



User Mouse Movement Patterns

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INTRODUCTION

A/B testing is a form of comparison, typically used today for designing websites, to determine how successfully a website can accomplish a goal. Through collection of mouse movement and actions on different websites, mouse location will be compared and used to determine how A/B testing factors and website layout can be improved.

BACKGROUND AND SIGNIFICANCE

User interface is a commonly brought up issue in the world of business and web designers due to the fact that it can either draw more customers or lose them easily. Ease of access and certain orientations often times help to increase user interest, and because of this analyzing the success of a webpage can be fairly useful. However, another significant aspect is looking at the relationship between different actions or common patterns on websites, and seeing how user interactivity helps to determine the success of a company.

A lot of research behind A/B testing has been made, but most of it has been because A/B testing remains an important part of statistics. A major source used was a research done by Luis A. Leiva Torres and Roberto Vivo Hernando of the Technical University Of Valencia in Spain, also about mouse movement and website usability. There were important findings that could definitely be used with respect to improving that one website in general, but there are still many more factors which can be tested for multiple websites. A definite flaw in this work would be that, although multiple factors were considered, different types of user actions were generally overlooked.

This study targets the demographic of high school students and websites they commonly use and puts an emphasis on mouse motion patterns and distribution. It also considers the significance of mouse clicks, scrolls, and scroll location separately and together.

Overall, A/B testing is a process that gets refined through continuous tests and large amounts of data, and this is exactly what my proposal offers. Thus, conducting an experiment specifically on mouse movement patterns of users contains statistical significance in the fact that it can be used to improve further testing for companies and also provide general guidelines for web developers about positioning of content, advertisement, and buttons. Crazy Egg, an A/B testing based company, suggested in an article that when conducting such tests, using heat maps to determine user eye location and mouse location shows the main issues and success a website has with keeping users on the website. Generally, tracking mouse movement is a great starting point for designing more specialized tests for the website in the future.

RESEARCH METHODOLOGIES AND ANALYSIS

Procedures and Materials Used

The primary materials used for this experiment were the Chrome extension which I designed and the database to upload information to, Firebase. The procedures are as follows:

1. Set up a Firebase account and open up the database. Allow for anonymous users to read or modify the data.
2. Open up the Chrome extension and replace the current config code with the version for personal Firebase.
3. Install the Chrome extension by following the readme.txt file. If the extension successfully runs, a lot of values being printed out in the console.
4. Have your subjects install this extension onto their own browsers, and allow them to browse Reddit, Facebook, Youtube, Twitter, Instagram, or Quora for any amount of time. For this experiment, users were told to browse for at least 10 minute sessions.
5. Make sure the data is being uploaded to your Firebase database. Remove any submissions with missing data.

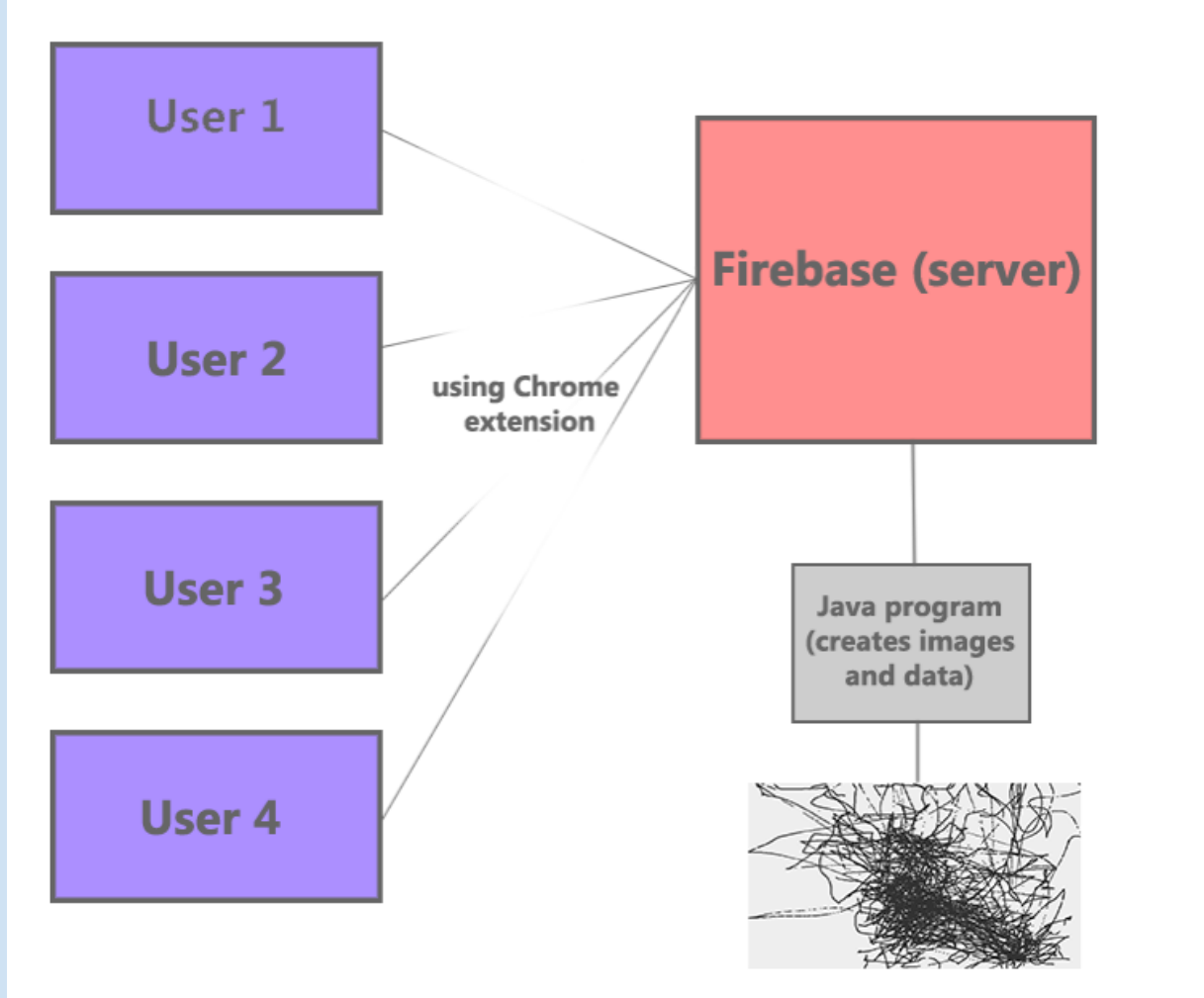


Figure 1: Diagram showing data collection process

Analyzing the data

The data are a large list of values stored on Firebase. The data can be read through a program written in Java. The program itself displays a list of points, and can also provide numerous statistics on distribution of these points. For example, a significant statistic would be the general concentration of points in a certain area, like the center of a Facebook page. Other areas of significance would be the distribution of points on the upper or lower half of the page, or even on the outskirts of the page. The program can also determine average speed of the mouse and direction of travel, helping to show which areas a user would like to spend more time in or generally move towards when they seek new content. The example shown in Figure 2 depicts the average distribution of mouse location, where there is a clear majority of data points, almost 60% of the time, on the left side.

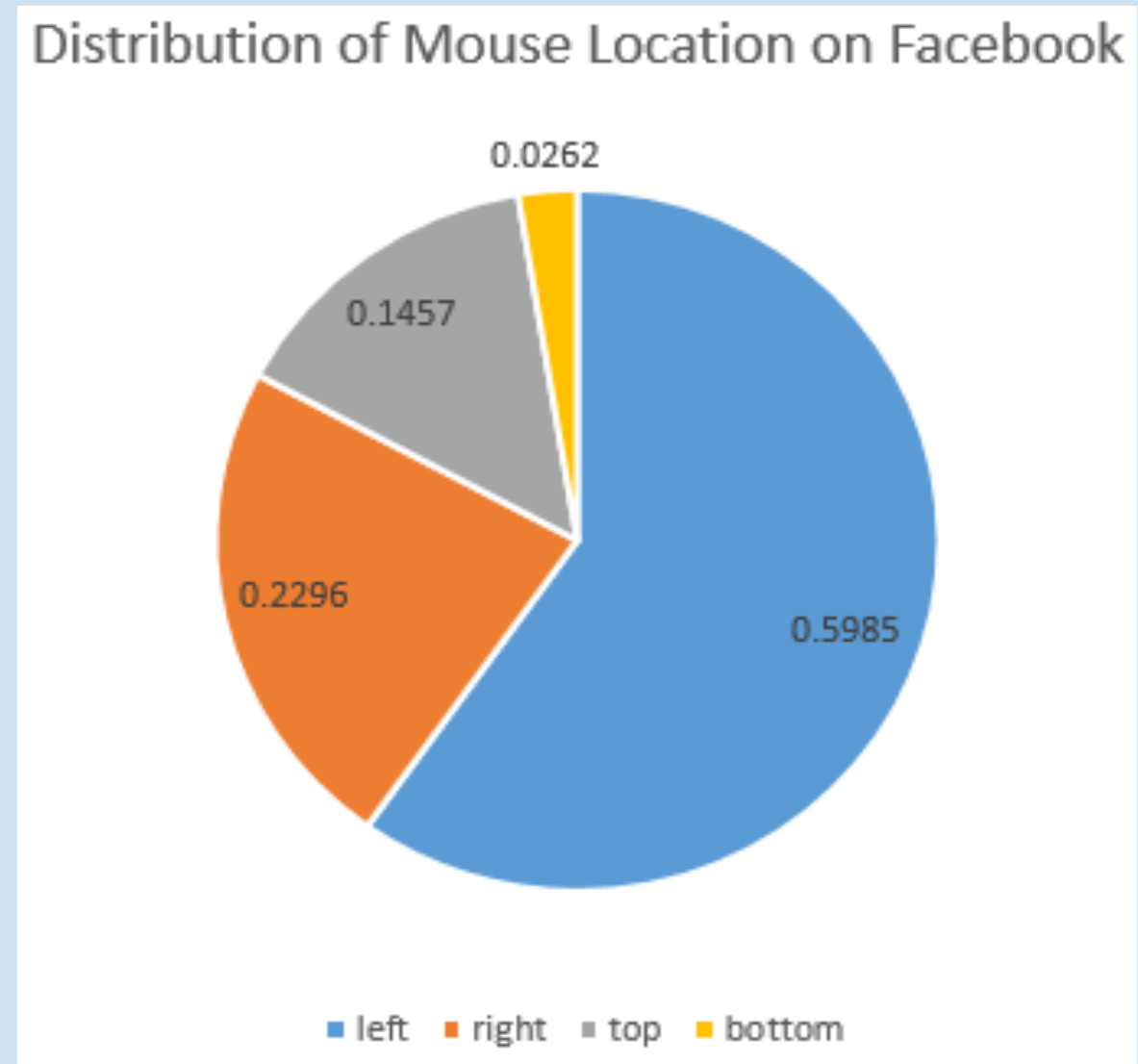
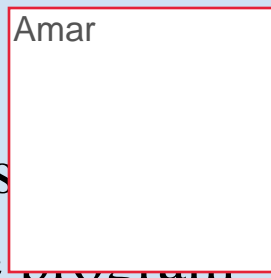


Figure 2: Distribution of data points

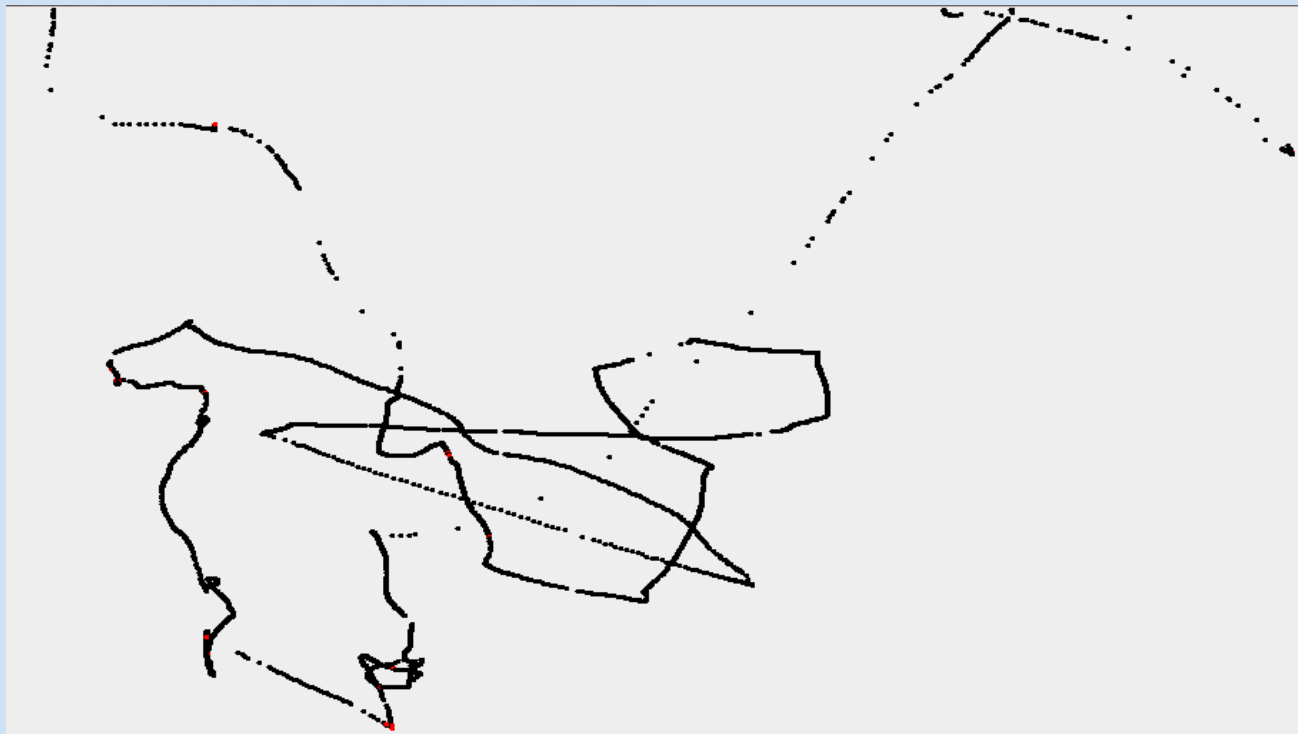


Figure 3: A displayed list of points indicating the mouse movement of a user

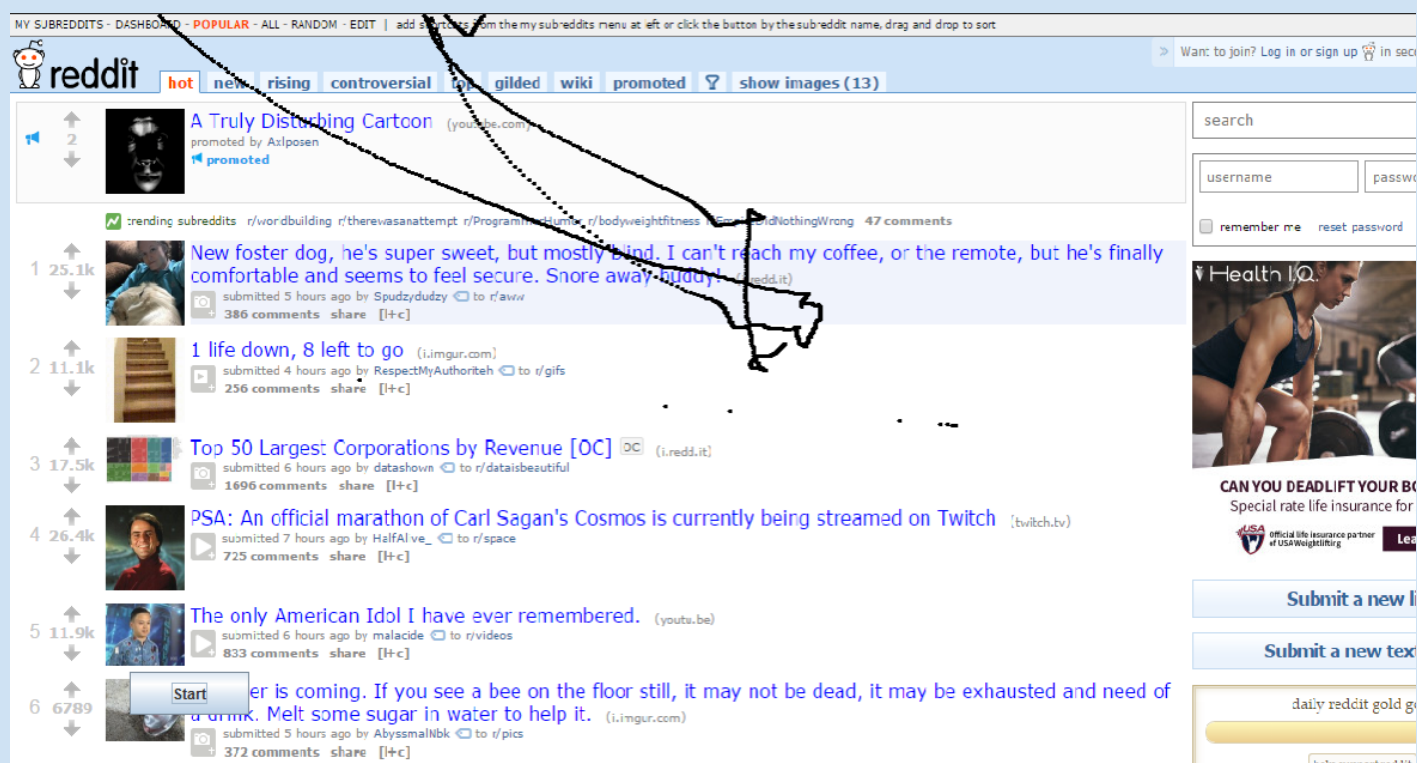


Figure 4: 40 seconds of data from Reddit, showing very briefly user mouse patterns

CONCLUSION

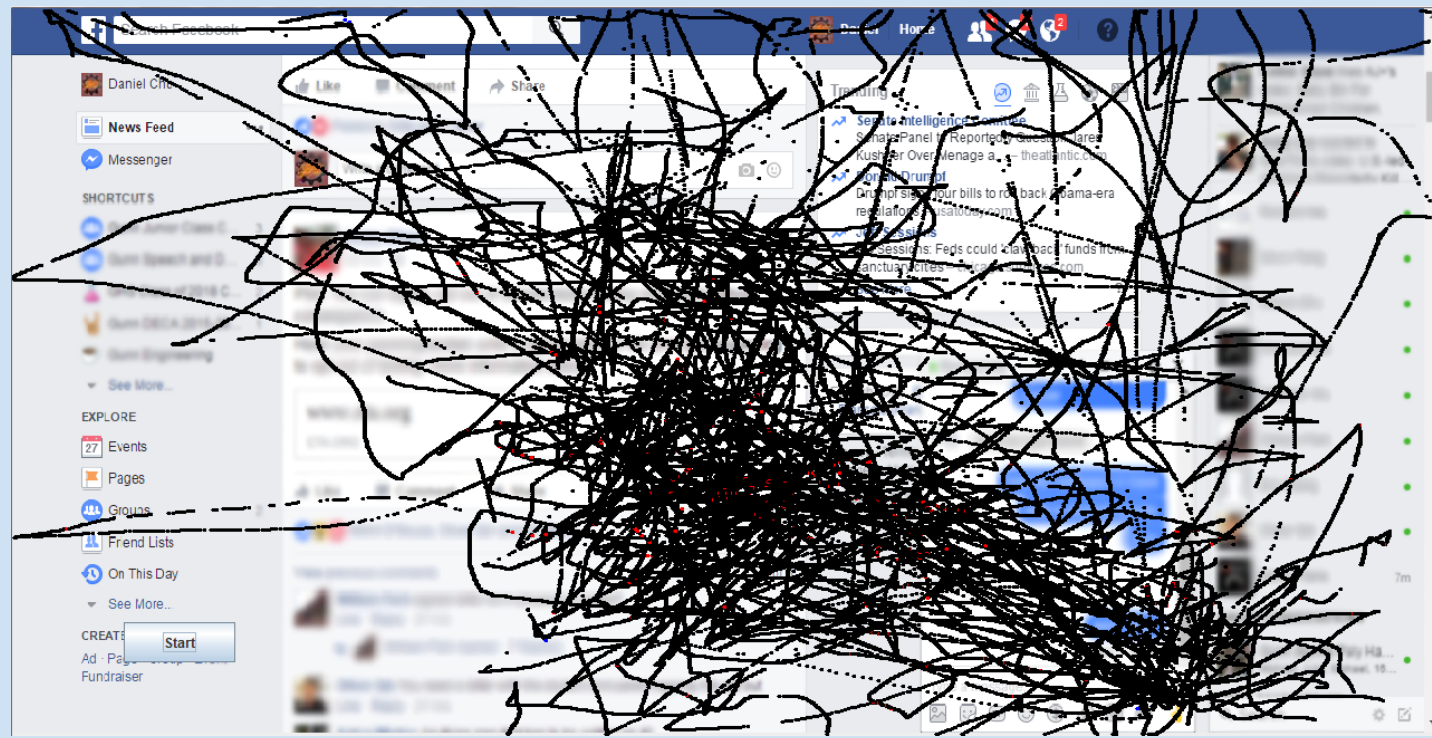


Figure 5: An example of 20 straight minutes of browsing on Facebook. ____% of the distribution of mouse location is towards the center of the page, with the user barely even using the left side

After looking at multiple hours work of user data from Reddit and Facebook, there is a clear indication that these websites are both taking advantage of user mouse movement patterns, mostly for advertising purposes. Facebook itself contains advertisements on the right hand side of the page, between the main content and the chat section. Most of the major movement for users occurs because of movement from the chat area back towards the center, and Facebook has placed ads and other links in that general area. Reddit also does something similar, keeping an advertisement towards the right hand side of the page, but mainly utilizes advertisements within the content itself, which blends in with the numerous posts and updates. Reddit's form of advertising makes a lot of sense given that most users never move their mouse to the right hand side, instead 97% of the time keeping it in the general bounds of the main content.

However, both of these sites lack full utilization of space in certain areas. For example, the area in Figure 3 saw very little usage, and could be compressed to provide more area for the main content on the page. Reddit uses most of its site for visual purposes, allowing for more content but less interaction in those areas. Because of this, the formatting of Reddit encourages less movement but optimizes the amount of information gained.

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Works Cited:

1. Chawla, Shuchi, Jason Hartline, and Denis Nekipelov. "A/B Testing of Auctions." (n.d.): n. pag. 2 June 2016. Web.
2. Fung, Kaiser. "Yes, A/B Testing Is Still Necessary." Harvard Business Review. Harvard Business Publishing, 11 Dec. 2014. Web. 19 Dec. 2016.
3. Geiger, Jonathan G. "Managing and Maintaining the Business Intelligence Environment." LeBlanc/Applied Microsoft® Business Intelligence Applied Microsoft® Business Intelligence (2015): 363-78. Web.
4. Hanington, Jenna. "The ABCs of A/B Testing I Pardot." Pardot. N.p., 14 Jan. 2016. Web. 08 Nov. 2016.
5. "How to Create the Perfect Website A/B Test." The Daily Egg. CrazyEgg, 08 Aug. 2016. Web. 21 Feb. 2017.
6. Torres, Luis A. Leiva, and Roberto Vivo Hernando. "A GESTURE INFERENCE METHODOLOGY FOR USER EVALUATION BASED ON MOUSE ACTIVITY TRACKING." A Gesture Inference Methodology for User Evaluation Based on Mouse Activity Tracking (n.d.): n. pag. Web.