Remote Eye Tracker Technology

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ETR 556

User Experience (UX) Research

Northern Illinois University

Summer 2018

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Introduction

Eye tracking technology can be described as the scientific technology of using the movement information of the human eyes to determine where an individual is looking at, what the individual is looking at and how long the gaze is on a particular spot. The eye tracker technology enables researchers to record eye position and movement based on the optical tracking of the reflections produced by the cornea (Liu et al., 2017). Eye tracking is conducted by a remote system that is attached to the screen.

Research areas for the technology

The eye tracking technology can be used in almost every field, but we assume this technology will be used mostly in marketing and education games and research. For this project, the remote eye tracker technology will be used is Gazepoint which is a powerful system for collecting and analyzing eye-gaze data. The Gazepoint Control System collects and sends remote eye tracker data to Gazepoint Analysis.

Accuracy of gaze tracking

Determination of the accuracy and precision of gaze tracking is one of the key areas of research for remote eye tracker technology.

Tracking robustness

There is a need to track the robustness of the remote eye tracker technology. This involves measuring the percentage of people whose eyes can be tracked by the remote eye tracker.

Advantages

- For the participant using the remote eye tracker technology, it is observed that the device offers a lot of comfort and is generally easy to use because the user does not have to put on a device on the head (Jafari & Ziou, 2015).

- The use of numerous reflections generated from the cornea in remote eye tracker technology plays a key role in improving the quality and reliability of the technology in estimating the point of gaze compared to other methods (Liu et al., 2017).
- Another advantage is that estimations can be carried independently for the right and left eyes leading to the generation of two point of gaze estimates.

Disadvantages

- One of the key disadvantage associated with this technology is that it exhibits low precision and fluctuating fixation estimates in some instances.
- Another key finding of experiments on remote eye tracker technology is that at certain eye and head orientations, the corneal reflections may be distorted on the camera and sclera boundary, blocked by eye lashes or disoriented on the rough surface of sclera as a result of diffuse reflection (Nakazawa & Nitschke, 2012).

How to Use Remote Eye Tracking

In this project will explore how remote eye tracker technology can be used to perform recovery tasks, collecting and analysing date. The project will involve one user who will be assigned to do a task of tracking a call number of a book. After positioning and calibration, the participant will be asked to look at different call numbers by using the website http://library.niu.edu as an example.

Task

- Use NIU recourses to find the call number of the book "Supervising clinical experiences in the classroom" by William A. Bennie.

How to Use the Technology with Screenshots

Eye trackers use invisible near-infrared light and high definition cameras to focus light onto the eye and record the direction that it is reflected off the cornea. At the beginning

of the eye tracking session, the system calibrates the eyes of the user so as to ensure that it tracks them correctly.

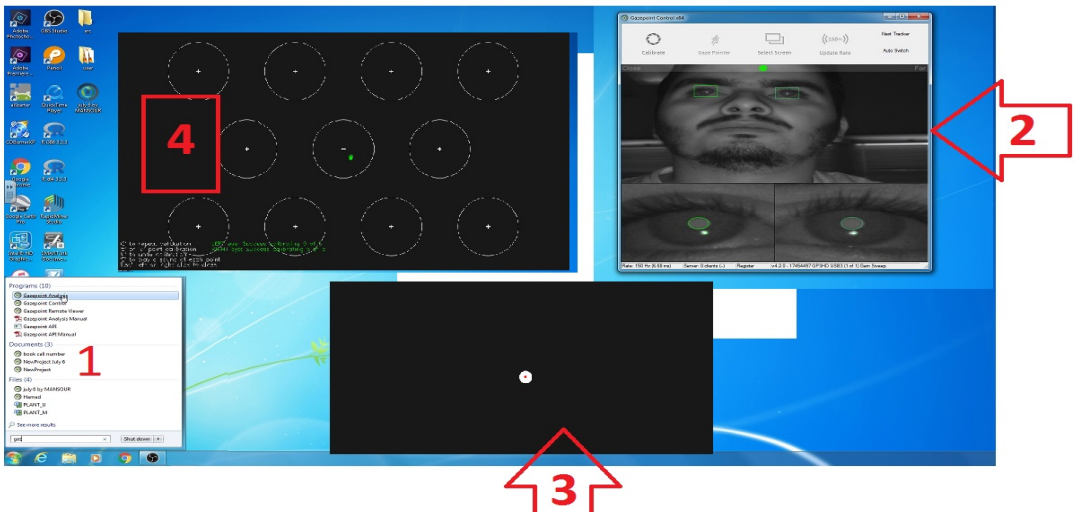

Figure 1: Steps of Using the Technology

Steps of Using the Technology:

1. To open the program, click the Start Key as shown in step 1 in the Figure above and choose gaze-point control system.
2. Once the program is opened, make sure that the green dot is positioned in the middle of the bar as shown in step 2 in the Figure above. Once the green dot is positioned in the middle of the bar, click the collaborate button.
3. After clicking the collaborate button, a new window will pop up as shown in step 3. At this point, the user's eyes should be focused on the white dot that is moving in the window. This step provides for two options of calibration; 5-point calibration or 9-point calibration.
4. On completion of the calibration step, a new window will emerge as shown in step 4. To make sure that the eye tracking process is accurate, the user's eyes should be focused on the middle circle as illustrated in step 4.

Procedure of collecting data using the eye tracker technology

A calibration procedure for each participant is necessary so as to obtain accurate eye movement data before utilizing the eye tracker. Once the calibration procedure is completed, the areas of interest are determined so as to further evaluate the gaze data for the interest (Lai et al., 2013).

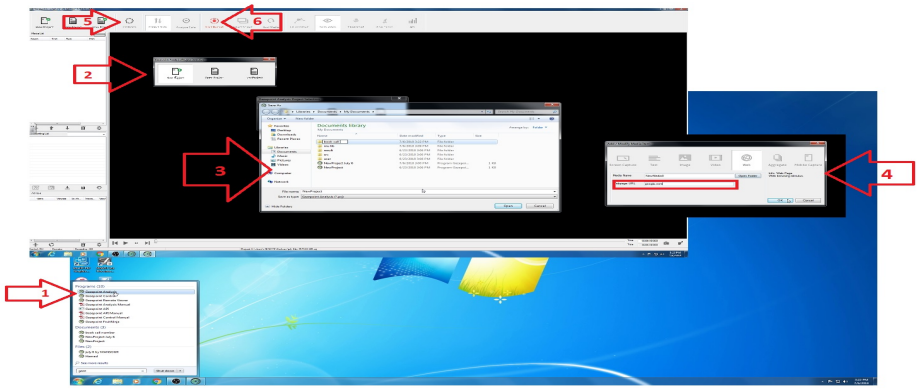

Figure 2: Steps of Collecting Data

Steps of Collecting Data:

1. Once the user has determined that the eye tracker is accurate, the user should click on the Start Key as illustrated in step 1 of Figure 2 and choose 'Gaze-point Analysis System'.
2. The user will then be required to create a 'New Project' as shown in step 2 in the Figure above.
3. The user will be required to save the project as shown in step 3 in the Figure 2.
4. The fourth step provides for 7 options as shown in the Figure 2. The options include; screen capture, text, image, video, web, aggregate, and mobile capture. In this step, the user will be required to choose the web option.
5. Calibration of the eye tracker will be carried out again so as to ensure that the eye tracking process is accurate.
6. Upon completion of these steps, the user will be ready to begin the session by clicking on the start record button as illustrated in step 6 in the Figure 2, and the user should click on the same button (Start) to stop recording.

Procedure for analysing data

The Remote Eye Tracker provide different methods of date that can be analysed such as visualization, area of interest (AOI), think aloud, and others. This project covered how to choose visualization map and create area of interest and how to export date to be used.

a. Visualization

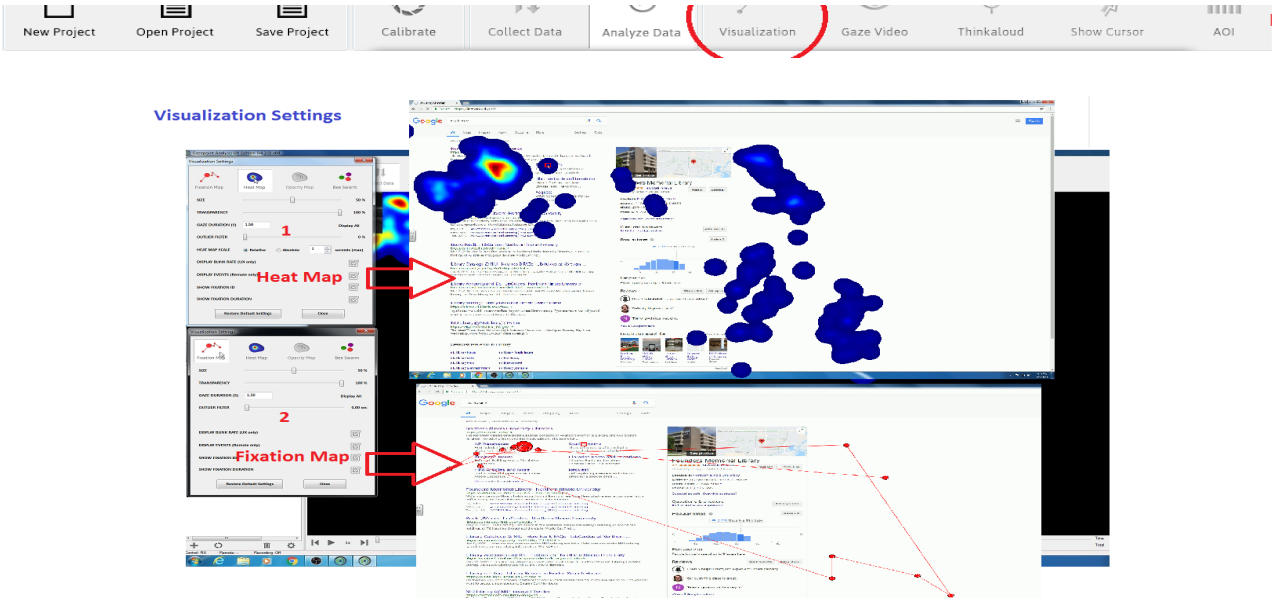

Figure 3: Visualization Setting

Steps of Data Analysis:

1. The program provides different kinds of visualizations that show the most area of focus of the user. Once the user completes the session and stops recording, the user is required to click on the visualization button as illustrated in the first step of Figure 3.
2. Once the user clicks on the visualization button, a new window will pop up. This window contains four options (Fixation Map, Heat Map, Opacity Map, and Bee Swarm). In this project, only fixation map and heat map were used. Figure 3 shows examples of the two options and demonstrates how the user can complete

the task. Once the user has completed these steps, the data will be available on the excel sheet summary when exporting the data, as shown in Figures 5 and 7 below.

b. **Creating Area of Interest (AOI)**

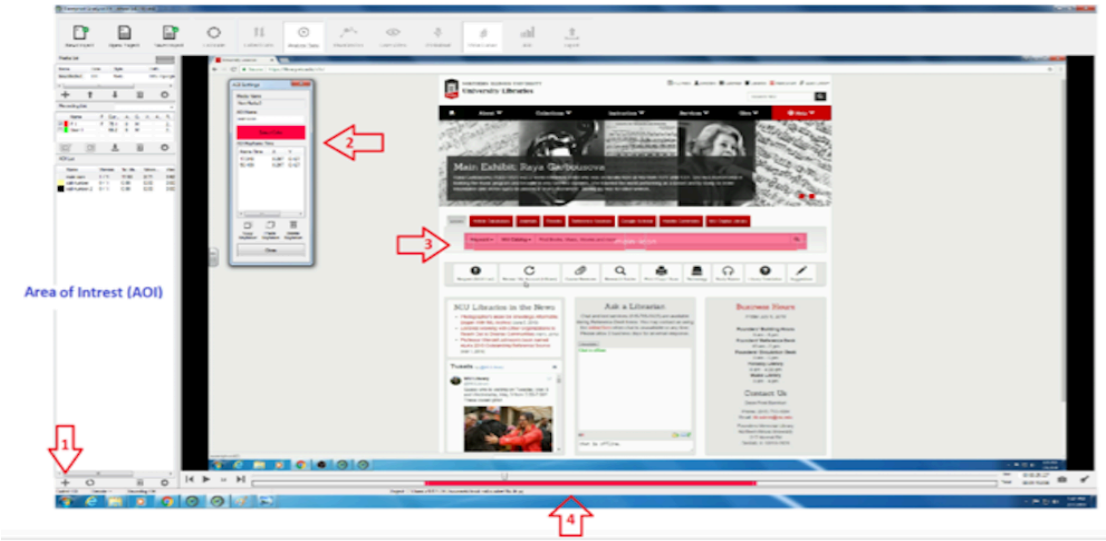

Figure 4: Create Area of Interest (AOI)

1. As shown in step 1 in Figure 4, the user should click on the + button to start creating the AOI.
2. A new window will pop up and the user will be required to choose the color of AOI and name of it as shown in step 2.
3. The user will then determine the AOI by drawing a box as shown in step 3.
4. The user can adjust the time of the box of AIO from the bottom tap as shown in step 4.

c. Export data

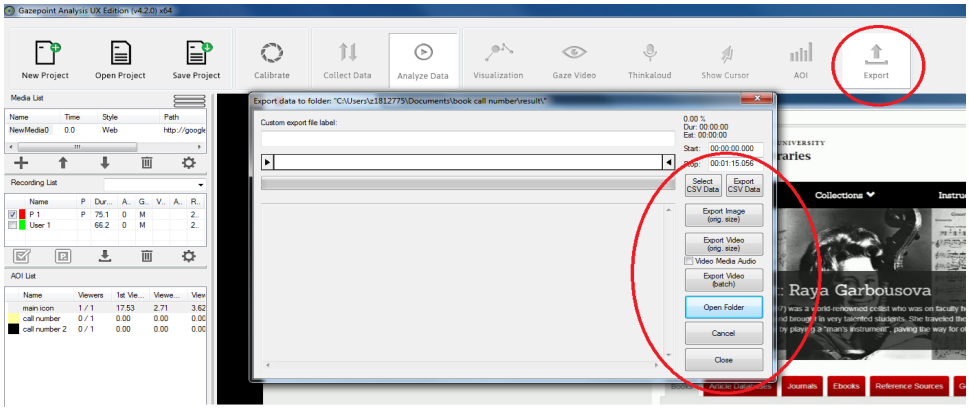

Figure 5: Export Data

1. Once the user has completed the task, the data can be exported by clicking on the Export button as shown in Figure 5. This feature provides an option for various types of data such as video, images, and excel sheet (CSV) as shown Figures 6 and 7.
2. The user can select the specific type of data to be exported by clicking on it as shown in Figure 5.
3. The user will then be required to click on the open folder button to find the data as shown in Figure 6.

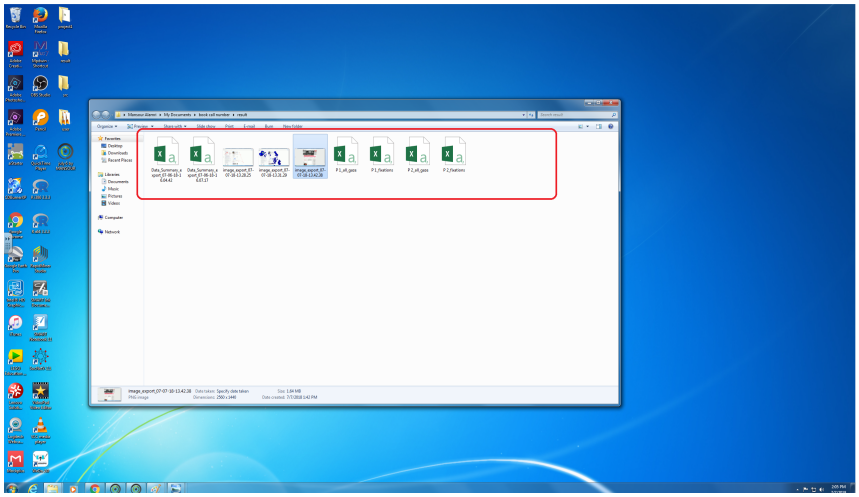

Figure 6: Example of Exported Data Folder

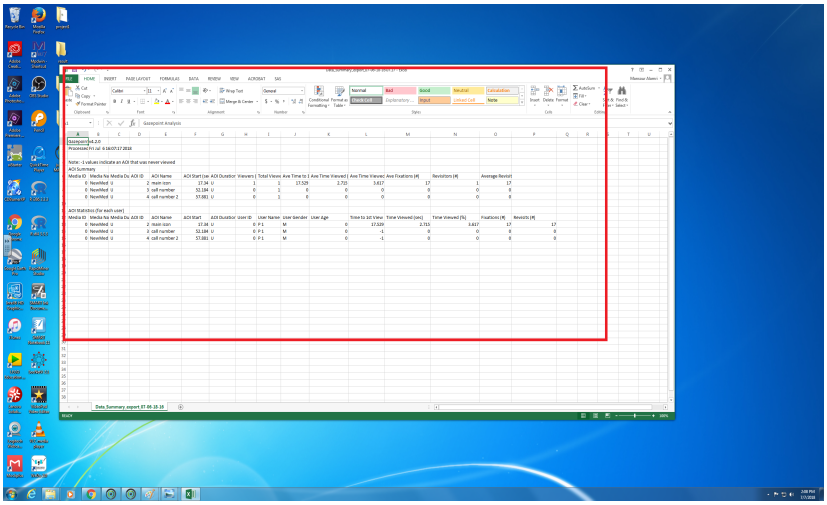

Figure 7: Example of Exported Data Excel sheet

Conclusion

This paper is an overview of Remote Eye Tracker technology. It focused on Gazepoint Control System and Gazepoint Data Analysis. The advantages and disadvantages of this technology were briefly described. Finally, this paper included steps of how to use this technology, how to collect data by this technology, and how to export the data.

References

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