

Evaluating the Usability of Applications Using Gaze Tracking

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An important part of software development is properly designed user interface, because poor usability is not tolerated by users who simply choose another application, especially in web applications. Users should be able to interact with application with ease, regardless of level of complexity of the application logic [1]. The best way how to determine level of usability in an application is user testing with real users, because it provides direct information about how people use application and it shows to us problems with the specific interface being tested. There are several usability methods that can be used to obtain data from testing. We can use this data to identify usability problems in interface design and then developers can perform the necessary changes in interface design [3].

Now we can use eye tracking to obtain more information on what draws the attention of users or where the users search for information in application. Eye tracking is technique which record eye movements while user is looking at stimulus. The eye tracking is an appropriate usability testing tool because of eye-mind hypothesis, which infers the link between what a person is looking at and their cognitive activities [2].

First step in our research was to conduct usability study which consist of 5 different tasks in web application of three mobile operators. We were using eye-tracking and also we were recording participants screen and mouse, keyboard events. Six participants joined this study and then we make a qualitative evaluation. Based on the results of this study and also based on another research in this area [1][5] we picked up few usability problems in web interfaces and eye-tracking metrics which we used to design rules for identifying this usability problems. We aimed on three usability problems which are action buttons or links which design or label is confusing for user and second problem is the wrong position or design of error page which appears after form validation, so is hard to notice this message for user. The third usability problem is the page in which user expect some information or functionality, but this page does not provides such

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information. This usability problems were also described in *Claudia Ehmke's* research [1]. For each of these three usability problems we define rules consist of eye-tracking metrics which creating patterns together with mouse and keyboard events and also positions of areas of interest. In our case areas of interests are DOM elements of webpage. In our method we are using large scale of metrics like time to first, fixation, duration of fixations, length of saccades, percentage of reverse saccades, convex hull area of scanpath, transition density[4] etc.

We conducted another experiment which was aimed on this three usability problems. Experiment have two versions with ten tasks and each of this task was in different web application. Half of the web applications was edited so it contains one of these usability problems. After each session with participants we show them a record of their screen with fixations and make retrospective think aloud to obtain more information about their decisions and behavior. We have 7 participants and we evaluated this study qualitative, but also quantitative with metrics which was computed by our method. Based on results we conclude that our method can identify proposed usability problems and we improved our method by creating more specific rules for identifying usability problems.

The final experiment which had quantitative character have same structure like the previous one, but it was coupled with more tasks. In this session fourteen participants take apart. Data which we obtain was analyzed by our method and it was able to identify confusing button with precision about 80%. Error message after unsuccessful validation which was harder to notice for participants because of design or wrong position was detected with precision 79%. We are also able to determine whether page have expected information or not, but not in all cases, because we notice similar behavior on homepages when users try to find demanding link in menu. Because of this it is hard to tell if it's right detection or not. We also make a statistic t-test to prove that metrics which we are using are significant or not. This t-test also prove that our hypothesis was correct and it is possible to identify quantitatively this usability problems with eye-tracking metrics which we proposed.

References

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