Improving Web Usability for the Hard-of-Hearing

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1 Introduction

Recently, with continued advances in information technology, there is an ever-growing amount of information accumulated on the World Wide Web. At the same time, the need to make this information accessible to any person who needs it becomes a serious issue. This paper focuses on web content accessibility for the hard-of-hearing. This is motivated by the fact that the first author, who is engaged in educating hard-of-hearing persons through daily classes, felt that hard-of-hearing persons would interact with web pages differently than hearing persons. Using web-based interactive course materials seems effective since they allow the creator to control the presentation of the content. However, the issue of how the hard-of-hearing interact with the web has not been adequately studied.

2 How the hard-of-hearing browse the Web

In previous studies [Namatame et al. 2004; Namatame and Kitajima 2005], we demonstrated differences in web-browsing behavior between hard-of-hearing persons and hearing persons in terms of the number of errors and the nature of scan paths used as they accomplished a task on an experimental web page that simulated a then-existing automotive site. The participants were asked to locate a page that described a designated car model and to choose a favorite color for it. We recorded their link selections and eye movements and analyzed the data from the site's top page. The results indicated that the hard-of-hearing made a significantly larger number of errors in link selections and adopted less consistent browsing patterns than the hearing participants. Figure 1 depicts the scan paths from one of the hard-of-hearing participants. It does not indicate a clear pattern of scanning. This is contrasted with scan paths from the hearing participants, which show vertically aligned scan paths consistent with the semantic structure of the page.

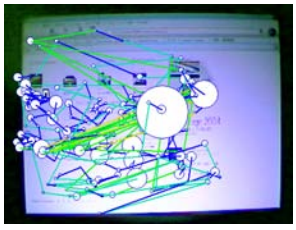

Figure 1: Scan path of a hard-of-hearing (before redesign).

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ETRA 2006, San Diego, California, 27–29 March 2006.
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3 Redesigning and evaluation

We conjectured that the design of the experimental web page was not self-evident from the way the information was organized. The hard-of-hearing participants would have had difficulty in capturing the hidden semantic structure partly because written language is not their primary language. We redesigned the top page by adding vertical lines that effectively separated it into columns. We expected that this redesign should improve the site's usability for hard-of-hearing persons. This paper reports that this redesign was effective.

Five hard-of-hearing persons participated in the experiment. Their eye movements were recorded using an EMR-HM8 from NAC Inc. The task images were projected on a flat screen 150cm in front of the subject. The projection window size was 90cm wide by 75cm high with a viewing angle of 33 degrees horizontal by 27.5 degrees vertical. The data sampling rate was 60 Hz.

Figure 2 illustrates an eye movement pattern typical of those from hard-of-hearing participants. It confirms that the redesign successfully improved usability for hard-of-hearing persons.

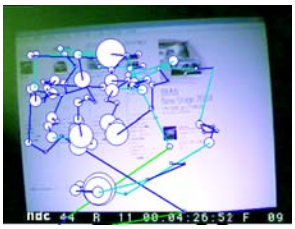

Figure 2: Scan path of a hard-of-hearing (after redesign).

4 Conclusion

An important lesson is that what is obvious for the web-literate is not necessarily obvious for the hard-of-hearing. Hidden semantic structures resulting from fancy design ideas were not easily captured by the hard-of-hearing, resulting in a serious usability problem. Their eye movements told us clearly where the source of confusion was and suggested an effective design change. A small design consideration resulted in a large improvement in the usability of the web site.

References

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