

# Testing Google Interfaces Modified for the Blind

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## ABSTRACT

We present the results of a research project focus on improving the usability of web search tools for blind users who interact via screen reader and voice synthesizer. In the first stage of our study, we proposed eight specific guidelines for simplifying this interaction with search engines. Next, we evaluated these criteria by applying them to Google UIs, re-implementing the simple search and the result page. Finally, we prepared the environment for a remote test with 12 totally blind users. The results highlight how Google interfaces could be improved in order to simplify interaction for the blind.

## Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces – *User-centred design*

## General Terms

Design, Experimentation, Human Factors.

## Keywords

Search engine, user interface design, accessibility, usability, blind.

## 1. SEARCH ENGINES AND BLIND USERS

Web navigation is quite difficult for blind persons using a screen reader, since the pages are read sequentially, one row at a time according the page code structure, starting from the top left corner of the page and losing all layout, style and font information [3]. Search engine interaction is even more difficult due to the complexity of the interfaces and functions: actions take longer and tasks are more difficult since additional actions are required. Craven et al. [2] performed experiments on a sample of blind and visually-impaired users who carried out four information-seeking tasks, including the use of search engines. Visually-impaired users searching the Web for a specific piece of information took on average 2.5 times longer than sighted users. The efficiency gap was further quantified in [4], where, when executing a set of tasks, blind participants took twice as long as sighted users to explore search results and three times as long to explore the corresponding web pages.

Our results show that it is possible to have a great UI “look & feel” while assuring satisfaction and efficiency of use for all, and in particular for a blind user interacting via screen reader with a

voice synthesizer. We chose Google to show that UI interactions can be improved while maintaining the original graphic layout provided by the Google visual designer. Our design was completely user-centered since we took into consideration the special needs of blind users from the earliest stages.

Our approach involved modifying source code: grouping the most important parts of the interface and repositioning them in a more appropriate way in the code, adding shortcuts to make navigation faster and introducing sounds for alerting one user about important events. We took great pains to ensure that **the visual appearance of the pages was the same in the original and modified version**. We believe that when designing the graphic layout of the user interface one should keep sighted users in mind, but when structuring the interface code it is fundamental to consider the needs of blind users. For parsing search results, we used Google API and XSLT 4. Once the prototype was tested and revised by this paper’s blind author, we conducted qualitative usability testing with blind users who navigate via screen reader, in order to collect comments and suggestions and highlight any interaction problems.

## 2. USABILITY TESTING

The screen reader deals with web page content in a very different manner from visual rendering. Without knowing the structure of the interface, people risk spending a great deal of time exploring without ever reaching the important elements.

Figure 1 shows the screen reader’s interpretation of the original (left) and modified (right) result pages. Italics refer to words/sentences inserted by the screen reader, informing the user about interface elements (link, button, edit field, heading level and so on). New parts, added when we re-engineered the interface, are highlighted in bold. Note how the different order of the sections in the code has changed the screen reader’s sequential reading. In the modified UIs the results are the first elements announced. Each result is numbered and separated by a blank line (a pause) from the following while in the original UIs there is no clear separation between results, which may be confusing.

A test was sent to each participant in electronic format by e-mail or in a form accessible via Web.

Figure 1 – Screen Reader rendering.

Original Google interface	Modified Google interface
Francesco Renga Concerts - Google Search	Results for Francesco Renga Concerts - Google Search
<i>Link</i> Go to Google Home	Web
Web	<b>Heading level 1 Results:</b>
<i>Link</i> Images	Results 1 - 10 of about 2150 for
<i>Link</i> Groups	Francesco Renga Concerts.

<p><i>Link</i> News  <i>Link</i> Froogle  <i>Link</i> more »</p> <p><i>Edit</i> Francesco Renga Concerts  <i>Search</i> <i>Button</i></p> <p><i>Link</i> Advanced Search  <i>Link</i> Preferences</p> <p>Search:  <i>Radio</i> <i>button</i> <i>checked</i> the web  <i>Radio</i> <i>button</i> <i>not</i> <i>checked</i> pages  from the UK</p> <p>Web</p> <p>Results 1 - 10 of about 2150 for  Francesco Renga Concerts.  (0.076712 seconds)</p> <p><i>Table</i> with 4 columns and 6 rows</p> <p>Sponsored Links</p> <p><i>Link</i> Francesco Renga CDs [...] <i>www.cdconnection.com</i></p> <p><i>Link</i> Concerts [...] <i>www.MrsFinder.co.uk</i></p> <p><i>table</i> <i>end</i></p> <p><i>Link</i> Northern Italian culture [...] <i>www.bed-breakfast-italy.com/culture/outdoors.htm</i> - 11k -  <i>Link</i> Cached –  <i>Link</i> Similar pages</p> <p><i>Link</i> Live 8 - LIVE on XM [...] <i>www.xmradio.com/live8/index.jsp</i> - 23k  <i>Link</i> Cached –  <i>Link</i> Similar pages  [...]</p> <p>Result Page:  1  <i>Link</i> 2  [...]  <i>Link</i> 10  <i>Link</i> Next</p> <p><i>Edit</i> Francesco Renga Concerts  <i>Search</i> <i>Button</i>  ...</p>	<p>(0.072713 seconds)</p> <p><b>1</b> <i>Link</i> Northern Italian culture - [...] <i>http://www.bed-breakfast-italy.com/culture/outdoors.htm</i> - 11k -  <i>Link</i> Cached –  <i>Link</i> Similar pages</p> <p><b>2</b> <i>Link</i> Live 8 - LIVE on XM [...] <i>http://www.xmradio.com/live8/index.jsp</i> - 23k -  <i>Link</i> Cached –  <i>Link</i> Similar pages  [...]</p> <p><b>Heading level 3</b> Sponsored Links</p> <p><i>Link</i> Francesco Renga CDs [...] <i>www.cdconnection.com</i></p> <p><i>Link</i> Concerts [...] <i>www.MrsFinder.co.uk</i></p> <p><b>Heading level 1</b> <i>Result Page:</i>  1  <i>Link</i> 2  [...]  <i>Link</i> 10  <i>Link</i> Next <b>alt++</b></p> <p><b>Heading level 2</b> Search:  <i>Edit</i> Francesco Renga Concerts <b>alt+c</b>  <i>Search</i> <i>Button</i></p> <p>Search:  <i>Radio</i> <i>button</i> <i>checked</i> the Web <b>alt+w</b>  <i>Radio</i> <i>button</i> <i>not</i> <i>checked</i> pages  from the UK <b>alt+p</b></p> <p><b>Heading level 2</b> Advanced search:  <i>Link</i> Advanced search <b>alt+a</b>  <i>Link</i> Preferences</p> <p><b>Navigation bar:</b>  <i>Link</i> Navigation help <b>alt+h</b>  <i>Link</i> Google Homepage <b>alt+g</b>  Web  <i>Link</i> Images  <i>Link</i> Groups  <i>Link</i> News <b>alt+n</b>  <i>Link</i> Froogle  <i>Link</i> more  ...</p>
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The protocol used included a preliminary questionnaire, a set of tasks, and a post-questionnaire:

- 1) In the preliminary questionnaire the 12 participants provided information about their technical expertise, age, educational background and knowledge of search tools as well as screen readers.

- 2) The remote testing procedure provided tasks to be completed. We decided to perform a remote test in order to allow users to use their own computers and assistive technologies. The environment for executing the search tasks was available online at a specific URL and contained only two links: one to the user interface reproducing the original Google Homepage and the other to our modified Google Homepage.
- 3) The post-test questionnaire had 22 questions divided into three sections: information regarding the subject's experience performing the assigned tasks, difficulties in carrying out the task, and degree of satisfaction.

Testing itself consisted of 10 steps (tasks) including a preliminary exploration of the original and modified Google interfaces, as well as performing free and specific queries and exploring results in both the interfaces.

### 3.RESULTS

No data were collected during testing performed by users; only subjective data were gathered by questionnaires. Data from the post-questionnaire revealed that all users appreciated the simplified interaction and especially the positioning of the search box and results. In particular, all participants declared that the modified home page interface simplified the search set-up compared to the original one, and 11 of 12 thought the result interface was clearer and easier to use. Concerning the speed of accomplishing the assigned search tasks, 11 of 12 participants acknowledged they felt that the simplified interaction and the greater clarity in result exploration reduced the time needed to carry out the search. The most skilled user stated that the time it took to reach desired results was reduced by 20-30% compared to time required for the original Google interface. Regarding evaluation of specific features, participants judged sounds, shortcuts, and different visiting order assigned to links (i.e. by tabindex) to be important, as well as hidden labels and numbering of results which assured greater clarity and aided orientation in result exploration. The participants suggested that Google adopt all (9 users) or some (2 users) of the proposed changes. Last, users expressed great interest in applying the same solutions to other services offered both by Google (Froogle, News, and Scholar) or by other e-commerce websites.

### 4.REFERENCES

- [1] Andronico P., Buzzi M., Castillo, C., Leporini B. 2005. Improving Search Engine Interfaces for Blind Users: a Case Study. To appear in UAIS, Springer.
- [2] Craven, J., Brophy, P. 2003. Non-visual access to the digital library: the use of digital library interfaces by blind and visually impaired people. Tech report, Manchester: CERLIM. <http://www.cerlim.ac.uk/pubs/index.php>
- [3] Goble C., Harper S., Stevens R. The Travails of Visually impaired Web Travellers. In Proceedings of Hypertext '00 (San Antonio, June 2000), ACM Press, 1-10.
- [4] Ivory, M. Y., Yu, S. Gronemyer, K. Search result exploration: a preliminary study of blind and sighted users' decision making and performance. Extended abstracts of CHI '04 (Vienna, April 2004), ACM Press, 1453-1456.