Web Textual Hyperlinks supported with Sign Language Videos

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Abstract. Web users seem to apply a scent following strategy in order to make navigation decisions and find information in a website, (e.g. Card, Pirolli, Van Der Wege, Morrison, Schraedley & Boshart, 2001). This strategy which implies assessing the semantic similarity between searching goals and hyperlink choices is inefficient if the semantic scents are not available to the user as happens, for instance, when they navigate a non native language website. This phenomenon affects especially to users of minority languages like the Sign Language (SL). While the technological advances have made possible the inclusion of the SL in the Web by means of videos, the usability and effectiveness of such innovations has not been tested empirically. We present the result of one study aimed to compare the performance of deaf signers when searching in Websites with textual hyperlinks versus textual hyperlinks supported by SL videos. The result showed that that deaf signer users became less disorientated (measured by the number of page visited per search) and were less dependent of their verbal categorical reasoning abilities in the SL supported than in the textual condition. These results represent an empirical support to the usage of videos linked to textual hyperlinks as an efficient Web navigation mechanism for deaf signer users.

Introduction

Most of Web information search models focus mainly on how users assess and select textual hyperlink or labels (e.g. Fu & Pirolli, 2001; Kitajima, Blackmon & Polson, 2000, 2007, Brumby & Howes, in press). However, could such models account for those situations in which the information scent cues are non-text cues? Solving this question is especially relevant for users who are not efficient in the use of textual cues such as deaf signer users (Fajardo et al, 2006, Smith, 2006) or users navigating in a foreign language (Kralisch & Berendt, 2005). In fact, quoting Pirolli (2004, p. 36), "the most significant current problem for the future development of the models concerns the analysis of non-text information scent cues, such as graphical icons, animations, and so on, and the relation of proximal information scent cues to non-text distal content such as video and music".

Therefore, how users draw on non-text information scent cues and which is its differential efficacy for Web information search regarding text cues was the main goal of this research. In particular, we focused on how videos in SL can support navigation with textual hyperlink to deaf users.

Secondly, we intended to study the relation between verbal categorization abilities and web search performance in deaf people. Verbal categorization skill could be essential to perform navigation decision among textual hyperlinks organized in a hierarchy of categories as it is usually the case with commercial websites where the products appear organized into categories and sub-categories. However, deaf people seem to present difficulties in some areas of categorical reasoning finding it difficult, for example, to resolve verbal analogies (Marschark, Convertido, McEvoy and Masteller, 2004). Therefore, if textual hyperlinks are supported with translations in SL, the use of verbal categorical skill should be reduced increasing the efficacy of web information search for deaf people users of sign language. In order to test these two objectives we conducted the study that it is explained in what follows.

Experiment

Participants
Twenty-three deaf people users of SL as native language and 21 hearing people participated in this study in exchange for an economical compensation or credits.

Design
The study followed a within subject design with Type of Hyperlink as independent variable (Textual hyperlink vs. Textual hyperlink plus video in SL). The dependent variables of the search task were number of targets found; search time and disorientation (number of pages visited before find the target).
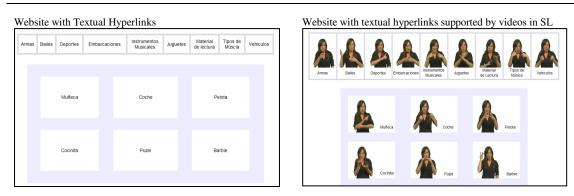

Figure 1. Websites with textual hyperlinks (left) and hyperlinks supported by SL videos (right). In the supported condition, a video per each hyperlink option was provided. The first frame of the videos showed the most representative segment of the sign. The videos were activated by clicking or passing the mouse cursor over the frames or hyperlinks.

Tasks and Material
Deaf participants were asked to perform a set of 18 searches in two types of Website (see Figures 1 and 2): 1) Websites with textual hyperlinks and 2) Websites with textual hyperlinks supported by SL videos. The control group composed of hearing non signer users performed the search task only in the text condition. For each type of hyperlink, two websites with different content (Entertainment and Supermarket) but similar number of categories and subcategories were built in order to counterbalance order of presentation and content. The categories and subcategories were obtained from the Marful, Fernández and

Díez' database (2006). The translation text to sign language was performed by experts of the Federations of Deaf People's Associations collaborating in the study (FAAS and Euskal Gorrak). In addition, participants were asked to complete a test of verbal categorical reasoning (a Verbal Analogy Task adapted from Marschark et al., 2004). The order of presentation of search and analogy tasks was counterbalanced across participants.

Results

In this section we present a resume of the most relevant results of this study. On the one hand, deaf users (M=.7; SD=1.2) resolved a lower percentage of verbal analogies than hearing participants (M=.9; SD=1.1), $F(1,42)$=30.; MSE= .04; p<.001. On the other hand, although the search accuracy as measured by number of targets found did not vary between the different types of website (Mtextual=15; Mvideo=14), the former users got more disoriented (visited more pages before finding the target) with the textual hyperlink website (M=4.4) than with the video supported website (M=4.1), $F(1,22)$=6.52; MSE= .2; p<.02. Finally, for deaf users, the verbal analogy task's performance correlated significantly with accuracy (r^2 (23)=.5; p< .02) and search time (r^2(23)=-.4; p< .057) in the textual hyperlink website but only with accuracy (r^2(23)=.5; p< .03) in the video supported website.

Discussion

How Web users draw on non-text information scent cues and which is its differential efficacy regarding text cues has received scant attention in past research becoming one of the challenges for future development of information search models (Pirolli, 2004). Thus, the main goal of the presented research was to test the efficacy of Sign Language videos of hyperlinks to increase information scent cues during Web interaction for Deaf users. As expected, deaf signer users became less disorientated (measured by the number of page visited per search) and seem to be less dependent of their verbal categorical reasoning abilities in the SL supported than in the textual condition. The reduction of verbal categorical processing demands on deaf users would be desirable because, as we replicate in this research, the efficiency in the application of verbal categories seems to be lower for deaf than for hearing participants (Marschark, Convertido, McEvoy et al., 2004).

These results represent an empirical support to the usage of videos linked to textual hyperlinks as an efficient Web navigation mechanism for deaf signer users. However, how deaf users actually use and combine the information contained in videos and textual hyperlinks in order to assess the semantic similarity between searching goals and hyperlink choices still cannot be drown from our results. This question might be the following to be investigated and could serve Web information search models as a source of data to explain the following of non-text information scent cues.

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