

RealEYES - Efficient User-Studies with Gazetracking

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Introduction

As products get more and more rich and complex features, usability becomes a major factor for their success on the market. The usability of products can be evaluated by user studies. User studies are carried out in a lab environment, where typical users are observed while interacting with the product. The observation can be realized by recording video data from test persons' mimic reactions, a screenshot video of the tested application, audio comments, eye gaze position, mouse and keyboard input, physiological data (e.g. skin conductance) and application-specific data (events).

Huge amounts of data result from this approach. It is difficult to process all those data and find the critical points where usability problems occur. To process video data resulting from such a user study, eight to ten times the video's running time is typically needed.

Therefore few usability labs utilize this approach in usability studies, even though the objective data and easy presentation of the usability

problems found have clear advantages over subjective data gathered from e.g. questionnaires.

It is clear that efficient methods and tools have to be developed before such user studies will be adopted by the usability evaluation market.

The organization of the framework

The RealEYES framework as described in this article implements a set of efficient methods and tools to support user studies. The framework consists of the following components: Recorder, Analyzer, Statistics and Questioning (see figure 1).

They all work on a common information backbone comprised of AVI and XML files, where the AVI files contain video and audio streams as well as gaze, mouse, keyboard, event and physiological data, and the XML files contain meta data and intermediate test results. Thus, no lengthy conversion of data is needed when working with the tools in the RealEYES framework. All tools are equipped with sophisticated export functions for easy integration of test results into a usability report.

German Abstract

Die Usability, also Benutzer- bzw. Benutzungsfreundlichkeit, von Produkten lässt sich mit Hilfe der Usability Evaluation überprüfen. Die Usability Evaluation umfasst z.B. die Anwendung von Blickverfolgung und Videoaufzeichnungen in Benutzer-Studien. Dabei werden typische Nutzer in einer Laborumgebung bei der Bedienung der zu testenden Software beobachtet. Die hierbei anfallenden Datenmengen sind jedoch sehr gross, so dass ihre Auswertung viel Zeit kostet.

Gegenstand des vorliegenden Artikels ist das RealEYES Framework. Das Framework besteht aus den Werkzeugen Recorder, Analyzer, Statistics und Questioning. Die Werkzeuge verarbeiten Testdaten aus AVI-Dateien und Metadaten aus XML-Dateien und ermöglichen eine effiziente Durchführung von Benutzer-Studien.

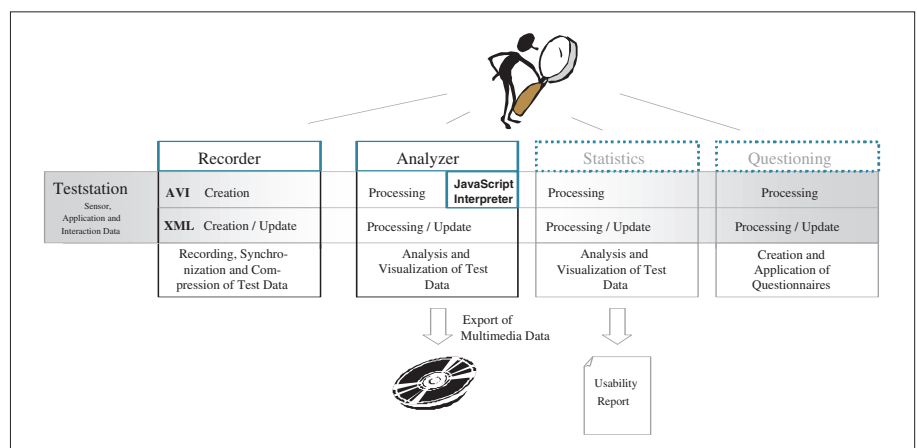


Figure 1: Structure of the RealEYES Framework



Figure 2: Temperature Grid Visualization

The tools of the framework

The most important tools in the RealEYES framework are the Recorder and Analyzer. The Recorder manages the recording of all data. It requests the meta data, captures, synchronizes and compresses the test data and writes them to a single AVI file per session. The Analyzer is the main analyzing application that replays all video streams and visualizes the other data. Many standard and customized visualizations of the screenshot video together with the gaze and mouse data are available (e.g. the well-known temperature grid; see figure 2). The visualizations provide the usability expert with very good insight about the actual user interactions with the tested product. New visualizations may be implemented by an advanced user of the system and plugged into the Analyzer.

Crucial for an efficient analysis of the recorded data is quick and convenient navigation. The Analyzer supports the navigation using standard video player controls and event marks. Event marks may be inserted automatically by the Recorder, manually by the usability expert, or semi-automatically using scripts written in JavaScript that run in the Analyzers script engine. Regions of interest may

be defined and simple statistic calculations can be done on them. The regions may not only be defined geometrically, but can also be restricted in time or to tasks of the user study. Other tools of the framework may reuse the defined regions. To improve the ability to test web applications that often do not fit on the screen, both Recorder and Analyzer support and obey a scrolling region in all their features.

The two other tools in the RealEYES framework are Statistics and Questioning.

Statistics allows for complex statistical analyses to be accomplished. Furthermore, in contrast to the Analyzer tool that only processes data from one session (one testing user), the Statistics tool is able to analyze and visualize data from all sessions of a user study. The Statistics tool is therefore able to directly answer questions like »Did the majority of testing users see the navigation buttons? «.

Questioning allows the usability expert to create and utilize online questionnaires. The data gathered from questionnaires is written to the XML file and can be processed by the Statistics tool.

Conclusions

This article introduces the RealEYES framework with the tools Recorder, Analyzer, Statistics and Questioning. Using the RealEYES framework the time to process test data from user studies can be reduced considerably. The export functionality of screenshot videos and screen dumps enhanced with visualizations of gaze data or test results allows convincing usability reports to be created. The RealEYES framework was successfully employed in a number of user studies of web applications, advertising effects, and of the cognitive load of computer users. Future work includes further refinement of the Statistics tool with export functionality to major statistic software packages, more visualizations, and a wizard interface for standard analyses. In addition, an embracing tool is planned that guides the usability expert through the whole process of a user study and sequentially calls the other tools of the framework.

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