

# Collaborative Visualization of Web Interactions for Usability Testing

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**ABSTRACT:** We purposed collaborative visualization of recorded web interaction. Evaluation work takes time to analyze one by one. Evaluators easily discover some problems by displaying the interaction of some users coordinately. We developed ITR-Player (Web InTeRaction-Player) for collaborative visualization. Visualized data are mouse movements and gazing points. Evaluators can discover problems from difference of eye movement and common operations by visualized data. It leads to shortening at the evaluation time because users' behavior can be collectively analyzed.

**Keywords:** gazing point, eye information, web usability, visualization, pupil size

## 1 INTRODUCTION

The usability of Web sites are so important that it can influence the amount of sales. because users are unwilling to read Web pages with low usability, such as having pages that are hard to operate or understand, or pages that react differently from expectations. To create easy-to-use Web pages, an evaluation of usability is required. Web usability is evaluated to discover the problem on a website generally.

There are usability evaluation tools and visualization methods for supporting usability testing. But the tool is original for recoding. So interface design is not a usual browser design. There is visualization method of users' interactions. It can support one user's interaction in detail using gazing points. But it is difficult to analyze some users' interaction at once. There is an eye tracking tool using web camera [San Agustin et al. 2007]. Evaluators can record users' interaction data easily using these tools. Therefore evaluators require the environment to evaluate with comparing some users.

We developed ITR-Recorder (Web InTeRaction-Recorder) as a Firefox add-on for recording users' usual interaction. And we developed ITR-Player (Web InTeRaction-Player) for collaborative visuali-

zation. It leads to shortening at the evaluation time because users' behavior can be collectively analyzed.

## 2 RELATED WORKS

There is a usability evaluation tool WebTracer that support recording and analysis of a gazing point and operation while a user is browsing a website [Nakamichi et al. 2007]. The tool is different from appearance of usual browsers. It use original icons and do not support tab browsers. When a user browses a Web site, a new tab is often displayed. Such a user operation is not recorded in the tools.

There is heatmap for visualizing users' gazing point [Nielsen and Pernice 2009]. It can highlight focus parts of users. But low usability web pages include crucial problems are few in actual web sites. Some users' focus part is very likely to be non-problem. Evaluators should compare users' interaction in usability testing. Collaborative visualization of users' interaction can be help evaluation work.

## 3 ITR-RECORDER FOR RECORDING

We developed ITR-Recorder (InTeRaction Recorder) as add-on for Firefox to record the usual web interaction of the users. Firefox is used widely at companies or universities, and users increase. The users

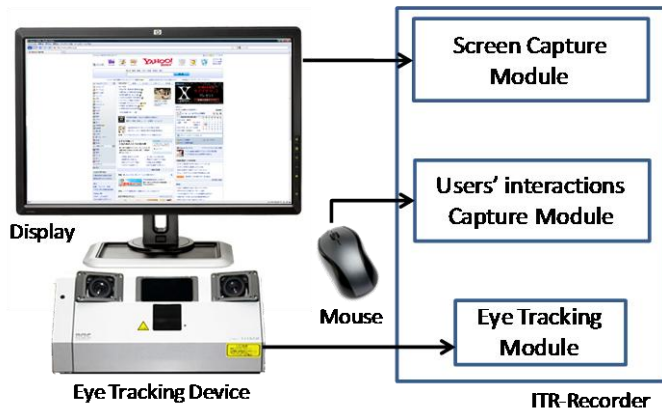


Figure 1. System Architecture of ITR-Recorder

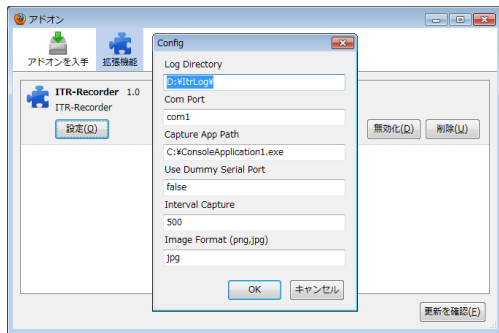


Figure 2. a Config Menu of ITR-Recorder Add-on

can carry out tasks of a usability testing in browser environment same as daily life.

ITR-Recorder is structured from 3 modules. It has users' interaction capture module, screen capture module and eye tracking module. System architecture of ITR-Recorder shows Figure 1. Users' interaction capture module made as an add-on. Screen capture module and eye tracking module made as external applications and called from the add-on application. Users' interaction capture module records mouse cursor coordinate, mouse clicks, mouse wheel movement, visited page history, and tab movement. These recorded data save as a chronology of events to log.txt. Screen capture module record web browser screen as image format files at regular time intervals. When web contents have a change, it records a screen. Eye tracking module records gazing point coordinate and pupil size from eye tracking equipment. These recorded data save as a chronology of events to gaze.txt. Eye tracking equipment for recording eye information is EMR-AT VOXER [EMR-AT VOXER]. Log.txt and gaze.txt are merged and saved as interactionLog.txt. and summarized data each pages based on interactionLog.txt save to summary.txt.

When a evaluator can set recording parameters using the config menu of ITR-Recorder add-on (Figure 2). Evaluators can set easily recording image

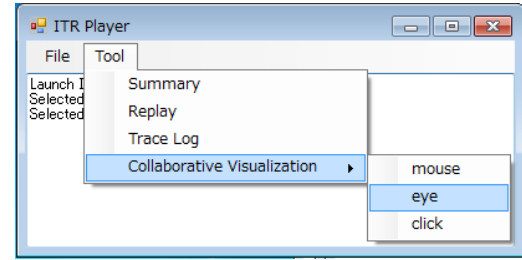


Figure 3. a Tool Menu of ITR-Player

format(JPEG, PNG) and recording interval time using the menu.

#### 4 ITR-PLAYER FOR ANALYZING

ITR-Player (InTeReaction-Player) is a visualization tool of users' interaction for supporting usability testing. It visualized users' interaction based on recorded log by ITR-Recorder. ITR-Player is an independent tool not add-on tool. It provides four functions to support analyzing users' interaction (Figure 3).

##### 4.1 Summary function

Summary function can indicate the total data of an operation history by list for every page. The list of the reason for changes, the download time of data (a favorite menu, a link, key, etc.), browsing time, the distance of mouse movements, the number of scrolling, the number of clicks, the number of keystrokes, the distance of eye movements, and speed of eye movements (= the distance of eye movements / browsing time) can be displayed for every page. By using these, an evaluator can analyze how analysis of the features of each Web page and the Web pages were changed.

##### 4.2 Replay function

The recorded data and the pictures of Web pages are integrated and displayed. The user's operations are replayed by displaying an icon at the coordinates of a mouse (arrow) and a gazing point (circle arrow) on the screen of a Web page. The mouse click and wheeling which were recorded display generation of an event by the icon on a screen. In a lower right replay control dialog box, replay control is possible. Also the events and keystroke data recorded at the time is displayed. By the replay control button, usual replay, stop, and step replay is possible. Moreover, movement at arbitrary time is possible by using slide control. Thus, by various replay controllers, an evaluator can analyze the series of operations to observe in detail.

##### 4.3 Trace Log function

Evaluators confirm users' interaction data by displaying an interactionLog.txt using trace log function.

### 4.4 Collaborative visualization

ITR-Player visualizes more than one users' interaction using collaborative visualization function. When an evaluator analyzes users' interaction, he needs to select some log directory.

The function can display mouse cursor movements or gazing point movements on the same page from selected log directory (Figure 4 and Figure 5). Evaluators can analyze difference of users' interaction using the function.

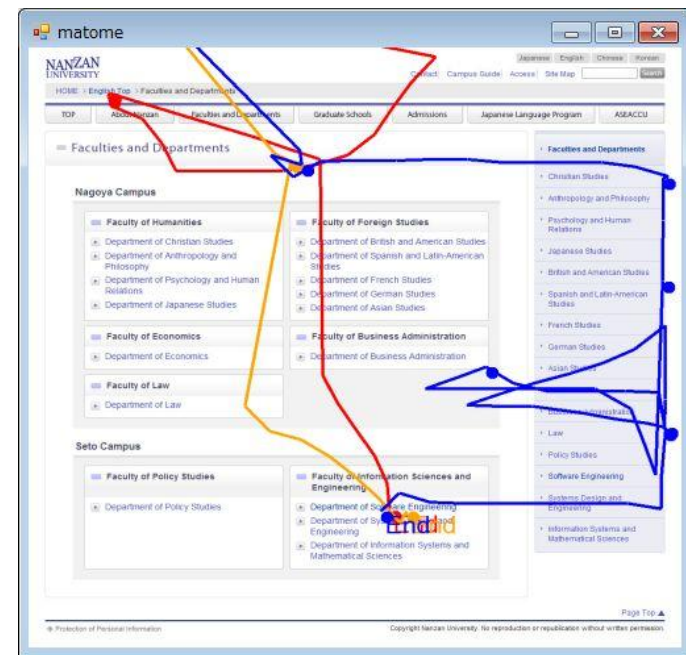


Figure 4. a Collaborative Visualization of Mouse Cursor Movements and clicks

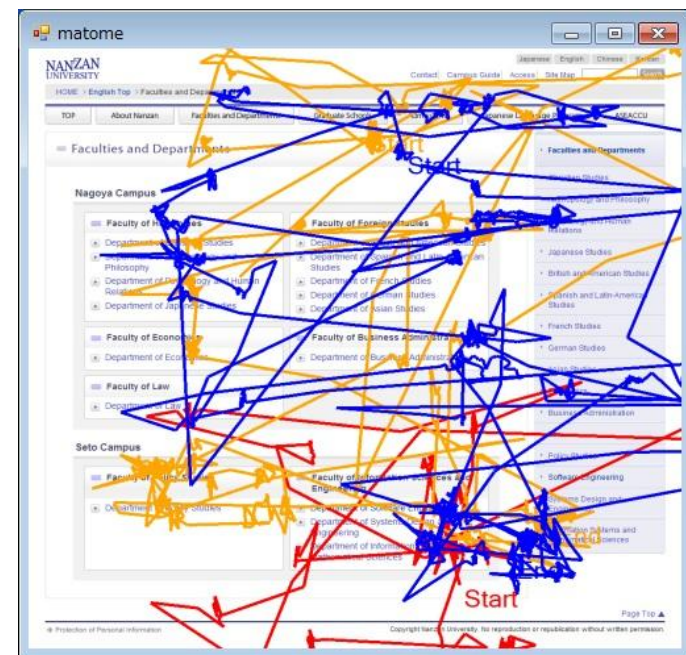


Figure 5. a Collaborative Visualization of Gazing Point Movements

## 5 DISCUSSION

We consider the advantage of a collaborative visualization of users' interaction data. In the actual web sites, there are few low usability pages include crucial problems. Evaluators need to focus different interactions of users.

In a long scrolling Web page such as figure ?, most of users use a mouse wheel for scrolling. But a user sometimes clicks a scroll bar for page scrolling. Therefore the user has bad impression to the page.

Most of users focus to link title "software engineering" from visualized gazing point. Because users must click "software engineering" to find objective information. But there are users' gazing point over other link titles. These links may be a cause of a low usability page.

The evaluator can focus his attention on the behavior that is different from many users by using collaborative visualization. Such analysis is difficult by the heat maps. Because heatmap is difficult to highlight few data.

## 6 CONCLUSION

We purposed ITR-Recorder and ITR-Player for supporting web usability testing. ITR-Recorder (InTe-Action Recorder) is recording tool of usual users' web interaction as add-on for Firefox. ITR-Player is a visualization tool includes collaborative visualization function. Evaluators can discover problems from difference of eye movement and common operations by visualized data using collaborative visualization. It leads to shortening at the evaluation time because users' behavior can be collectively analyzed.

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EMR-AT VOXER.  
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