Hypertext in Sign Language

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Abstract. As deaf people often dispose of only limited reading competencies, they have serious problems using hyperlinks as a navigation tool for the internet. The poster presents a solution to this problem: It proposes applications for creating and displaying hyperlinks in Sign Language that will enable deaf users to navigate the internet in their natural language.

1.   NEED FOR HYPERTEXT IN SIGN LANGUAGE

Sign Languages are natural visual-spatial languages, developed and used by deaf and hearing signers all over the world. They use manual communication instead of sound to convey meaning, i.e. simultaneously combining handshapes, orientation and movement of the hands, arms or body, and facial expressions. Sign Languages are not based on the spoken language in the country of origin. In fact their complex spatial grammars are markedly different from auditory-vocal languages. Sign Languages are non-literate languages, because the visual modality makes it difficult to develop a universally accepted written form. The existing transcription systems (e.g. Sign writing) receive very limited acceptance, because transcriptions of signed communications don't capture the interplay of gesture and facial expression that is the basis of meaning.

The reading competencies of deaf people often are very low. Obviously, never having heard sound makes it much harder for deaf people to learn to speak or read an auditory-vocal language. The fact that the average deaf high school graduate is only able to read at a fourth-grade level demonstrates the difficulty a deaf person can experience. The most deaf therefore prefer Sign Language (ASL) to Spoken or Written Language. (Padden, C. & Ramsey C., 2000).

The deficiencies in reading result in difficulties using the World Wide Web. Text based web sites with links embedded in the text are hard to understand for the deaf. A study of Fajardo et al. (2003) revealed that deaf signers have problems of web accessibility due to a deficit in auditory-vocal working memory that could be compensated with web design exploiting their specially developed visual-spatial skills. Currently the WWW offers very few information in Sign Languages, mostly by embedding video files showing Sign Language speakers translating the written text into Sign Language. However, this approach neglects hyperlinks, the most efficient navigation tool for the World Wide Web. Up to now there is no equivalent to hyperlinks in Sign Language.

To improve accessibility and navigation capability for deaf users, it is necessary to develop a technique that enables pages containing video-based Sign Language content to be hyperlinked to other signed pages without print-based hyperlinks.

2.   REQUIREMENTS

An application enabling hypertext in Sign Language must support the author and the reader. The author creates Sign Language Hyperlinks by associating periods in a Sign Language video text with web addresses of further Signed Web pages or other web resources. To the reader of the Signed Web page, the hyperlink appears as a small video containing a sign or short phrase in Sign Language.

To make Sign Language hyperlinks an efficient and widely accepted navigation tool for deaf web users, it is highly important to consider the requirements of the readers of hypertext in Sign Language. The hyperlink-videos have to be repeated permanently, in order to keep the signed hyperlink constantly available (like print based hyperlinks). When the hyperlink the video refers to is currently playing in the main video, both the main video and the current hyperlink should be clearly marked. The hyperlink videos have to be spotted easily, allowing the reader to quickly scan the page to discover the number of hyperlinks, as well as their content, order, location, and grouping. As in written hypertext, the reader should get a basic understanding of the purpose of the page without very much reading. But to avoid overloading of the Sign Language working memory (Wilson & Emmorey, 1997), only a limited number of hyperlinks should be presented simultaneously.

2.1.   Technical requirements

Reading hypertext in Sign Language should be possible for all deaf users regardless of their platform, their firewall configuration and the performance of their hardware. To keep the technological barriers low, only browsers and standard plugins should be used.

The production of hypertext in Sign Language may require a higher level of technological skills from the author. This corresponds to written hypertext, where reading is easier than producing it. But to enable the widespread creation of hypertext in Sign Language, the requirements for authoring should be as low as possible.

3.   STATE OF THE ART

As mentioned before, the use of sign language videos in the internet is still very limited. Though administrative services are required to display information in sign language, only few institutions do so. If content in sign language videos is available, it often is hard to find for deaf users with low reading capabilities. The state police of North-Rhine-Westfalia for example offers sign language videos for the topics "Welcome" and "domestic violence" (http://www1.polizei-nrw.de/im/Aktuelles/article/dgsvideos.html). But before the deaf user is able to see the videos, she must navigate several purely text-based pages and read the information about the video. Here, hypertext in sign language could clearly help deaf users to find their way.

The Austrian Sign Language Service Centre and the IT-company indeed developed videotext.web, a technology for the simultaneous display of sign language video and written text. Videotext.web enables the authors of webpages to associate paragraphs in written hypertext to timestamps in the corresponding sign language video. The user can then go through the written text and the sign language video simultaneously; the paragraph corresponding to the current time of the video is marked by a grey background. But while Videotext.web enables simultaneous reading of written text and watching of sign language videos, it does not support navigating in the internet for deaf people with low reading capabilities.

4. SOLUTION

The solution for the display of hypertext in Sign Language relies on Flash 6. Flash 6 is given the preference due to its high penetration rate; according to the Wysistat *Study on the use of Macromedia Flash* 94.9% of all web users can read Flash 6 files. For the authoring process an executable application has been developed that enables defining hyperlinks in Sign Language videos.

4.1. Authoring Hypertext in Sign Language

For creating hypertext in Sign Language, one additional step is inserted into the workflow of web page creation.

After recording a Sign Language video, the author compresses the video and converts it to .SWF. She will then use the hyperlink authoring application for defining hyperlinks by setting timestamps within the video and by providing http-addresses of the pages the links should lead to. Finally she uploads the .SWF-Sign Language video, the .SWF container video that provides the display of the small hyperlink videos and the HTML page to the web server.
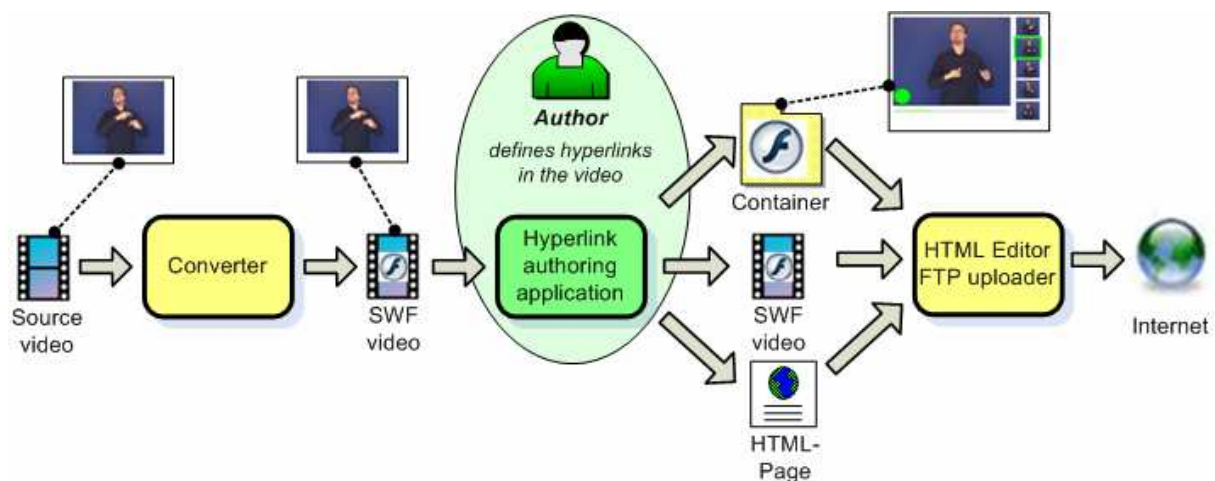

Fig. 1. Authoring process for creating hypertext in Sign Language

4.2. Display of Hypertext in Sign Language

The display of hypertext in Sign Language must meet the interaction requirements and the preferences of deaf people. To achieve this, a user centered design process with short cycles of development and testing will be established. This poster outlines the main principles of the display.

Hypertext in Sign Language will be displayed with the help of a container flash application that can be started with any web browser with a flash plugin. Up to nine hyperlinks are displayed simultaneously next to the main video. While the main video shows a hyperlink, it will display a hands-symbol (for links to other sign language pages) or a text-symbol (for links to text-based pages) and the corresponding small hyperlink video will be unmasked (see Fig. 2). Clicking on the hyperlink videos leads the user to the underlying URL.

In first end user tests it became evident that the small hyperlink videos should start on rollover, becausee this approach provides a quieter image than starting all hyperlink videos at the same time. The user can still get a quick overview of all available hyperlinks by rolling the mouse over them. A prototype of the display of hypertext in sign language is available at http://desire.isk.rwth-aachen.de/deutsch/index/hypertext/hypertext.html
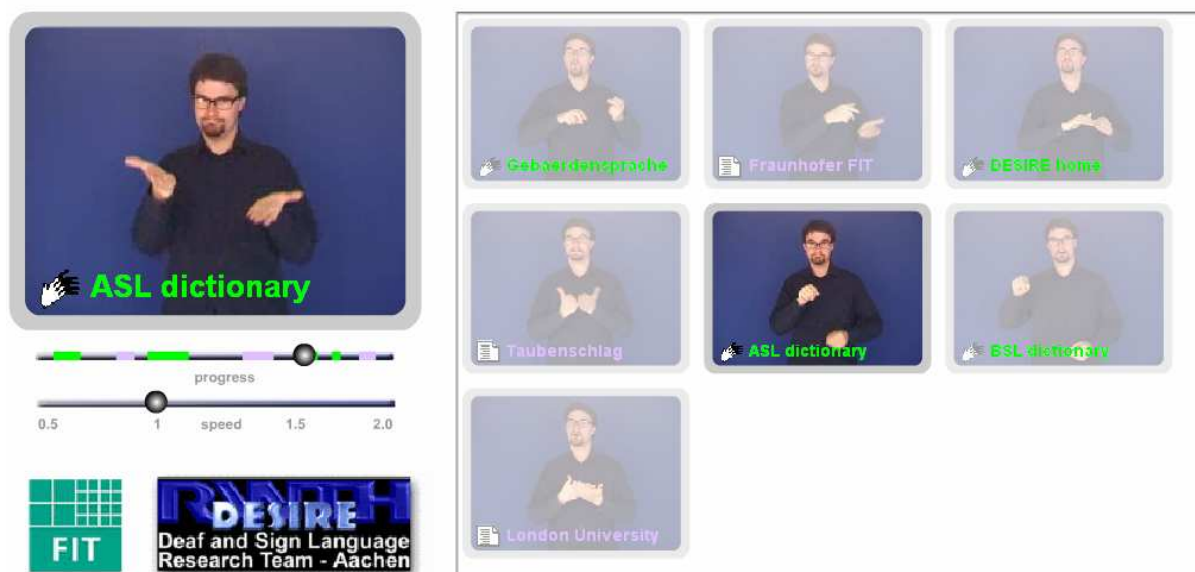
Fig. 2. Display for the reader

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5.　　EXPECTED USEFULNESS

As hypertext in sign language enables deaf users to navigate the internet in their natural language, they will be able to concentrate on the content instead of struggling to understand the meaning of the written links. With hypertext in sign language the internet will become an easy to use information source for deaf users – just the way written hypertext is for hearing users.

Of course, the impact of hypertext in sign language is restricted by the relatively high efforts needed for producing sign language videos. Thus hypertext in sign language will primarily be used for contents that do not change often, e.g. knowledge related contents as encyclopedias or information portals of administrative services. But even then hypertext in sign language will greatly empower deaf users. Given the limited general education of many deaf people, the access to static content in their natural language will clearly improve their ability to gather information autonomously.

6.　　OUTLOOK

A first version of the authoring and the display applications has been developed and feedback has been gathered from expert deaf users. The next steps include the testing by end users and the integration into the national AILB research project that aims at providing a work and job related internet platform for deaf young adults. Here hypertext in Sign Language will be used to enable the navigation in a sign-language encyclopedia of work related terms, providing the technology with a valuable use scenario. With the feedback from the use within the AILB project, hypertext in Sign Language will then be adapted to the use of the whole deaf internet community.

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