sends the request out to Facebook server to retrieve the user’s Facebook name and ID as the unique identifier for the user in this study. After that, step-by-step guidance is provided to the user to introduce how to go on with this user study (Figure 5.3), and user can click on the “Go” button or copy the URL to start the study.

Logger and Questionnaire button in Rings

The logger is designed and implemented to track several important user activities, including viewing the information in the floating window for a specific user, clicking on a post to jump to that post on Facebook, clicking on the profile picture to jump to the profile page on Facebook, searching people in the research version of Rings, and searching posts by post-date. Logging these types of information can provide insight into users’ activities in Rings.

When a user triggers an event, e.g. types a person’s name in the “Search people” box and then presses “Enter” key to locate that person on the visualization, the logger component

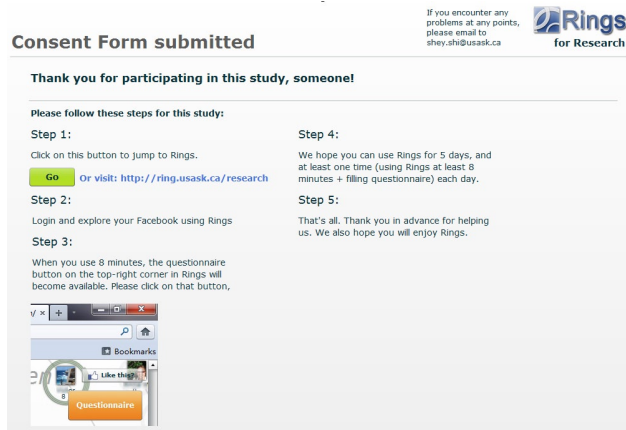


Figure 5.3: The screenshot of the consent form submitted screen.

uploads the information (containing Facebook ID, session ID and type of event) of that event to the application server. The PHP Script on the server side generates the time-stamp at that time, updates the current session's duration according to the session ID, and inserts the event record into the database. After using Rings for 8 minutes, a questionnaire button appears on the top-right corner and keeps blinking to attract the user's attention to fill the daily questionnaire (Figure 5.4). To implement this feature, a timer is started when the user connects Rings to her Facebook account. The visible property of the questionnaire button is set as "true" to show the button on the screen when the timer is done. Clicking on the questionnaire button directs the user to the questionnaire application and the user's Facebook ID is passed via URL. The questionnaire button in Rings will be hidden after clicking on it, which can avoid filling the daily questionnaire repeatedly.

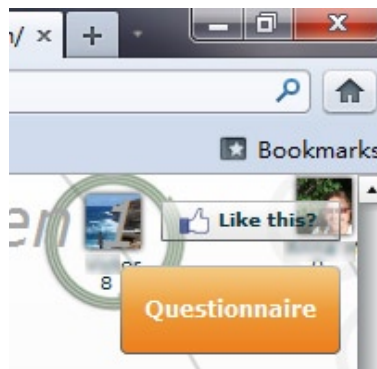


Figure 5.4: Questionnaire button in Rings.

Questionnaire application

The Questionnaire application provides daily and final questions to participants. After clicking on the “Questionnaire” button in the research version of Rings, the questionnaire application is displayed in a new web page, and user’s Facebook ID (the unique identifier in the survey system) is passed into the questionnaire application automatically through the URL. After that, the questionnaire application first verifies whether the passed Facebook ID is registered as a participant in the study. If the Facebook ID is not registered, the current user will be informed to sign the consent form (Figure 5.5). The user needs to click on the “Sign consent form” button to jump to the consent form application, to come back, and to refresh the webpage after having submitted the consent from.

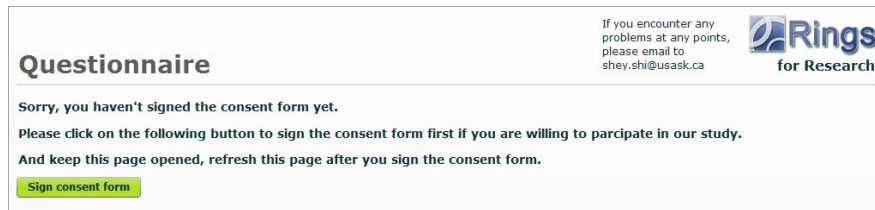


Figure 5.5: The feedback of not signed the consent form.

If the user has already signed the consent form, the questionnaire application will display the 5 daily questions (Figure 5.6). Answers to all the questions are required. After submitting this daily questionnaire, the user gets the feedback about how many daily questionnaires the user has submitted, and how many times she still needs to do it (Figure 5.7). As discussed in section 5.2.2, a participant can only submit one questionnaire each day. In order to avoid repeated submitting, the PHP Script code on the server-side is in charge of checking whether the current user has submitted a daily questionnaire on the day in question. In the case of a repeated submitting, the questionnaire application will notify user that she has already done the daily questionnaire, and needs to come back tomorrow (Figure 5.8). If the user has finished all the 5 daily questionnaires, the 4 open-ended questions will be asked to seek further opinions about Rings (Figure 5.9).

Questionnaire

Thank you for participating in our study, some one!

Please, indicate your level of agreement or disagreement with the statements below:


1. Rings gives me a good idea of who has posted recently on Facebook.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
2. Rings makes it easy to find the most interesting stuff posted by my friends.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
3. Rings makes me aware of who is very active on Facebook and who is merely lurking.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
4. The Rings interface is easy to understand.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
5. I intend to continue to use Rings as an interface to Facebook in the future.
 Strongly Disagree Disagree Neutral Agree Strongly Agree

Submit

Figure 5.6: The 5 daily questions.

Questionnaire

If you encounter any problems at any points, please email to shey.shi@usask.ca




Thank you for participating in our study, Shey Shi!

You have submitted the questionnaire 3 time(s). Please do it 2 more time(s).

Figure 5.7: The feedback of submitted daily questionnaire.

Questionnaire

If you encounter any problems at any points, please email to shey.shi@usask.ca




Thank you for participating in our study!

And you have finished the questionnaire for today. Please come back tomorrow.

Figure 5.8: The feedback of finished daily questionnaire today.

If you encounter any problems at any points, please email to shey.shi@usask.ca



Questionnaire

Thank you for participating in our study, Shey Shi!
You are done with all the questionnaires! We appreciate your help!

Some further questions, please tell us...

What types of information were expected but not shown in Rings?

Were there any other functionalities that were not provided by Rings but could be there?

Is there anything that you thought inconvenient or uncomfortable in Rings?

Any other comments or suggestions?

If you intend to use Rings in the future, please
Visit and bookmark <http://rings.usask.ca>
or

Figure 5.9: Four open-ended questions in the final questionnaire.

5.2.4 Results

The study involved 21 users and continued for over 3 weeks. Each user was required to use Rings for at least 5 days before completing the study, but there was no requirement that these days be consecutive. Some users stretched their participation for longer than 1 week and some completed the study in 5 days.

Results of the daily questionnaire

After the 3-week study, five (5) participants completed all the five daily questionnaires (one questionnaire for each day), one (1) participant finished four daily questionnaires, two (2) filled two, and six (6) filled one daily questionnaire. Totally, forty-seven (47) daily questionnaires were submitted in the research database. One participant finished nine daily questionnaires, since there is no maximum limitation on the submitted daily questionnaires. A participant could continue with this study and fill the daily questionnaire after she completed all the five daily questionnaires. There are also eight participants who have never submitted any questionnaire.

The results obtained for the short daily questionnaire with 5 daily questions (Section 5.2.2) are presented in Table 5.1.

Table 5.1: The results of the daily questionnaire.

#	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	0	0	0	32%	68%
2	2%	9%	6%	62%	21%
3	0	0	2%	15%	83%
4	0	2%	9%	40%	49%
5	2%	11%	15%	36%	36%

As explained in section 5.2.2, the rationale for making the participants answer these 5 questions daily is that we expect to see attitude change, as users gradually explore the functionalities of Rings and become familiar with the system. Therefore, the analysis regarding attitude change was conducted among the eight participants who submitted more than 2 daily questionnaires. From the results (Figure 5.10), some attitude changes can be recognized easily according to the feedback to all the five statements. Attitude change is most evident with respect to statement 2 (Rings makes it easy to find the most interesting stuff posted by my friends) due to lack of familiarity with Rings at the beginning of the study. However, after the third time of using Rings, the attitudes of the participants with respect to statement 2 changed towards “Agree” and “Strongly Agree.” This pattern of attitude change can be also seen with respect to the other statements.

Results of the final questionnaire

On the final questionnaire, four further questions about Rings were asked, which aimed at collecting further suggestions and comments from participants to improve Rings. These four questions asked the users about:

1. possible information they expected to find but which was not shown in Rings,
2. possible functionalities that were expected, but not provided,

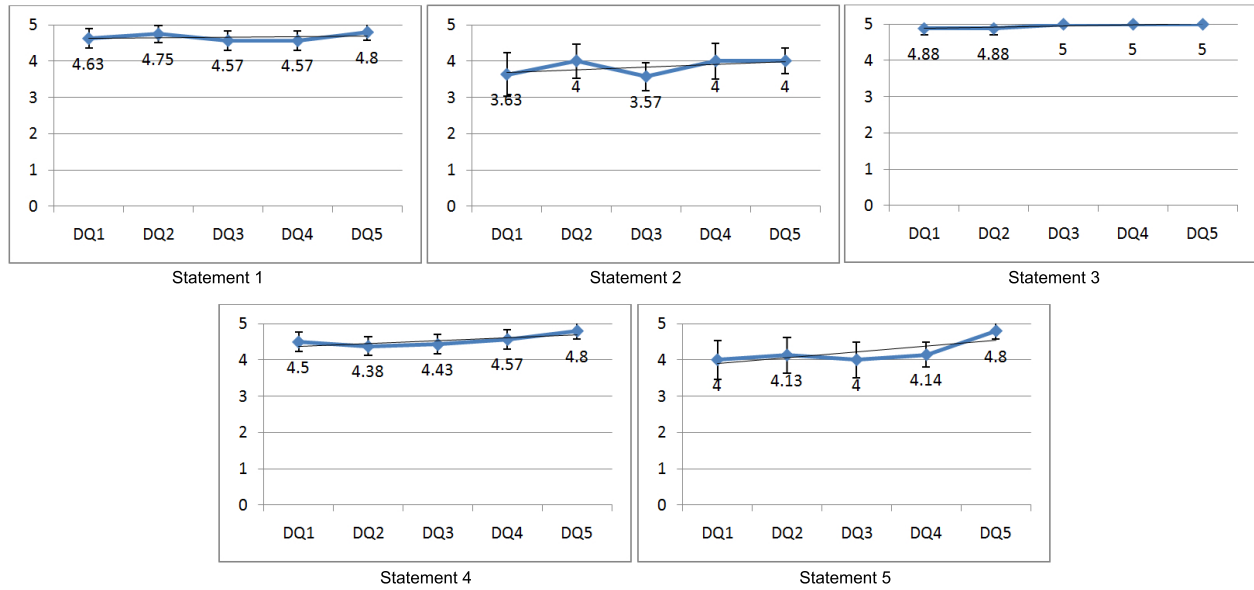


Figure 5.10: Attitude changes on the five statements over the five daily questionnaires (means).

3. anything that users felt inconvenient or uncomfortable,
4. other comments and suggestions.

Four out of five participants who finished all the five daily questionnaire filled final questionnaire. The submitted feedback, revealed one limitation of the visualization, that it cannot provide information about interactions among the user’s Facebook friends at a glance, since it is focused on the posting status. For example, it does not reveal that user A has commented/liked user B’s post. While users can see that a particular post has generated interactions with other users (comments or likes) by the color and the header of the post in the floating window, users have to click on a specific post and then jump to the Facebook page to view the particular interactions with other users related to this post, which is not convenient.

Another limitation is that currently the information in the floating window is all text-based, and the user cannot visually scan for the types of things that they are interested in, as they are used to doing in the Facebook stream of updates.

Customizing the avatars of friends was suggested by one participant as the functionality that she had expected but was not provided by Rings. Facing a lot of avatars on the screen

makes it hard to locate the friends whom the user is interested in. So she suggested providing a simple way to customize friends by clicking on the profile picture and to set the friend's spiral visible in the visualization or invisible. So that user can easily hide the friends that she does not want to view by scanning the visualization.

There are still some usability issues remaining in Rings. First, the friends names are not shown properly in the visualization, which makes users uncomfortable. Currently, the user's full Facebook name is cut if the length of the name is longer than a certain limit. For example, "Tina Hang" will be displayed as "Tina H", since the limit of the name string is set as "6" (Figure 5.11). This display issue is more severe when displaying longer user name (i.e. "Andrew Verylonglastname"). Second, the search functionality is not implemented perfectly. Rings just scans all the usernames and picks the first one that contains the typed keywords, which can lead to wrong results when there are several matches. For example, if a user wants to search "Ian Jordan" among her friends, she types "Ian" as the search keyword. Then Rings provides another person named "Liankuan Bin" as the search result, because "Liankuan Bin" contains the keyword "ian", and coincidentally "Liankuan Bin" is listed before "Ian Jordan" in the user array. Search recommendation is not provided in the current Rings either. Finally, Rings cannot resize the visualization (i.e. zoom in or out) automatically according to the number of spirals on the screen to fit best the screen space.

These issues need to be resolved in future versions of Rings.

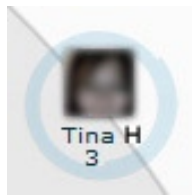


Figure 5.11: Username displaying issue.

Results of usage of Rings

Each usage of Rings can be seen as a session, and the session record, containing the user's Facebook ID, start-time and duration (in seconds), is inserted into the database. After the end of the second user study, there are 85 valid session records in the database and more

than 4300 event records (viewing information in the floating window, clicking on the profile picture, etc.) in these sessions.

Among these 85 sessions, the majority (65, covering 81.3%) were shorter than 1000 seconds, while 20 of them lasted longer than 1000 seconds (Figure 5.12). Since the participants of the second user study were asked to use Rings for at least 8 minutes each time, 58 sessions (68.2%) meet this requirement.

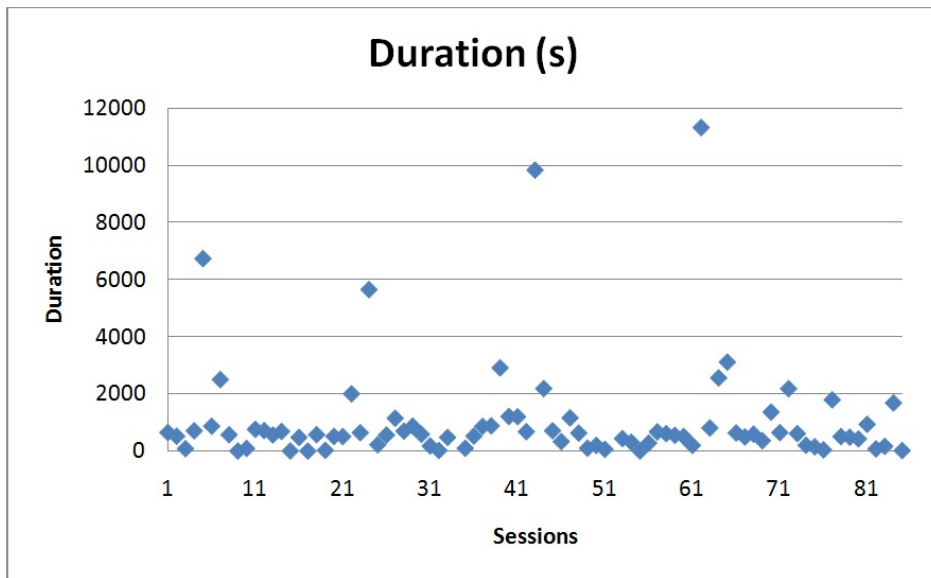


Figure 5.12: The distribution of session’s duration.

Taking an overview of the session event data, as expected, most of the events (4018, or 93% of all events) are viewing information in the floating window for various friends. Other activities, like clicking on the profile picture to jump to the profile page of a friend on Facebook, clicking on a post to jump to that post on Facebook, searching people, and searching post by post-date, were rarely used in the second user study (Figure 5.13). The phenomenon that viewing information in the floating window covers the majority of logged events is also reflected in figure 5.14, which presents the detailed statistics for each session that meets or exceeds the minimum 8 minutes (480 seconds) duration.

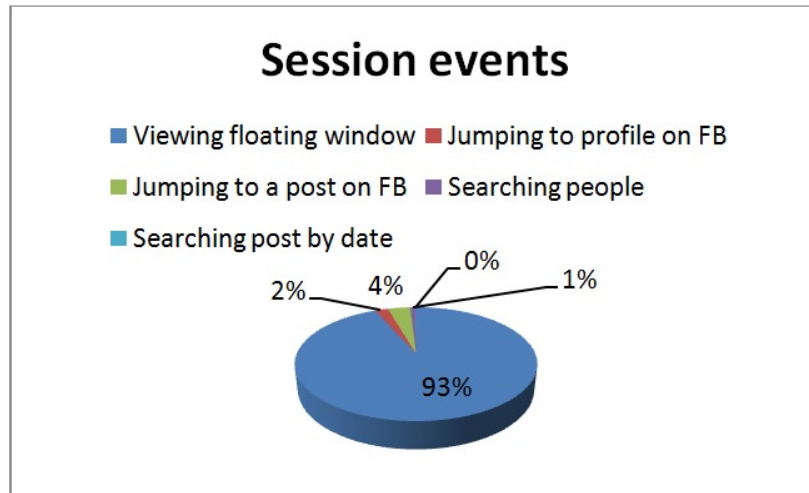


Figure 5.13: The overview of all session events.

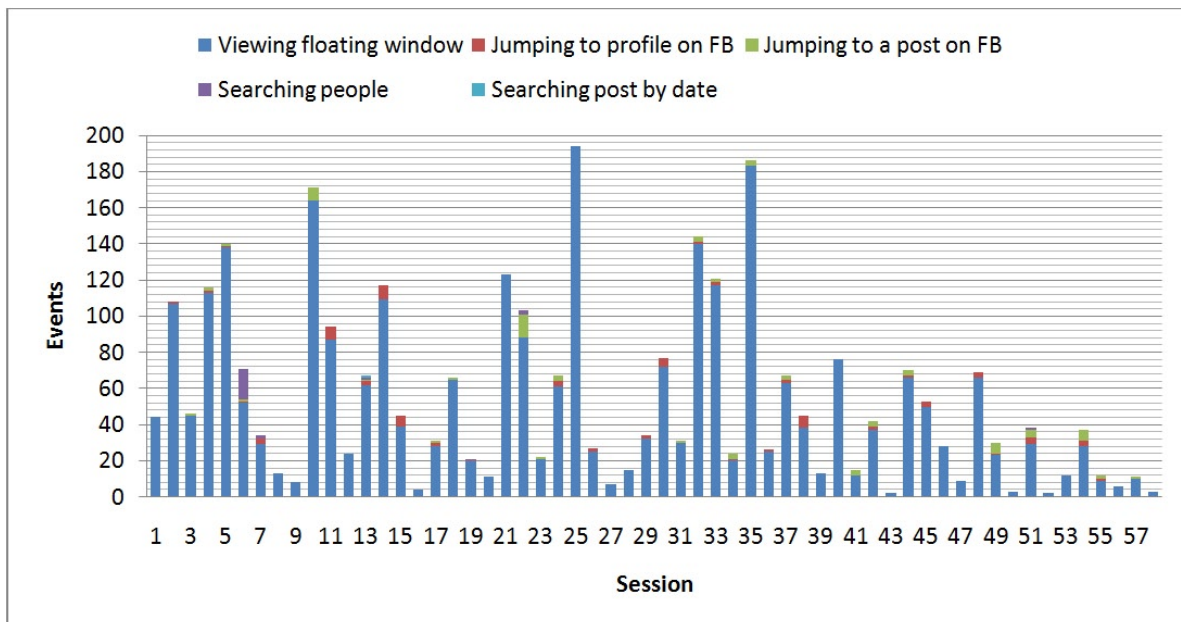


Figure 5.14: The overview of events for 58 sessions.

5.3 Discussion of Results

The results presented in the previous section show that most of the participants who filled the daily questionnaire in the second user study thought that Rings provided an increased awareness about their friends' posting activities and status (i.e. active users or lurkers,

popular or not), and they were able to find interesting/popular posts more easily than that by using Facebook News Feed page. The user interface of Rings was found usable and intuitive by most of the participants. In addition to these, the majority of the participants who filled the daily questionnaire stated that they intended to continue to use Rings as an interface to Facebook in the future. However, there were still about 10 participants who have not finished all the five daily questionnaires, and eight users who gave consent but did not participate in the study, which contradicts somewhat this statement. After tracking the real use records of Rings, only two participants in the field study came back and used Rings two times after the field study. One possible reason is that Rings is not easily accessible from Facebook. Users need to remember the URL of Rings, or to bookmark it to get to Rings. However, once they have the habit of going to the Facebook website, it is hard to get them to user a new URL.

The study also helped to find some issues. From the usage log data, it is not hard to discover that most of the users just used Rings to view the posts from their Facebook friends. The other functionalities provided by Rings, specifically the search functionalities, were rarely used. Three major reasons for this can be suggested: First, most of the participants tried Rings to complete the study without discovering the features provided by Rings. Second, the shortcomings of these features prevented users to use them smoothly. For example, they may have felt frustrated with the search functionality, and this may have been the reason for not using. Last, some features were not mentioned in the tips window, and users may not have noticed that they can click on the profile picture and/or on a post to jump to Facebook for further interactivities. Also, it is possible that searching is not a natural activity of users on Facebook, and that they tend to be more passive viewers of other's activities, of active posters, rather than searchers. Some of these reasons are also mirrored from the feedback to the 4 open-ended questions in the final questionnaire.

CHAPTER 6

CONCLUSIONS AND FUTURE WORK

This thesis proposes an intuitive and interactive visualization creating an increased awareness in the user about her social network on Facebook and allowing her to get insight about the level and pattern of posting activities of her friends.

6.1 Summary

The literature review in chapter 1 identified the research problem and approach taken to address this problem. It traced the evolution of online communities that led to an increased amount of social data in which users become immersed and the difficulties users have to face in finding relevant data. The area of information visualization was briefly presented as it holds promise to present large amount of social data from online communities (i.e. Facebook) in an intuitive way. A particular online community was chosen as a test bed for this research - Facebook - as it is currently the most popular online community.

The proposed visualization focuses on representing the users' friends with respect to the time and quantity of the social updates they posted on Facebook. The avatar visualization for each individual user is designed as a spiral with various colors and radii, reflecting the number of updates that the user has posted in the last 30 days. Each individual spiral is placed on one of several concentric rings on the screen according to the time when the latest update was made. Users who posted recently appear close to the center, and those who have not posted for a long time at the periphery. Users who posted a lot appear as large spirals, and those who posted just a few updates as small spirals. Users who have posted updates that have gained popularity (likes and comments) appear with more solid color, while those, whose updates have not generated any likes or comment appear more transparent. In this

way, by seeing the position of a certain friend's avatar (spiral) in the visualization, the size of the spiral, its color and solidity, the user gets an instantaneous awareness of the activity level of the user and the popularity of their posts. Moreover, functions were designed and implemented to help the user explore the visualization more easily. A user can move the mouse pointer on her friend's spiral to view the details of posting information in the floating window. If she wants to interact (i.e. like, share, or comment, etc.) with that post or her friend, she only needs to click on that post in the floating window or click on the profile picture, and then she will be directed to the Facebook page of the friend. "Search people" enables the user to locate a friend on the screen by typing part/full name of that friend. If a user wants to search updates posted during a specific period, she can use the "search post by post-date" function. The designed approach is implemented with Adobe Flex as a web-based application, called "Rings".

To evaluate whether Rings can help the user get an increased awareness of their friends' activities and explore Facebook more easily, a user study was conducted. From the results shown in section 3.2.3, three research questions were confirmed:

1. The information provided by the visualization in Rings allows an increased awareness of specific friends' Facebook activities.
2. The information and functions provided by the visualization are useful for user's daily Facebook browsing.
3. The user interface is convenient and usable and the performance of Rings is good.

Meanwhile, some issues were reflected during the first user study. To fix these issues, related parts of the visualization had been redesigned and re-implemented in preparation for a field study.

The field study aimed at evaluating the modified system in a real user situation. Users participated in the study remotely on the web, using Rings to access their Facebook stream instead of using Facebook, and provided feedback after using Rings. The results of the field study show clearly that most of the participants thought that Rings provided an increased awareness about their friends' posting activities and status (i.e. active users or lurkers,

sending popular posts or not), and they were able to find interesting/popular stuff more easily than using Facebook News Feed page. The user interface of Rings was found usable and intuitive by most of the participants. In addition to these, the majority of the participants stated that they intended to continue using Rings as an interface to Facebook in the future.

6.2 Discussion

In addition to providing the user with increased awareness of her friends' posting activities and status, the proposed visualization approach can help users and moderators of online communities (e.g. Wikipedia, educational social networks) get awareness of their members' participation. Participation is very important for online communities. The moderator of an online community is able to recognize who of the users are active, who are not active, who have never participated in any activities, and who have contributed a lot of interesting/useful posts by using this proposed approach.

There is also a possible motivational effect of the proposed visualization to stimulate regular frequent posts. From the previous research, people strive to achieve visual prominence in social visualization and will contribute more to achieve it [32]. In this proposed visualization, visual prominence is mostly related to the position (the user who has posted most recently shows up in the center in the visualization) and the size (more posts, the bigger size) of the avatar. It would be interesting to explore in future work whether this visualization really promotes more active posting behavior.

6.3 Conclusions

In conclusion, this research has stated that the proposed approach of interactive visualization provides increased awareness of friend's activities on Facebook and helps the user find interesting/popular stuff on Facebook more easily. It provides an alternative way to browse the Facebook stream.

The main features of the design are:

1. Explicit representation of timeline as a background of concentric circles with the most

recent time in the center and the past expanding towards the periphery. This approach allows scalability and focuses user attention to the center where the most recent activity is.

2. Explicit representation of the user's friends as avatars on the timeline background. This approach allows expressing visually various summative characteristics of the friends' activities (e.g. number of posts, popularity of posts) through size, color and opacity of the avatar visualization.
3. Interactivity of the visualization allows users to explore further the activities of their friends, to see details of their posts, and to go to Facebook to post comments or likes of these posts.

6.4 Contributions

This research makes contributions to two areas:

1. To the area of social network visualization, by proposing an original and effective visualization approach to reveal the friends' posting levels and time patterns in a social network.
2. To the area of Social Network Infrastructure design, by proposing a new interface for viewing and interacting with a stream of social data.

The software implementation of the approach (Rings) is itself a significant contribution to the community of Facebook users as it provides a convenient way to view friends' updates quickly and to stay current with friends' activities on Facebook over time, even after periods of inactivity. It also provides a way to counter Facebook's personalization of the stream, as it is known that by default Facebook hides updates from friends which the user has ignored for some time. This personalization is a way to deal with information overload, but it can lead to missing important updates from friends about whose activities the user is completely unaware. Rings shows all activities of all friends of the user, and it is the user's explicit choice to explore what updates particular friends have made, not the choice of Facebook's personalization heuristic.

6.5 Future Work

There are many other interesting directions for this research in the future:

1. The current implementation is working on social data from Facebook. There are some other popular online communities that use streams to display user status updates and offer public API, such as Twitter and LinkedIn. The proposed visualization approach can be applied in these social communities. Moreover, the visualization can display data from different social networks at the same time, using the concept of a “mashup”.
2. The current visualization design uses only the radius of the circles representing time segments, but the angle parameter has not been utilized. It can be used to position groups of friends close together (e.g. in a given sector of a ring). It is possible to retrieve friends’ information and group them by different parameters, for example, their current location, current university/college, or current employer. According to one of those data, all the friends on the screen can be classified into several groups, and each group can be displayed in a sector on the visualization. Another criterion for grouping could be friendships between friends (similar to the clustering that the existing SocialGraph Facebook application provides). The angle can be used also to position close by users who interact with each other, i.e. who have made comments on each other’s posts or liked each other’s posts, thus taking into account the suggestion from one user in the field study, who complained that Rings currently does not visualize the interactions between users. In general, any commonality between friends can be grounds for clustering, and by co-locating the avatars of these friends together in the same sector in the visualization will help the user to figure out where her friends are placed on the screen, and will make it easier to locate a specific friend without search function.
3. The current proposed visualization focuses on the users’ posting activities. It cannot display other two important user activities: “likes” and “comments” on others’ posts. For example, a Facebook user will be displayed as a lurker if she has not posted anything on her wall, even though she is active by liking or leaving comments on others’ posts.

The ideal visualization should be able to reflect and support all the important activities on social networks.

4. Allowing users to customize their friends' avatars is another interesting direction. Obviously, not every friend on Facebook is active, but the user may still not want to remove them from her friends list. There should be an easy way for the user to emphasize or de-emphasize a friend's avatar in the visualization, so that she can focus her attention on the friends she is interested in.

This visualization can be also made customizable in the future, to allow the moderator of an online community to choose different visual elements, for example, different colors, sizes or shapes of the avatars to represent different kinds of users, or different features of users, or their behaviors, taking evidence from different data sources. Thus the proposed approach can be used as a basis for developing a generic social visualization tool that can fit more online communities.

5. Finally, a new, more memorable domain name for Rings and a link from Facebook would help keep users in the long-term using Rings.

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APPENDIX A
CERTIFICATE OF APPROVAL STUDY AMENDMENT



Behavioural Research Ethics Board (Beh-REB)

Certificate of Approval Study Amendment

PRINCIPAL INVESTIGATOR
Julita Vassileva

DEPARTMENT
Computer Science

Beh #
08-143

INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT
University of Saskatchewan

STUDENT RESEARCHER(S)
Zina Sahib

SPONSORING AGENCIES
NATURAL SCIENCES & ENGINEERING RESEARCH COUNCIL OF CANADA (NSERC) DISCOVERY

TITLE
Studying the Motivational Aspects of a New Online Community for Women in Science and Engineering

APPROVAL OF
Addition of Shey Shi and Martina Nagy to the research team
Revised online community to recruit from

APPROVED ON
29-Jul-2010

CURRENT EXPIRY DATE
16-Jul-2011

Full Board Meeting

Date of Full Board Meeting:

Delegated Review

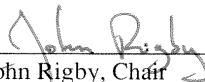
CERTIFICATION

The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

ONGOING REVIEW REQUIREMENTS

In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: http://www.usask.ca/research/ethics_review/



John Rigby, Chair
University of Saskatchewan
Behavioural Research Ethics Board

Please send all correspondence to:

Research Ethics Office
University of Saskatchewan
Box 5000 RPO University, 1602-110 Gymnasium Place
Saskatoon SK S7N 4J8

APPENDIX B
INFORMED CONSENT FORM

You are invited to participate in a study entitled “Evaluation of Rings”. Please read form carefully, and feel free to ask the researchers any questions you might have.

Researchers: **Julita Vassileva**, Department of Computer Science (966-2073), jiv@cs.usask.ca
Shi Shi, Department of Computer Science, shey.shi@usask.ca

The purpose of the study is to evaluate whether the visualization approach is effective for user to explor Facebook friends. In the study, you will be completing a list of tasks using Facebook and Rings application. The estimate of the total time to participate in this study is 30 to 45 minutes.

There are no known risks in this study.

Findings from the study will be used to refine Rings application. You will be able to try and use the application for your own purposes if you like it. You will receive a \$15 honorarium.

The research data will be stored on a password-protected computer system and will be available only to the researchers. Personally identifying information will be destroyed upon completion of data collection, and pseudonyms (alias) will be used to refer to the participants. The data will be kept by the researchers for a minimum of five years upon the completion of this study in a secure storage. The signed consent form will be stored separately from the data.

Aggregate results will be used in a M.Sc. thesis and articles published in peer reviewed conferences and scientific journals. However, any information that can be linked to a specific participant will be removed or altered.

Your participation is voluntary, and you may withdraw from the study for any reason, at any time, without penalty of any sort. You may refuse to answer individual questions. If you withdraw from the study at any time, any data that you have contributed will be destroyed at your request.

If you have any questions concerning the study, please feel free to ask at any point; you are also free to contact the researchers at the numbers provided above if you have questions at a later time. This study has been approved on ethical grounds by the University of Saskatchewan Behavioural Research Ethics Board on October 28, 2010. Any questions regarding your rights as a participant may be addressed to that committee through the Ethics Office (966-2084). Out of town participants may call collect. You may find out about the results of the study through MADMUC website (<http://madmuc.usask.ca/>) or by contacting the researchers.

I have read and understood the description provided above; I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I consent to participate in the study described above, understanding that I may withdraw this consent at any time. A copy of this consent form has been given to me for my records.

(Name of Participant)

(Date)

(Signature of Participant)

(Signature of Researcher)

APPENDIX C

LIST OF TASKS

*Term “Active” is defined as “Post Frequently (more than 15 posts in last 30 days)” in this research.

Tasks for Facebook

1. Please try to tell all the users who have posted in last 3 hours.
2. Please try to tell all the users who have posted in last 24 hours.
3. Please try to tell 3 users who have never posted anything in the past 30 days.
4. Please try to tell 5 users whom you think they are active users, and what are the post-dates of their latest posts.
5. Please try to search Wendy Zhao, Lilia Li, and Jingyang Peng, count how many posts have been posted in last 30 days, and how long has passed since her last post for each person.
6. Please only show the friend list named “U of S” on Facebook News Feed page, then tell 4 active users among them.
7. Please try to find all the posts between April 14, 2011 and April 15, 2011.

Tasks for Rings

Login

1. Please connect to Facebook account using Rings.

User Interface

1. Please point out the control panel (comprises the “Tool Box”, update timer, and scale slider) on the top-left corner, and visualization part (each friend is represented as a screw) in Rings.
2. Please tell when Rings is going to check updates next round.
3. Please point out the “Scale” slider, and scale the visualization.
4. Please hide the “Tool Box”, then show it again.

5. Please tell the information contained in each screw.
6. Please move mouse pointer on a screw, and tell the information inside the floating window.
7. Please click on a post in the floating window to jump to that post on Facebook. Then back to Rings.
8. Please click on a friend's profile picture to jump to his/her profile page on Facebook from Rings. Then back to Rings.
9. Please go to "Display" tab in "Tool Box", and determine all the friends will be divided into several groups if there are more than 200 friends on Facebook. And only one of the groups can be displayed on the screen.
10. Please hide all the lurkers with the "No lurkers" option under the "Display" tab.
11. Please display the visualization with the "U of S" (friend list) option, then choose the "All" option.
12. Please go to "Search" tab in "Tool Box", and search "shey", then find where is the result.
13. Please search posts by post-time.
14. Please go to "Tips" tab in "Tool Box", and click on the "Show Tips" button, then determine the meanings of different screw colors and sizes. Close the tip window when you are done.
15. Please determine what the layout of the users' screws represents.

Visualization

1. Please tell all the users who have posted in last 3 hours.
2. Please tell all the users who have posted in last 24 hours.
3. Please tell 3 users who have never posted anything in the past 30 days.
4. Please tell 5 users whom you think they are active users, and what are the post-dates of their latest posts.
5. Please search Wendy Zhao, Lilia Li, and Jingyang Peng, count how many posts have been posted in last 30 days, and how long has passed since her last post for each person.
6. Please choose the "U of S" option under the "Display" tab, then tell 4 active users among them.
7. Please search all the posts between April 14, 2011 and April 15, 2011, and tell the number of those posts you got.

APPENDIX D

QUESTIONNAIRE

Date & time: _____

Name: _____

How many friends do you have on Facebook: _____

*you may check the number of your friends from your Facebook profile page.

Personal Information

1. Gender a. male b. female
2. On a scale of 1 (beginner) to 5 (expert), how would you rate your computer skills as an end-user? _____
3. How many hours do you browse Facebook daily (on average)?
 - a. Less than 1 hour b. 1 - 2 hours c. 3 - 5 hours d. More than 5 hours
4. Please check all that apply:
 - I read post(s) on Facebook.
 - I leave comments on Facebook.
 - I used/am using 3rd party application(s) instead of Facebook webpage to read and leave comments. The name(s) of the application is(are): _____.
 - I used/am using 3rd party visualization application(s). The name(s) of the application is(are): _____

Tasks for Facebook

Tasks

1. Please try to tell all the users who have posted in last 3 hours.
2. Please try to tell all the users who have posted in last 24 hours.
3. Please try to tell 3 users who have never posted anything in the past 30 days.
4. Please try to tell 5 users whom you think they are active users, and what are the post-dates of their latest posts.
5. Please try to search Wendy Zhao, Lilia Li, and Jingyang Peng, count how many posts have been posted in last 30 days, and how long has passed since her last post for each person.
6. Please only show the friend list named “U of S” on Facebook News Feed page, then tell 4 active users among them.
7. Please try to find all the posts between April 14, 2011 and April 15, 2011.

Questions

1. Imagine these tasks (Task 1 to Task 7) are your daily activities on Facebook, please rate each task according to the level of useful that you think.

Task 1	Least useful	1	2	3	4	5	Most useful
Task 2	Least useful	1	2	3	4	5	Most useful
Task 3	Least useful	1	2	3	4	5	Most useful
Task 4	Least useful	1	2	3	4	5	Most useful
Task 5	Least useful	1	2	3	4	5	Most useful
Task 6	Least useful	1	2	3	4	5	Most useful
Task 7	Least useful	1	2	3	4	5	Most useful

2. Please rate each task according to the difficulty.

Task 1	Easy	1	2	3	4	5	Hard
Task 2	Easy	1	2	3	4	5	Hard
Task 3	Easy	1	2	3	4	5	Hard
Task 4	Easy	1	2	3	4	5	Hard
Task 5	Easy	1	2	3	4	5	Hard
Task 6	Easy	1	2	3	4	5	Hard
Task 7	Easy	1	2	3	4	5	Hard

3. Please tell us anything else that you are interested in on Facebook.

Tasks for Rings

Login

Tasks

1. Please connect to Facebook account using Rings.

Questions

1. I found that getting the sense of connecting to Facebook account in Rings was...
 Not at all easy Not easy Easy Extremely easy
2. I found that the retrieving speed at the first time that I connected to Facebook account was...
Slow 1 2 3 4 5 6 7 8 9 Fast
3. I have comment(s)/suggestion(s) for this part:

User Interface

Tasks

1. Please point out the control panel (comprises the “Tool Box”, update timer, and scale slider) on the top-left corner, and visualization part (each friend is represented as a screw) in Rings.
2. Please tell when Rings is going to check updates next round.
3. Please point out the “Scale” slider, and scale the visualization.
4. Please hide the “Tool Box”, then show it again.
5. Please tell the information contained in each screw.
6. Please move mouse pointer on a screw, and tell the information inside the floating window.
7. Please click on a post in the floating window to jump to that post on Facebook. Then back to Rings.
8. Please click on a friend’s profile picture to jump to his/her profile page on Facebook from Rings. Then back to Rings.
9. Please go to “Display” tab in “Tool Box”, and determine all the friends will be divided into several groups if there are more than 200 friends on Facebook. And only one of the groups can be displayed on the screen.
10. Please hide all the lurkers with the “No lurkers” option under the “Display” tab.
11. Please display the visualization with the “U of S” (friend list) option, then choose the “All” option.
12. Please go to “Search” tab in “Tool Box”, and search “shey”, then find where is the result.
13. Please search posts by post-time.
14. Please go to “Tips” tab in “Tool Box”, and click on the “Show Tips” button, then determine the meanings of different screw colors and sizes. Close the tip window when you are done.
15. Please determine what the layout of the users’ screws represents.

Questions

1. I found that getting the sense of user interface was...
 Not at all easy Not easy Easy Extremely easy
2. I have comment/suggestion for this part:

Visualization

Tasks

1. Please tell all the users who have posted in last 3 hours.
2. Please tell all the users who have posted in last 24 hours.
3. Please tell 3 users who have never posted anything in the past 30 days.
4. Please tell 5 users whom you think they are active users, and what are the post-dates of their latest posts.
5. Please search Wendy Zhao, Lilia Li, and Jingyang Peng, count how many posts have been posted in last 30 days, and how long has passed since her last post for each person.
6. Please choose the “U of S” option under the “Display” tab, then tell 4 active users among them.
7. Please search all the posts between April 14, 2011 and April 15, 2011, and tell the number of those posts you got.

Questions

1. Please rate each task according to the difficulty.
Task 1 Easy 1 2 3 4 5 Hard
Task 2 Easy 1 2 3 4 5 Hard
Task 3 Easy 1 2 3 4 5 Hard
Task 4 Easy 1 2 3 4 5 Hard
Task 5 Easy 1 2 3 4 5 Hard
Task 6 Easy 1 2 3 4 5 Hard
Task 7 Easy 1 2 3 4 5 Hard
2. I have comment/suggestion for this part:

Overall

Questions

1. While exploring Facebook, having access to an overview of your friends' posts (like the visualization provided by Rings) is...
 Not at all useful Not useful Useful Extremely useful
Why?
2. What is your favourite feature of this social-visualization application?
3. What is your least favourite feature of this social-visualization application?
4. How well did this application help you do things that you could NOT do with typical Facebook pages?
 Not at all well Not well Well Extremely well
5. If this application were integrated into Facebook, would you be interested in using the app?
 Not at all interested Not interested Interested Extremely interested
6. Please describe any other comments you may have about the visualization tool.

APPENDIX E

QUESTIONNAIRE FOR USER INTERACTION SATIS- FACTION 7.0

Name: _____

Overall User Reactions

Please circle the numbers which most appropriately reflect your impressions about using this computer system. Not Applicable = NA.

1. Overall reactions to the application:

Terrible 1 2 3 4 5 6 7 8 9 Wonderful NA
Frustrating 1 2 3 4 5 6 7 8 9 Satisfying NA
Dull 1 2 3 4 5 6 7 8 9 Stimulating NA
Difficult 1 2 3 4 5 6 7 8 9 Easy NA
Inadequate Power 1 2 3 4 5 6 7 8 9 Adequate power NA

Screen

1. Characters on the computer screen

Hard to read 1 2 3 4 5 6 7 8 9 Easy to read NA

2. The color scheme of the application

Ugly and hard to see 1 2 3 4 5 6 7 8 9 Beautiful and easy to see NA

3. Please write your comments about the screen here:

Terminology and System of Information

1. Use of terminology throughout system

Inconsistent 1 2 3 4 5 6 7 8 9 Consistent NA

2. Messages which appear on screen

Confusing 1 2 3 4 5 6 7 8 9 Clear NA

3. Please write your comments about the terminology and system here:

System Capabilities

1. System speed

Too slow 1 2 3 4 5 6 7 8 9 Fast enough NA

2. The system is reliable

Never 1 2 3 4 5 6 7 8 9 Always NA

3. Provides useful feedback

Never 1 2 3 4 5 6 7 8 9 Always NA

4. Ease of operation depends on your level of experience

Difficult 1 2 3 4 5 6 7 8 9 Easy NA

5. Please write your comments about the system capabilities here: