

# Remote Navigability Testing Using Data Gathering Agents

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**Abstract.** Testing for web navigability is one of the most important steps in the design of web product. However, navigability testing is an expensive technique which requires the use of many human resources. The user behavior recorded in such kind of tests is usually affected by the artificial situation created in the laboratory. In order to avoid such kind of drawbacks, we have developed ANTS (Automatic Navigability Testing System), an application able to observe and to record spontaneous user behavior in his/her own home.

**Keywords:** Agents, Navigability Testing, Usability Testing, Remote Testing, ANTS.

## 1 Introduction

We are going to introduce a new system developed to help designers to build up web sites more usable. Before doing so, we are going to introduce basic concepts of usability and how this quality feature of web site can be measured. Then we will evaluate several different tools developed to measure usability, evaluating their advantages and disadvantages.

## 2 The Usability Lab

The success of any web site depends on the users who are going to use it in the future. Those users should find the site satisfactory, effective and efficient (ISO Ergonomic Requirements, ISO 9241 part 11: *Guidance on usability specifications and measures*) [1]. If the user feels uncomfortable while surfing the web, it would be very easy for him/her to close the browser and look for another web site. For a business, this event would mean a high waste of money as well as allowing rival companies to catch those clients.

If we want to know how the user's navigation performs, we have to make use of a usability laboratory. The usability lab offers powerful and precise tools to obtain tons of data which helps designers to analyze the weak points of their site: difficulty of use, misunderstanding of key features the interface, incompatibilities between the user's and designer's mental model and, of course, to user's interaction.

However, the use of physical usability laboratories has also a series of important drawbacks:

- The evaluation of the navigation requires a high precision and constant observation of the volunteers. The observation time is usually very long, so a lot of resources must be spent.
- Due to the high prices of the evaluation, the number of volunteers is usually small. Therefore, the accuracy of the results obtained decrease.
- Testers have to choose volunteers among people with the same cultural level of the intended target user, hopefully finding recruiting users whose behavior matches that of the average user, so it is difficult to discover new types of users not already identified.
- Volunteers know that they are being observed. This fact adds external noise to the evaluation process. Nervousness, confusion, and similar reactions are usually recorded by the usability laboratory video cameras.
- Knowledge about specific details of the experiment also influences the user's behavior when performing navigation tasks. Volunteers know what is expected from them, so they may adapt their own techniques of navigation to the model of navigation supplied by testers (designer's mental model).
- Usability evaluation makes use of computers that match with some specific technical specifications needed to run the application. The awful truth is that performance of the user's computers is usually far away from the performance of the laboratory computers.
- Since the evaluation of the usability takes place in a laboratory, testers usually miss how the user's computational environment affects user's behavior and performance.

In order to avoid the problems commented, we propose the use of a Remote Navigability Testing approach, replacing human observers by software data-gathering agents. An automatic data gathering process means a cheaper testing process, since the high costs derived from navigability testing are generally caused by hiring a laboratory and human resources for long times of observation.

Some of the advantages of this approach are:

- Users ignore the nature of the evaluation, as well as the role they are playing in it. They only interact with the system under testing.
- Users are not under pressure. They feel comfortable to explore the navigational map provided. External factors do not affect the test results.
- It is possible to obtain information about how the performance of the computer affects how users explore the site.

When the remote evaluation is carried out, the prototypes can be freely distributed as beta versions to be evaluated by all users interested in the application.

### **3 State of the Art in Remote Testing**

Next, we include the main features of some of the most important data gathering tools applied to navigability testing.

### 3.1 Ergolight

Ergolight [2] offers the Ergolight Interactive Site Usability Reports to evaluate a web site. That product allows the designer to obtain reports about the design problems that affect the user's experience. The report includes a list of pages sorted by cost of effectively. For each page, the reports also include a list of problematic links. To use this service, the designer needs a visit log for the site. Also, the domain is needed in order to allow the inclusion of links between the reports obtained and the analyzed pages. That log file should be created by the server automatically. The analysis report includes the following items:

- Site ranking. Evaluating the ease of use for the web access, and information quality.
- Site diagnostic. It evaluates whether the pages are hard to find, if they are going to irritate the users, if they are going to be displayed slowly, and so on.
- Statistics. It will shows statistics regarding the number of visits, , the percentage of inputs and outputs, the size of the downloads realized, the number of access to each page sorting by the size of them, and so on.

#### 3.1.1 Advantages

The number of variables analyzed regarding the user interaction is high. To see the results, we only have to access the result page. This page is always updated. It brings suggestions to improve those items that should be fixed. Each page is important. Concrete actions like downloads are important. The results include links to specific pages.

#### 3.1.2 Disadvantages

To use this service we have to know how the web server works. This program doesn't obtain information directly from the users. It obtains it and classifies it from the information included into the log archive of the web server. Since the results are mere statistical reports, if we need to increase the accuracy of the results obtained, it is necessary to increase number of visits to our web site.

### 3.2 WebMetrics NIST

WebMetrics NIST [3] offers a group of products to facilitate the task of determinate whether a web site is usable. This group is composed by:

- WebSAT (Web Static Analysed Tool). It indicates whether the HTML code carries out with the IEEE specifications or with the WebSAT usability guides.
- WebCAT (Web Category Analysis Tool). We can create different kinds of categories and different kinds of objects. Each object belongs to a category. During the test the users have to determinate which is the better category for a concrete object.
- WebVIP (Web Variable Instrumented Program). This product allows the insertion code into the pages to make automatic advice of how the user can do some tasks.

### 3.2.1 Advantages

The tools are orientated to make easier the web design, not to evaluate the web after it was developed. When the user is asked to perform any action, it is not required to learn new especial procedures.

### 3.2.2 Disadvantages

The division of the available features into different tools becomes a disadvantage when we it is required more than one tool for the evaluation. WebMetrics uses its own special format (called FLUD, the collaboration between different applications becomes complex.

## 4 ANTS

We have designed an agent-based tool called ANTS (Automatic Navigability Testing System) in order to provide support for remote testing. The design of ANTS is based on a client-server paradigm, using a design metaphor inspired in colonies of ants. Our system uses a large collection of different ants, which were specially designed for the purpose of gathering specific kind of data. For instance, our system uses text agents to determine user's typing skills, motion agents to measure the user's motion accuracy and so on.

Whenever web document is downloaded, the ant included in the web page is downloaded from the anthill (the ANTS server). When the document is displayed to the user, the ant establishes a communication channel with the anthill, which is used to send the data collected. An ant-assistant object located in the server-side (see figure 1) maintains the communication channel alive during the interactive dialog's cycle of life, collecting the information sent by the ant, classifying it, and sending it to the warehouse object commissioned to store it in the proper user model.

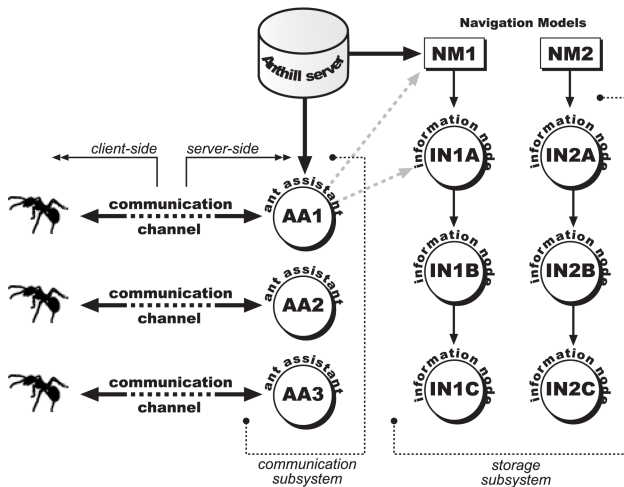


Fig. 1. ANTS design

The ants keep track of every action performed by the user in every user process, generating an abstract navigation model similar to those employed by the Object Oriented Hypermedia Design Model (OOHDM) [4]. This abstract navigation model is used to determine the landmarks, routes and mental models [5] employed by the users when they make use of user process of the application. This information is later used by the testers to determine the user's expertise degree in the use of the application [6].

Specialized agents increase the amount of gathered information or complement it for specific usability tests. When using standard ants we get valuable information about the navigation behavior of a huge amount of users but not for all. For instance, standard ants can get information about the links employed by the user when performing a mouse-based navigation but no information is retrieved when using a key-based navigation.

Visually handicapped users and any other users with similar special interaction requirements need to perform key-based navigation. In this case, the tab key is used to select the required link moving the focus from one link to the next one.

Obtaining information about the key pressed by the users along their navigation session is crucial in this kind of tests, so the standard ants are complemented by text-ants which are able to record any single key pressed by the user. This data is later used by the researchers in order to reproduce the navigation session for an offline analysis.

Mouse-based and key-based navigation can be analyzed separately in order to determine different navigation speeds, level of expertise and interaction requirements in both approaches.

ANTS also includes other agents specialized in gathering specific information to obtain a better view of the interaction requirements of the users. For instance, the motion-ant is able to obtain a mouse motion accuracy rating for each user of the project. This information is quite valuable in order to design the visual appearance of the web. For instance, if the average users are elderly people or any other kind of users with low motion accuracy, the size of the target objects in mouse pointing tasks (links, buttons, etc.) should be increased accordingly in order to make this task easier.

## 5 Conclusions

When using automatic remote testing tools such ANTS, data flows freely from the origin to the server storage system, where it can be analyzed off-line. As navigation takes place in the own user-computing environment, there is no need to assign expensive laboratory resources for testing.

Testers are free from the boring task of capturing data, so they can focus their efforts in analyzing the results obtained and improving the quality of the navigation maps. As there is no need to assign human resources for conducting user observation, the whole process of usability testing is cheaper.

We want to remark however, that remote testing does not pretend to be a substitution of classic usability testing. Our intention is to optimize usability testing for certain special tasks. Remote testing is able to detect actions but it is unable to observe how those actions are performed. For example, with remote testing it is quite easy to get the number of clicks on a button during a navigation session, but it is

impossible to know the difficulties that the user could have when he/she performed the click. That is a task where classic usability testing seems to be unbeatable.

**Acknowledgments.** This technology has been developed through projects IB05-152 SEELE: Automatic generation of Web Interfaces dynamically tailored to the requirements of different kinds of disabilities and PC-04-31 GeoFront: Real Time Collaborative Knowledge Manager System for Virtual Worlds. Funds provided by the Asturian Office of Science and Technology (FICYT).

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