A WEBSITE USABILITY TESTING TOOL

Franc Novak[1], Denis Špelič[2], Borut Žalik[2]
[1]Jožef Stefan Institute; Jamova cesta 39, 1000 Ljubljana
[2]FERI- University of Maribor; [2]Smetanova ulica 17, Maribor
Phone: +386 1 477 33 86, +386 2 220 74 15
e-mail: franc.novak@ijs.si, denis.spelic@uni-mb.si, borut.zalik@um.si

ABSTRACT

This paper presents a low-cost website usability testing tool that records user's mouse movement when performing search query on a web page. After a given time-out the web page is blurred and only some region around the mouse cursor remains transparent. The tool can be regarded as an automated version of the conventional squint test and can be used for the validation of the website design from the perspective of user cognitive load.

1 INTRODUCTION

Visual design is a fundamental issue of graphical user interfaces implemented in electronic systems since the first bitmap displays appeared in the early 70s of the last century. Beside elegance and attractiveness, which are the attributes of aesthetic relevance, visual design is intimately concerned with the selection of the employed visual elements in order to enhance user interaction. As K. Mullet and D. Sano state in their fundamental work [1], [2], the visual designer enhances communication by carefuly selecting the elements to be emphasized. Reducing a design to its essence, regularizing the elements of a design and combining elements for maximum leverage are established techniques for the simplification and refinement. Appropriate balance of scale and contrast is another important issue and different techniques for managing their relationships have been proposed, among them the squint test, which is also the subject of our contribution.

As suggested in [2], squint test is a helpful technique for establishing perceptual layers, sharpening visual distinctions and revealing figure/ground relationships of a given design. In practice, squint test can be performed by simply partially closing the eyes in order to distort the vision of the display. From the perceived shapes of the displayed elements one can establish a high-level view of the visual hierarchy of the design. The squint test puts the design through a quick checklist of Gestalt principles to see if they've been applied correctly to achieve the design's purpose [3].

Visual analysis can be used for understanding how visual information functions for its intended audience and purpose. A five-step visual analysis process described in [4] employs squint test when analyzing the nature of visual communication. Squint test is used for tracing the eye path and identifying the major visual elements that draw user's attention. As the author states, the proposed procedure was originally developed with a goal of providing common framework and language for both design evaluation and group communication. The ultimate goal of the performed visual analysis is to increase the quality of the resulting information product. Similar application of squint test is proposed in [5].

Advances in semiconductor technology in the 2000s offered new possibilities of tracing eye movement. The popular eye-tracking technique employs a camera that focuses on both eyes and records their movement as the viewer looks at some kind of stimulus [6]. Extensive research and application of eye-tracking technique in usability testing has been reported by J. Nielsen and K. Pernice [7], [8]. Although the eye-tracking can be regarded as mature and widely adopted technique it still faces some problems due to the difficulties in calibrating the instrumentation. As mentioned in [9], eye tracking equipment may reduce the test validity by notably slowing the system response or by requiring users to re-calibrate between tasks. And the last but not least, the cost of eye-tracking equipment may well prove to be prohibitive to some, and it is possible that similar results may be achieved by a less costly procedure.

In this regard, S. A. Johansen and J. P. Hansen [9] investigated the validity of two low-cost alternatives to eye-tracking technology. In the first case they prompted the users to report from memory on their own eye movements during a single web page search. In the second case they asked some experienced web designers to predict the eye movement of a typical user. Performed experiments have shown that users could remember 70% of the web elements that they had seen while the designers could only predict 46% of the visited elements. Achieved results are not perfect but they do justify further research.

It should be noted however, that requiring the user to memorise his/her part of a search on a web page repesents a cognitive load which might in some cases prove to be a limitation. On the other hand, the more clear and consistently structured web page the easier way to browse it and less cognitive load required memorizing the performed search. The approach presented in this paper exploits the fact that a well-designed website requires less cognitive load when performing a search query and vice versa. Recording and analyzing successful or unsuccessful attempts of a given search query provides useful

information to the designer for improving the website. A squint test is employed in order to more clearly expose possible weakness of the design. After a given time-out the web page is blurred and only some region around the mouse cursor remains transparent. The movement of cursor is recorded as the user tries to fulfill the requested task. The developed tool that can be regarded as an automated version of the conventional squint test can be used for the validation of the website design.

At this time, a prototype version of the tool has been implemented and tested only at some elementary usability test scenarios. Initial results are promising and we hope that we shall be able to provide some experimental case studies in the following days.

Since the reported website usability testing tool shares some similarity with eye-tracking, let us briefly describe the basic features of this technique.

2 BASIC FEATURES OF EYE-TRACKING TECHNIQUE

When the user observes a web page his/her eye movement is not smooth. Instead the eye moves and rests at a certain position and moves again and rests at another position, etc. The fixations that typically last around 200 ms during reading a text and 350 ms when observing other scenes can be recorded. The resulting data can be visualized in the form of a heat map or a gaze plot.

A heat map is a a graphical representation of data where the individual values are color-coded according to the amount of fixation locations at individual points of the observed screen. Presented data can originate from a single user or a group of users accessing the same document or screen. Although most of the reports employing eye-tracking refer to the visual analysis of web pages, the technique can also be applied for the analysis of printed documentation, manuals, etc.

A gaze plot is a visualization of the sequence of fixations of a single user. A series of enumerated dots indicates the sequence of user's eye movements. The size of a dot corresponds to the time that the user spent at the given fixation. This visualization technique is specially useful for monitoring individual user's eye movements and detecting possible difficulties when localizing the desired element or information on a given document or a web page.

The following illustrative example is borrowed from OGAMA (OpenGazeAndMouseAnalyzer): An open source software designed to analyze eye and mouse movements in slideshow study designs [10]. For the music slide shown in Figure 1, both the heat map and gaze plot are shown in Figure 2. In the heat map, green areas indicate short fixations, yellow areas correspond to increased durations of fixations, while red spots show the places with most intence fixations.

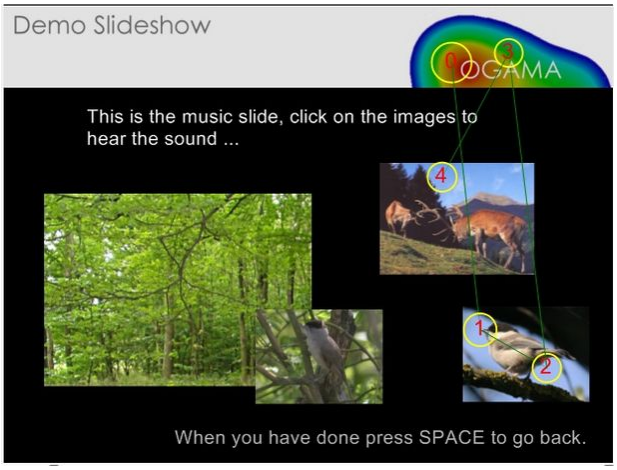

Figure 1: *A music slide (courtesy of OGAMA)*

Figure 2: *Heat map and gaze plot of the music slide (courtesy of OGAMA)*

3 WEBSITE USABILITY TESTING TOOL

As mentioned before, the developed website usability testing tool is actually an automated version of the conventional squint test with additional features of recording user's cursor movements and generating reports in terms of heat map, gaze plot and video recap of the performed actions.

In the first step, the user gets the instructions of the task to be preformed. This is typically a search query on a given website. The target website is presented to the user for a short time (a few seconds) and then it is blurred and only some region around the mouse cursor remains transparent. The user continues his/her search by moving the mouse cursor around until the goal is reached or the action is suppressed (i.e., the user gives up, unsuccessful to accomplish the task).

The following figures illustrate individual steps when the user was requested to to find the information about a bank loan at the website of Nova Ljubljanska Banka (NLB) for a new apartment. Figure 1 shows the initial dialog screen which explains the required task. The target website of Nova Ljubljanska Banka is shown in Figure 4, and its blurred version in Figure 5, recpectively.

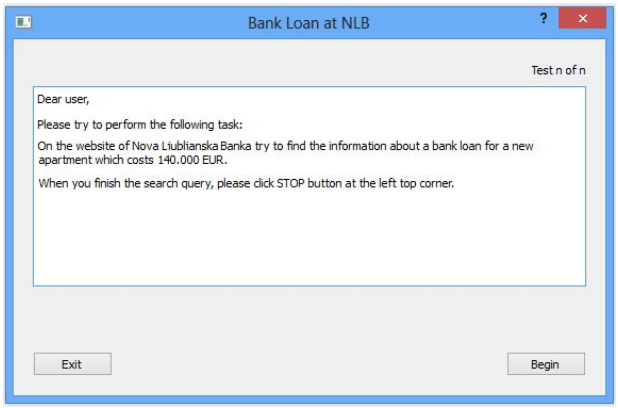

Figure 3: *First step: Description of task*

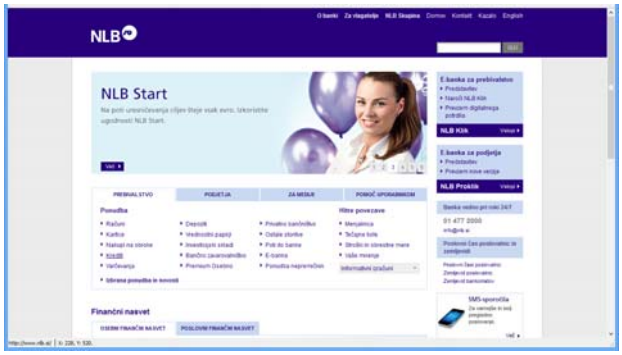

Figure 4: *NLB website (unblurred)*

Figure 5: *Blurred NLB website*

Heat map for the above case is shown in Figure 6 and a gaze plot of one of the participants is shown in Figure 7. While the heat map is used as a general indication of quality of a website, a gaze plot reveals individual parts of the website that impose particular difficulties to users.

Figure 6: *Heat map*

Figure 7: *Gaze plot indicating performed cursor movements*

For complex web pages, the user can (optionally) deblur the screen for a moment and continue the search query. The moderator can program the number of the allowed deblur attempts and their durations as well as the level of blur and the amount of space around the mouse pointer. Moderator's user interface is shown in Figure 8.

Heat map provides a quick overview of most frequently visited parts of the website, yet it does not reveal other parameters such as the sequence of visited elements on the screen and consequently the length of the cursor path

performed for the given task, which are relevant for assessment of efficiency of the analyzed website and identification of possible problems in navigation, layout design and visual distinction of elements of GUI. For this purpose, a final report for each participant is generated. An example is shown in Figure 9. Beside essential data collected during performed task, the report also includes participant's comment which may prove useful in future attempts to improve the website design.

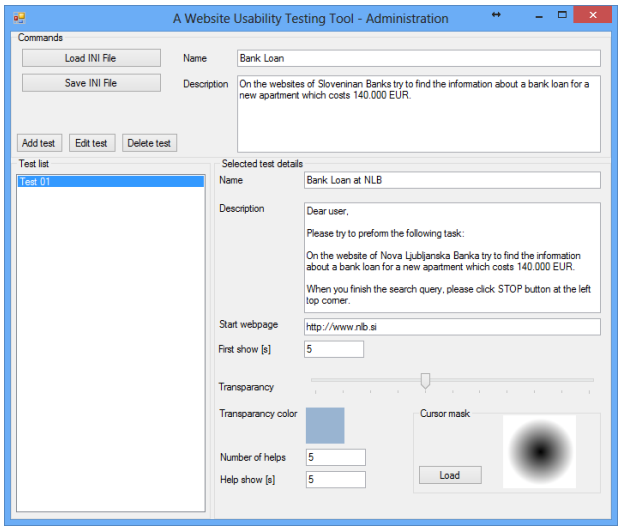

Figure 8: *Moderator's interface*

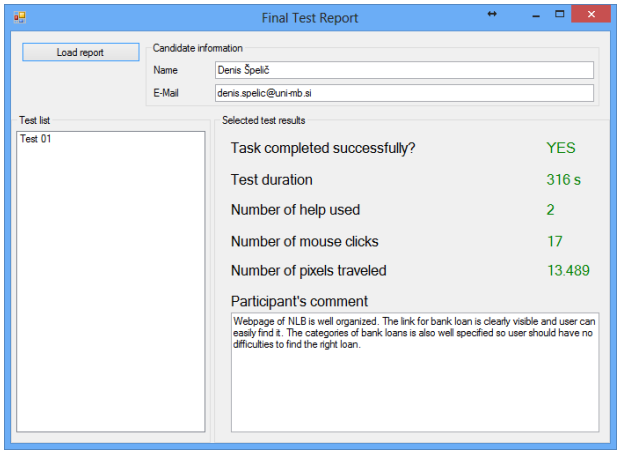

Figure 9: *Generated report*

Originally, the tool was developed as a supplementary aid for the course Human – computer Interaction. It can be used for the evaluation of web pages from visual communication point of view. Besides, it was also intended for practical exercises in usability test. Collected data can be exploited to acquire contextual information that might be helpful for designing user interfaces for specific target audience.

6 CONCLUSION

Presented user interface efficiency evaluator is a platform independent application written in C++ using the Qt library, that helps webdesigners determine how intuitive a website is. Proposed approach can be regarded as a low-cost alternative to eye-tracking. Furthermore, it can also be used for experimental case studies of assessing mental load imposed by a given website search query, as well as for acquiring contextual information from specific user groups, which may prove helpful in interface design in assistive technology applications.

7 ACKNOWLEDGMENT

This work was partially supported by the Slovenian research Agency under grants P2-0098 and P2-0041. The authors would also like to thank Klemen Forstnerič for his contribution in implementating the tool.

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