Eye Tracking Analysis of User Behavior in Online Social Networks

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Abstract. Social network has become a global phenomenon which attracts a wide range of population from all around the world of different ages, and cultures. People are using online social networks for several purposes like sharing information, chatting with friends, sharing photos and commenting. However, the analysis of users' behavior in social networks received little attention. Therefore, the purpose of this study is to analyze user behavior in terms of users' activities in social network sites by adopting eye tracking techniques. Four main measurements were examined which includes the first place user looks, time spent on areas of interest, main activities and completion time. Results from eye tracking analysis based on the first place user looks and on the time duration have indicated that wall *post* recorded most users' attention. Results have shown that the main activity was reading friends' status on the *wall posts* area. The findings provide support for the effort to understand and to model user behavior using eye tracking technique.

Keywords: User Behavior, Eye Tracking Analysis, Social Networking, Eye Movement data, Experimental Study.

1 Introduction

Social networks sites are getting extensive popularity among internet users in recent years. It was becoming a popular medium for socializing online and tools to facilitate friendship. People are using online social networks for countless activities like sharing information, chatting with friends, sharing photos and commenting. Many social network studies have been reported in the literature. However, studies examining user's behavior in social networks have received little attention [1]. Furthermore, according to Ozturk and Rizvanoglu[2], there are a limited number of social network studies that adopt eye-tracking technique. Majority of prior user behavior studies are carried out through observations and surveys. Recent studies show that eye tracking provides valuable insights into how users perceive online content. According to Michailidou et al [3], investigating sighted users' web behavior using eye movement tracking methods gives a better understanding of users' page presentation perception and cognition. In addition, Ozturk and Rizvanoglu[2] states that integrating an eye

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tracker would provide more precise information about user behavior which includes: the location where a user is looking at any given time, the time duration in viewing or reading at a particular area, and the sequence of location a user viewed in performing a particular action or activity.

This paper is aimed to understand users' behaviour in social network activities through the use of eye tracker. The users behaviour were analysed based on their eye movement data, which provides information about first location or area a user look, time spent on area of interest, main activities and time to complete a given task.

2 Existing Research on User Behaviour in Social Network

Social networking is one of the major phenomena of Web in recent years. According to Horng[4], the number of social network sites on Web 2.0 has been growing rapidly. Boyd and Ellison [5] defined social network sites as web-based services that allow users to share a public or private profile with common users and explore connections with others within the site.

In the last few years, the immense interest of the users towards the social network sites brought the emergence of various studies on this phenomenon. Fox and Naidu [6] evaluated the usability of three of the most popular social network sites known as Myspace, Facebook and Orkut. In this study, the usability test was conducted to evaluate first-time users' satisfaction, navigational efficiency and general preferences. Their finding concluded that Facebook is the best social network sites.

Many studies investigated the user behavior in social networking. Gyarmati and Trinh [1] stated that the success of a social network whether in short-term or in long-term, depending on the behavior of its users, in particular the users' activities. In addition, Acquisti et al. [7] emphasized that people use social networking services for countless activities which include connecting with existing networks for making and developing friendship or contacts, representing themselves online, creating and developing an online presence, viewing content and information, creating and customizing profiles, authoring and uploading their own content, adding and sharing third-party content, posting messages whether in private or public and also collaborating with other people.

Hampton et al. [8] also explored the user behavior or activities in Facebook. In his survey, he examined what people do on Facebook. Results from their survey, showed that on average day 15% of Facebook users update their own status, 22% comment on another's post or status, 20% comment on another user's photos, 26% "Like" another user's content and 10% send another user a private message.

Majority of prior user behavior studies have been conducted using survey and observation. There are limited studies that adopt eye tracking technique which have been highlighted in the literature could provide valuable insights into user behavior [2][3].

2.1 Eye Tracking Technique in User Behavior Studies

According to Lorigo et al. [9] the application of eye tracking has recently received significant attention from research scientists from various fields including search engine companies, marketing firms, and usability professionals. Regarding this

context, Carlo and Marcos [10] used eye-tracking in their study to analyze the browsing behavior of users in the search engine result page (SERPs), as wells as to examine the differences in behavior for different kind of queries such as informational, navigational and transaction. In addition, many usability studies used eye tracking to investigate the usability of web pages. Ozturk and Rizvanoglu [2] adopted eye-tracking in their experimental study to explore the usability of the profile pages in social network sites. In their findings, they emphasized several ways to improve usability in profile pages such as only relevant information should be presented in profile pages as well as the content block need to be visually separated in order to make the content readable, scannable and easy to perceive. Their findings also had shown that mostly users pay attention to the profile picture and their recent activities in the profile page. Related to this context, Michailidou et al. [3] also presented an eye tracking study to investigate sighted users' browsing behavior in the context of web accessibility. In this study, nine web pages were investigated to determine how the page's visual clutter is related to sighted users' browsing patterns. The results showed that salient elements attract users' attention first, and users tend to spend more time on the main content of the page. This study also emphasized that common gaze patterns begin at the salient elements of the page, move to the main content, header, right column and left column of the page and finish at the footer area.

3 Method

This study adopted an experimental method, based on within-participants design approach. Eight postgraduate students participated in this study. All participants have Facebook account. The experiment was conducted at User Sciences and Engineering Laboratory (USELAB).There were four measurements of user behavior collected in this study: first place user look, time spent on area of interest, main activities performed and completion time. These user behavior measures, as shown in Table 1, are captured from eye tracker based on gaze plot, observation length, heat maps, and screen recording.

Table 1. User Behavior Measurement

What to measure	***How to measure***	***Description of Outcome***
First place the users look	Gaze plot	Point of Attraction
Time spend on Social Interaction Elements Layout	Heat Map Number of gaze per AOI (area of interest)	Level of importance of an elements
Completion time	Screen recording	User performance: Time taken to complete a given task.

A popular social network site, Facebook was selected in this study for analyzing user behavior. Facebook has been recognized as the most influential social network sites on the internet and equally familiar to all participants. For the purpose of analysis, the layout of the Facebook main page is categorized into six areas of interest, which are navigation bar, applications, groups, wall posts, advertisements and chatting rooms as shown in Figure 1.

Fig. 1. Layout of social network

The experiment was divided into two sessions. In the first session, participants were required to explore the Facebook for 5 minutes, and in the second session, participants were required to do a specific task and user performance based on completion time were recorded. User behavior data were captured and recorded using Tobii T60 Model eye tracker which used two infrared light sources. The reflections from retina were recorded by a camera. The data was analyzed by software named Tobii Studio 1.3.

4 Analysis and Results

Gaze plot was analyzed to determine the first place user looks. Gaze plot provides details of eye movements including order and duration of gaze fixations. Each fixation is illustrated by a dot with a number inside it. This number indicates the sequence in which the place is visited. The first area a participant looking at is given the number one, as shown in Figure 2. Results from the gaze plots have shown that, for all participants, wall posts area was the first place that they looked at. This finding indicated that participants' first attention was on the wall posts area.

Fig. 2. Gaze Plot

In addition, based on the observation length analysis, that informed about the time spent on a particular area, majority of participants recorded the longest duration of time spent on the wall post area too.

Further analysis was conducted on the visual hotspots of heat map to identify the most attention grabbing area. These colored hotspots, from green to red, show the varying level of attention. The most attention area is denoted by a red circle at its center of attention as shown in the heat map in Figure 3. As expected, result showed that wall post received the most attention from all the participants. Thus, it can be concluded that wall post is the most important area in social network.

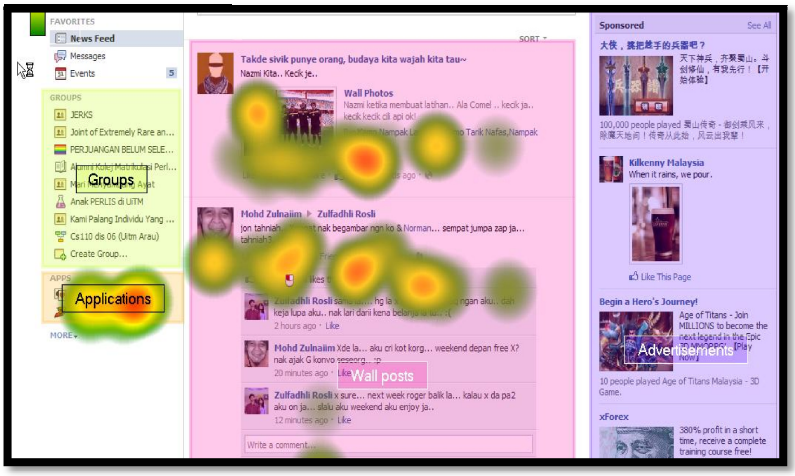

Fig. 3. Heat Map

For identifying the main wall post activity performed by the participants, screen recording data was analyzed. Result has revealed that the main wall post activity performed by majority of participants was reading their friends status. Other popular activities at wall post area were viewing photos and viewing links. The result has shown that updates from friends can drive one's attention to keep on reading other users status content.

Analysis on user behaviour based on participant's main activity and gender difference was also conducted. Result from correlation analysis showed that there is no significant relationship between gender and main activities of participants.

A correlation analysis was conducted to analyze the relationship between frequency of use and completion time. From this analysis, it has shown that there was a significant relationship between frequency of use and completion time. This indicates that experienced users perform faster than novice users in completing a given task due to their familiarity.

5 Conclusions

This paper examined user behavior in online social network using eye tracking data. Results showed that wall post area is the main area of interest. Wall post that is located at the center of the screen received the most attention based on the observation of the first place they looked, as well as on the duration of time recorded. Finding also showed that the main activity among users was reading friends' status on the wall posts area. The findings provide support for the effort to understand and to model user behavior. Further research is required to examine possible differences in user behavior for different type of demographics and culture.

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