

Towel: Experiences of Augmenting the Web with Journey Knowledge

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1. INTRODUCTION

Movement, or mobility, is key to the accessibility, design, and usability of many websites. While some peripheral mobility issues have been addressed few have centered on the mobility problems of visually impaired users. We use our past work to address these issues and derive mobility heuristics from mobility models, use these heuristics to place mobility objects within a web page, and describe the construction of a prototype mobility instrument, in the form of a Netscape plug-in, to process these objects. Specifically, we likened web use to travelling in a virtual space, compared it to travelling in a physical space, and introduced the idea of mobility - the ease of travel - as opposed to travel opportunity. Our hypothesis is that travel and mobility within the web mirrors travel and mobility within real-world environments. We suggest that the Web community has typically concentrated on navigation and / or orientation rather than the whole travel experience, and that this neglect is crucial when dealing with browsing by visually impaired users. We therefore extend the definition of travel to mean: confident navigation and orientation with purpose, ease and accuracy within an environment. Work, including ours, has shown that: Visually impaired users are hindered in their efforts to access the largest repository of electronic information in the world, namely the World Wide Web (WWW) [4]; A visually impaired user's cognition, perception, and world view are highly egocentric, meaning that information feedback should be tailored to these mental processes [1, 4]; Visually impaired web travellers are at a severe disadvantage, when moving around the web, compared to their sighted counterparts [4] (this is because of the lack of explicit and necessary mobility information, implicitly available to a sighted user [4]); The absence of suitable mobility guidelines, mobility design and evaluation methodologies, technical implementations, and work on holistic views (models) of mobility, all hinder visually impaired users [3, 4]; W3C WAI, WebABLE, RNIB, AFB, and other guidelines focus on sensory translation by the graceful conversion of visual to auditory information, but take no account of mobility; Hypertext design and evaluation methodologies, like HDM and SUE [2], pay little attention to mobility as do Web browsers for visually impaired users; Solutions exist to real world mobility problems of visually impaired travellers. These solutions can be applied (after some conversion) to the web, so that a visually impaired user's movement is enhanced [3]. We have now created a mobility tool in the form of a Netscape Plug-in in an attempt to support our theories. The plug-in produces a series of fragmented web pages, decorated with generated information derived from the placement of the Towel Mobility Extension (TME) objects. The plug-in is loaded when the browser

encounters an XHTML EMBED element within the unprocessed hypertext file signalling that there are TME objects available. Once loaded the plug-in is driven by a series of keystrokes, which both activate and control its operation. These are function keys and are therefore all easily accessed by both visually impaired and sighted users. When the plug-in is activated the TME objects are processed and the page fragmented and saved as separate local hypertext files with an automatically generated preview page. This page preview is a clustering of hyperlinks to the individual page fragments. Each hyperlink is post-fixed with a word count of the target document so that a user knows what to expect when the fragment is reached. In this way orientation to the page contents is much quicker. In this paper we briefly summarise our evaluation of the tool and describe the lessons we have learned.

2. EVALUATION

We conducted our experiment by first applying our craft based framework to seven sites representing a cross-section of the type of site available, from dynamic, through static, to document oriented locations. We analysed all sites from both a sighted and visually impaired users perspective. We then downloaded a page each from the sites and modified them in accordance with the results of the first application of our framework and re-evaluated the modified information. First, we focused on user evaluation which took the form of observing the responses of sighted and visually impaired users when moving around the processed 'Towel' test page. Users were asked a series of questions similar to those in the Pilot Study [4], and their responses were noted. We also asked more general questions regarding how the user 'felt' about the reformulated pages, how easy they thought they were to move around in, and what improvements could be made. It was also explained that we were testing the ease of movement and not the visual style and so comments about presentation were excluded. It was found that the fragmentation of the page enhanced visually impaired users movement around, and cognition of, our test pages. Both groups said that they gained a greater understanding of both the page and site structure, and this was particularly apparent for visually impaired users. Small chunks of information worked best however some users commented that this would increase the number of clicks to get to some information on the page. The preview information enabled the user to make a quick decision as to whether to investigate the page further or to move on to a different page. In fact visually impaired users found this far more useful than the sighted user, as these preview descriptions made visually implicit information explicit. Users also suggested that more information about a link destination should be automatically included so that they didn't have to directly investigate the target node. When investigating the page the journey metaphor of movement cues along the top of the document

were found to be particularly helpful in guiding a user through the page fragments. The notion of obstacles is promising, especially for large obstacles that take up a large amount of screen space. However, the users did suggest that the obstacle be removed from the page, and a suitably descriptive hyperlink inserted, so that user intervention is not required when travelling through the fragment. The 'skip' metaphor is helpful but were a little laborious then tabbing from link to link, however obstacle removal would solve this problem. Unfortunately link removal also creates problems, for instance if a menu becomes an obstacle when it has been encountered a number of times then removal would mean that navigation would be hindered. A compromise would be to 'skip' page / site 'furniture' and remove all other obstacles. Cues also seem to be useful in drawing a users attention to specific significant items within the page or journey. This was the case for both users, however they also felt that the inclusion of a mechanism to define their own cues to be filtered into the page when loaded would be an advantage. Finally, the user presentation of page and site, content and layout where found to be not as initially useful as we had expected. Next, we performed an evaluation by reapplication of the framework. This enabled us to see if the mobility framework was suitably applied to the site by the instrument, because if not, the overall scores for that system would decrease. In each case the increase in ratings for sighted and visually impaired users where similar across sites. After placement of the TME there was little change in the usability ratings for sighted users. In fact on examining the usability summary and the usability statistics it could be seen that there was very little room for improvement as the initial scores for each site where in the late 80% and early 90%. For the visually impaired user however the story is quite different because with usability ratings of 74%, 60%, and 51% for Towel, IMDB and Hypertext2000 respectively before placement of the TME, the scope for change was far higher, and indeed increased to an average of 86%. Problems do still exist as we have not yet achieved an optimum 100% mobility rating of all mobility types. However, the lessons learned by the re-application of the framework have feed into our understanding of points that we need to address in the future.

3. LESSONS

Through our evaluation it has become evident that there are a number of lessons to be learnt when considering designing and building new pages and user agents. Journeys should be monitored so the positional information is known, in this way cues and obstacles should be decided-on when they are near to the traveller and a user can state that obstacles should no longer be regarded as obstacles for them personally. The presence of cues and obstacles should be included with the preview information. These should be just either a 'C' or 'O' merely to indicate their presence and so as not to increase information overload. External Memory should keep journey metrics, dynamic maps, old journeys, and allow the exchange of information between travellers. External Memory should also allow the marking of interesting points for later investigation and should create a 'road' by placing junctions of hypertext links that you may want to follow at present or later. Either-way this map should be kept for the session and permanently if the user decides. User agents should enable the storing and sharing of journey information in much the same way as one person will relate a real-world journey to another. Agents should also enable look ahead on hyperlinks to create better preview information, in this way real content from the linked page could be used to augment user choice. The marking of pathways in an egocentric manner reinforces the users perception of familiarity with the journey and enables them to decide on the relevance of objects for this particular journey and the

ability to investigate the context when a user has tabbed to a non-descriptive hyperlink would be useful. Some web sites still use non-descriptive links (for example 'Click Here') however, if the user agent could work backwards and distinguish the context by the preceding sentence comprehension can be increased. We also found that most websites we examined had many travel objects few of which were cues because mark-up was misused. In such situations, user agents would be obliged to deduce the presence and identification of objects, infer their role, and choose an instrument to access and use them, through examination of the pages, site, and travel process. While this is not impossible it is difficult, and so we feel it is better to explicitly incorporate travel into design and hypertext design methodologies because the designer may be in a better position to decide about what a hypertext construction is in terms of mobility. however, applying the framework manually and then encoding the mobility mark-up into the web page has drawbacks because: It can take along time; Placement and encoding of the mobility objects can sometimes be ambiguous; It may pose a problem for a designer *unskilled in mobility issues*; It may pose a problem for a designer *unskilled in visual impairment*. Therefore, a useful development would be a system to automatically apply the mobility framework and either, insert hypertext mobility information, or reformulate the page to increase its ease of mobility. The designer may have to respond to a number of questions when the system cannot practically deduce what mobility information is necessary, however, typing simple information to infrequent prompts is much easier than directly coding and placing HTML. The system would also require a re-implementation of the mobility framework to move it from a craft based method to an engineering based method which could be applied by a machine.

4. CONCLUSIONS AND FURTHER WORK

We *Conclude* that by applying knowledge about real world mobility to web based mobility problems can enhance the travel experience for visually impaired users. However, we propose that *further work* needs to be undertaken to extend the framework to encompass a more systematic purpose and to account for current focuses of activity, we needed to more closely relate the work to hypertext usability frameworks such as SUE, extending their notion of context observability for example. More importantly however, we need to redesign the framework and investigate the benefits of a more engineering centered approach so that tools can be created to process a page before reaching the user.

5. REFERENCES

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