Research of Eye-Tracking as a Possible HCI Assessment Method

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I. ABSTRACT

The use of Eye tracking methods in research has increased of utilization in the later years, and it has demonstrated to be an effective method to capture a realistic reaction of the user by reading it's eye movement, that we can asses: the user performance with the product, the item in our project attracts the user attention and what instead confuses and strains the user. We will first address the diverse parameters the eye tracking method offers, to then tailor a report paper where we analyze our observer's performance. This paper provides an overview on eye-tracking as a research method, and it will showcase the main reasons why eye-tracking has an HCI method is effective in a game project. To support this claim, this paper will reference different information gathered by other papers on the subject, to then provide a structure of how the interviewer should approach the interview.

II. KEYWORDS

Eye tracking, HCI assessments

III. INTRODUCTION

HCI (Human-computer Interaction) has been one of the most important aspects of Application engineering since the conception of the computer. A user interface is a mediator between the user and the tool, and the simplicity and the accessibility of the object are vital for them to allow the viewer to have an enjoyable time with the application. Understanding this has always been a challenge for the researchers. Research techniques such has Heuristics, that have been talked by papers like "Exploitation of Heuristics for Virtual Environments"[1] are described to be used partially, or have adapted to the needs of the interviewer. In HCI, there are different ways to approach the user about it,[2] in this case, for a video game project. The observer will be judged using a scientific approach, gathering data about the user performance through an experiment which asses the viewer attention and focus. Mr Richard E.Mayer[3], in his paper, suggests that: "The eye-tracking methodology used in each of the studies in this issue offers a unique opportunity to contribute to understanding the learners perceptual processing during learning. Thus, in this issue the authors go beyond asking simply what works? or when does it work?"(Mayer, 2010, section 1). By this, he explains how we, as the interviewer, we can directly read the way the Observer is experiencing the media, what attracts their eye and what drives them away from it.

IV. WHAT IS THE OUTPUT OF EYE-TRACKING

Eye-tracking outputs multiple values that would not be possible to obtain in other methods. These are the different outputs:

A. Eye-Movement patterns

In the "Eye Tracking the Visual Search of Click-Down Menus"[4], it mentions, in the models used to verify the data, it concerns about the movement of the eye. This is important to understand where the user is looking and the way he's scanning the application, to see if the movements are erratic (signalling a confusing data display) or if the observer needs to backtrack (signalling confusion or too complex designed UI).

B. Eye Fixations

In the paper "Identifying Web Usability Problems from Eye-Tracking Data"[5] describes fixation has a brief moment where the eye is in a static position, and it is correlated to when the observer is focusing on a part of the application. The time spent in each fixation can pinpoint the which material the user finds interesting, and which material does not matter to them.

C. Saccade

A saccade, as it's defined in the last paper[5], it the fast movement of the eye from a fixation to another. This can determine how fast the Observer finds a new point of interest and how far is eye has to move to find it. A constant Saccade timing can determine a cohesive and coincided work, an erratic one can signify possible confusion of the observer, or poor placement of the elements on the screen.

D. Strain and mood

In "The Eyes Never Lie: The Use of Eye Tracking Data in HCI Research"[6] they have found in their research that the diameter of the pupil is directly connected to the mood of the observer. They observed that when it was given a harder task, the pupil of the user would constrict. Another strain signal is blinking. Blinking is very well described as a relief mechanism by Mr Eric Ponder[7] as: "The rate of blinking is closely related to the "mental tension" of the subject at the time, and in all probability the movements constitute a kind of relief mechanism, whereby nervous energy, otherwise unutilised, passes into a highly facilitated path. " (Mr Eric Ponder, 1927, page 110). This 2 alarm flags can signal the overall mood of the observer, and if not addressed properly they might drive off certain users away from the project out of frustration.

V. HOW TO UTILIZE THESE OUTPUTS TO TAILOR A RESEARCH

Now that we know what this method returns, we can now write down a possible interview ethic and queries that we need to fill during our experiment. Questions for an Hypotetical game scenario should be in the lines of:

- Is the player looking at this particular UI?
- is the player performance relatively smooth?
- whats the ratio of saccades and fixations?
- Is the player experiencing any kind of strain?
- if any, can you identify the problem?
- if the player looking at a menu, how fast they can research a particular item
- does their Eye pattern follow a normal behaviour or they have to backtrack a lot
- during gameplay, is the feedback of the game acknowledged by the player.
- if there are multiple UI on screen, which one as more focus

We can note that this questions are not made to the player verbal feedback, but they are tailored to their physical reaction. This will ensure a more genuine feedback from the Tester. Now that we tailored the questions, we can also manipulate the product in order to recive a wider range of feedback by the observer. In a research article made by the NNGroup[8], they wanted to demonstrate how non-interactive or flat UI is not interesting to the player. The way they researched this event was by creating 2 versions of the same product with small tweaks. This then was feed to 71 different users, each receiving one version. The Eye-Tracking method of assessment revealed that the Web page with flat-non interactive UI would give a harder time to complete tasks by the users, while the ones with stronger modifiers (Like shaders, Hyperlinks, animation, etc...) would be easier to be utilized by the viewer. In the creation of my assessment project, multiple versions of the project should be utilized as a valuable tool for design decisions.

VI. CONCLUSIONS

In conclusions, this paper has exposed the various reasons why Eye tracking is a valuable Assessment method and why it should be explored more by interviewers during UI creation. We also have listed the various outputs this method can provide and how we can exploit them to our advantage of creating an assessment.

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