The difficulties and the possibilities of adapted access for the blind to the Web

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ABSTRACT

The Internet represents one of the most used tools in the field of communication, thanks to its richness, its capacity to communicate rapidly and effectively on a world scale. The Man-Machine interfaces for accessing the Internet are currently too rigid and poorly adapted to human research strategies. This leads us to reconsider the interface for access to the Internet, hence the introduction of speech as a mean of interaction to access the Internet, both for input and output. The adaptation of the Internet using the concept of multimodality is a one of our objectives, to give the visually handicapped the ability to communicate easily with the outside world. In this article we will demonstrate the difficulties and possibilities of adapting access to graphic interfaces, in particular the Web, in accordance with the user profile.

KeyWords

Blind people, graphical user interface, Web, System author, non visual interface.

1. Introduction

Our objective is to demonstrate first, the possibilities for adapting access to the graphic interfaces under MS-Windows for visually handicapped users, second, to demonstrate the difficulties and possibilities to access the Web for the blind. The work undertaken centers on two important points:

- The first is to know how to access, in real time, the symbol data handled by the computer via MS-Windows (windows, content of windows and messages). This problem is resolved by a filtering system created for this purpose.
- The second is to know how to present the information to the user in an adapted manner. This problem is resolved by an authoring system author created for this purpose.

2. Access to the Web for the blind

We notice that most applications on the market use the multimedia concept in order to make their interfaces more attractive. In addition, modern businesses generate and consume an increasing flow of information. Today its success often depends on its capacity

to deal swiftly with the information it needs. Frequently this leads to the use of new technologies. Over the last few years, there has been a revolution in the world of the network communication: that of the World Wide Web (WWW), the growth of whose use has attained an exceptional level. These days, communication methods such as the fax, modem, electronic mail and Internet are at the disposal of all. These methods allow the visually handicapped to send faxes direct from their computer or to communicate with other persons via messages services. Instead of moving from where they are or depending on somebody else for information, an adapted system allows them to be independent and to profit from some of the advantages of the new technologies, in particular those linked to the communication and diffusion of information.

Currently the primary output for the WWW is highly visual: using text, pictures and graphic symbols, with a growing use of audio in sound files and motion pictures. « It rapidly became evident that the biggest problem was that of potential obstacles to access, inherent to multimedia type data; the most obvious obstacle was that of the presentation of graphic images to the blind user [P. Graziani, 1996] ». Because Internet is considered an international shop windows, graphics are widely used even in excessive quantities. In addition, other data formats are also used which can create problems for other user groups, such as the organisation of data in tables and the use of film which is used more and more frequently in hypertext document. Navigation is also difficult in Web pages that feature multicolumn displays . These are a nightmare for the blind.

« The current capabilities of browsers allow information to be presented visually and in auditory modes, but it is not currently the users choice to decide which mode they receive. The format of presentation is typically fixed by the source of the information and if the user needs presentation in a different form there are currently few ways for the user to translate the information [J.Gunderson, 96] ». Therefore information on the WWW must be structured for multiple/simultaneous presentation formats. Text information needs the capability to be viewed as either text, speech, Braille or any other user selected combination, pictures and movies need text description annotation.

The question that we ask is thus: what is necessary in order that a visually handicapped person can work with multimedia applications, which rely not only on the text but also the other elements in the Man-Machine Interface? We will, below, describe our method which allows the resolution of the electronic and ergonomic problems enabling an adapted access to the graphic interfaces by the blind.

3. Physical filter

In order to allow blind users to interact with graphical interfaces, a great deal of data must be extracted from the graphical environment. The data extraction is done by a filtering system. This system intervenes between the application and the final user. The user's actions and the data sent to peripherals (such as the screen) are filtered. Data is saved in appropriate data structures. A screen model is built and refreshed in real time.
Different types of filters are necessary to filter a whole Ms-Windows application :

- « A filter of messages sent and received by the applications
- A filter of widgets (dialog boxes, buttons, edit box ...)
- A filter of windows contents (bitmaps, tables, text...)[S. Farhat, 96b] »

We have been able to resolve the problem of access to data represented in the form of pixels; such as text and its attributes, the presence of images posted to the screen and the different controls of graphic interface (button, menu...). The recovery of text attributes (font, text colour, italic or not...) and the position of the character chains on the screen resolves the problem of hyperlinks. In fact, having information about the colour of the link and the ability to simulate a mouse click with the help of a function developed to that end, permitted us to access document systems where the text included hyperlinks.

It can be important that adaptation of interfaces takes into account the user's level of knowledge about the software or his type of handicap, which gives us the possibility to condition the adaptation to a user profile. « It is for this reason we have created an authoring system which allows the adaptation author a choice of which actions to realise on the basis of dialogue events observed by the filter [S. Farhat, 96a].» Our approach is to select certain events via a specialized filter in order to initiate the application. It differs from that of others e.g. Guib Project and Mercator in that the specialized filter creates a database for the adaptation tool's use.

4. Adapted Interface

In order to have an adapted system, one must first know what happens during the execution of the application. One thus needs an observer of events which allows one to intervene and to act on some of them, hence the notion of **filtering**. The desire to adapt a particular software, ultimately for a particular user, requires the adaptation time to be short as new versions of software are produced quite frequently. This leads us to the need to create an author system of adaptation. This system allows the adaptation at the interface level and brings the user the necessary help to facilitate their learning and manipulation of a given software. In order to have, a certain flexibility in the system's reaction, we have conceived an author system which allows the association of actions with events. The adaptation author is a seeing person, who bases it's work on the following points in particular:

- The user's knowledge,
- The knowledge of how the software is to be adapted,
- The conception of the author of what is a good ergonomics for the visually handicapped persons.

This approach allowed us to create ***an intelligent tool for the adaptation of graphic interfaces*** (see figure 1). The following outline represents our developed system which introduces the filter and the interactions model adapted for the users.

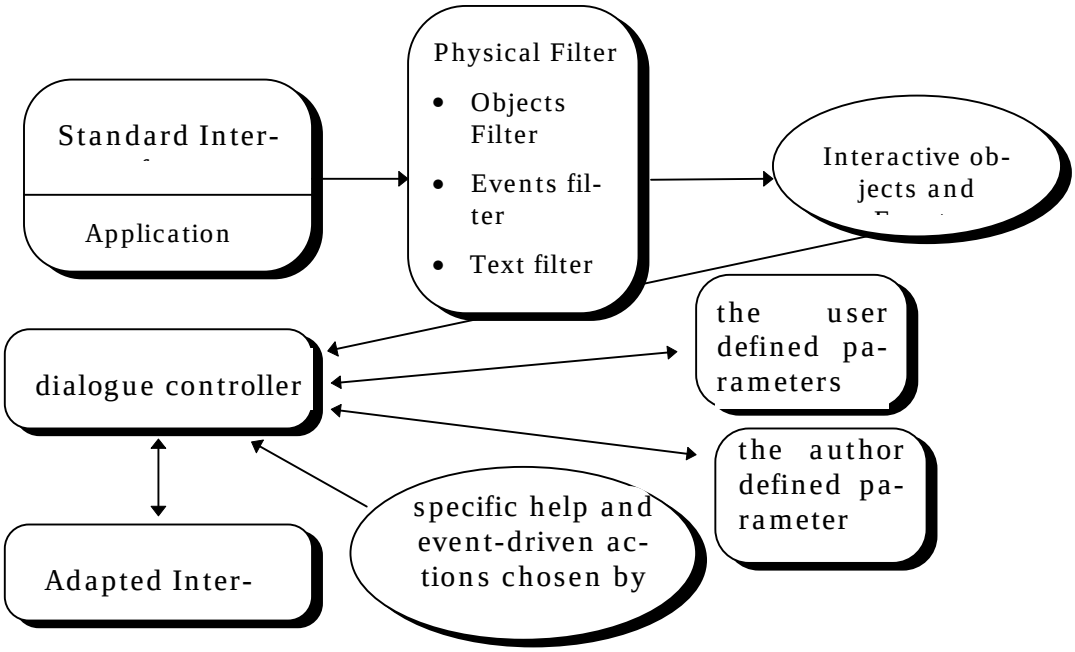

Figure 1*: An intelligent tool for the adaptation of graphic interfaces*

The objects of the graphic interface are reorganised on the basis of the data filtered from the application. This data is not sufficient to reconstruct it correctly. There has be addition of information about the application itself and the user. In addition, the semantics of the application must be retained. This depends on the type of application intended for the blind or the visually impaired. The semantic is based on the representation of the filtered objects and the conservation of the coherence of the interface, for example: restoring the information via a logical path in relation to the understanding of that which is on the screen. The semantic cannot be obtained by the filtering system. It is therefore indispensable that an expert of the application uses the adaptation generator to define it. Therefore, a database is created to furnish the user, in accordance with his preferences and his handicap, with an interface adapted to his profile. The dialogue controller has different sources of information at his disposal. These are the objects, filtered events, the user defined parameters, the author defined parameters and event-driven actions chosen by the author. These decisions execute all the tasks that are to be completed during his interaction with the system in a given situation. A certain number of aspects of the presentation can be automatic. It is possible to intervene and to specify for each application a certain number of data relating to the presentation which are per-

manently modifiable, even during the execution of the application. Indeed, a visually handicapped person could choose according to his handicap, the colour and degree of the text enlargement, the unit of navigation (word, line or sentence), the parameters of sound restitution, volume, speed ...

5. Using our system to access the Internet

5.1.Introduction

Another of our aims is to be able to use the intelligent tool for the adaptation of graphic interfaces to access the resources on the Internet. We have therefore begun to study and research the possibility of retrieving information from HTML (HyperText Markup Language) pages using our system. The browsers (Netscape, Mosaic, Microsoft Explorer...) are themselves MS-Windows applications, we can therefore filter the user commands, the controls, the menus, the images and the text in the same way as we have done for the other MS-Windows applications. The problem is more complicated at the level of the browsers' work areas; here we are unable to recover all the data, as it is not possible to have a specific adaptation for each application executed in the browser. The browser executes the applications, the identity of which we cannot know in advance, in its work window. Thus we are obliged to create a general adaptation, which forces us to have a general filter system. We have already created this. We have noted that some of the data from the applications using HTML pages cannot be interpreted using only our filtering system. In reality, creating HTML pages introduces frame and clickable image concepts, the presence of which can be detected by the filter, but we cannot foresee their functionalities.

We can envisage the following solutions to access the Internet:

- Not using the graphic mode, and accessing Internet servers which possess the Lynx software via an emulation terminal; this is equivalent to exploring a text screen. The adaptation tools of the character mode are applications which have been in use for a long time and which give good results. The textual structure could be equally well communicated through the visual, tactile or audio modes.
- Treating the HTML pages, there are programs, for example WAB, which convert the HTML structure into a form that is easier to read for the visually handicapped. The titles, the links and the format elements are described textually. « The modified document has three parts:
    1. the searched for document with some modification
    2. a list of all the links in the document
    3. a hierarchical list of all the titles

  The two lists give an overview of the document and allow the user to navigate with ease. [A. KENNEL & AL, 1996] »
- Using our MS-Windows filtering system to filter a given window of the browser.

5.2.Access to the HTML pages on the Internet

We have resolved the problem of accessing textual information thanks to our filter, which also allowed us to recover hyperlinks and the position of each link posted on the screen. The result of the filter therefore allows us to activate the links at the user's request without any interpretation of the active HTML page. An interpretation of the HTML pages could be interesting in order to recover the data from the logical structure of the HTML pages which is not physically represented on the screen. Such as in the following example: the existence, within an HTML page, of a flag which indicates a change of language. This flag has a logical meaning in the page, but will not be visible on the screen. For that to happen, a specific filter would be useful in order to complete our data structure. On the other hand, the presence of a title can be dynamically recognised by our system, depending on the font used by the browser. The use of both filters, the HTML page filter and our system, can create a problem in how what is visible on the screen is filtered and how it corresponds to what is filtered by the HTML pages. How can one co-ordinate the data recovered by both filters in order to drive the structure without any confusion? This problem will be studied in more detail in our future work.

In addition it is easier to use our filtering system which is more generalised, as it enables the filtering of the interactive actions carried out by Java and/or ActiveX and the user dialogue created by the Scripts (JavaScript and VBScript). JavaScript is based on Java, which is itself similar to C++. VBScript is based on Visual Basic and is used to write ActiveX scripts. Java and ActiveX are methods for adding interactiveness to the Web. The appearance on the market of Java and ActiveX will complicate the analysis of HTML pages since it will then be necessary to be able to analyse not only the standard HTML code, but also the code introduced by JavaScript and/or VBScript. The use of our filter will allow us to avoid, in this case, the creation of a compiler of the two languages which requires lengthy work.

On the other hand, for the images, it will be necessary to associate textual descriptions to them. In this case, we have been able to foresee the following two possibilities:

- We signal the presence of an image by an audible signal.
- The addition of a brief textual description of the image to the HTML pages. We would associate, for example, an image to a spoken commentary which would describe the principal characteristics of the image.

Conclusion

In the project we have realised, our goal was to test the author system and the filtering system, therefore we have only used vocal synthesis for output and a standard keyboard for input. We envisage introducing, for example, voice recognition and a Braille terminal. The visual information can be enriched by using several channels of communication simultaneously. Choosing several modes of communication allows access to a maximum of information in an adapted manner. Our work allowing the modification of a graphic interface without accessing the sources of the software application allows for

adaptations other than those destined for the visually handicapped. So, our approach can also be used to do the « Face Lifting» of visual interfaces in order to improve the ergonomics of the graphic interfaces and to adapt the applications to another language.

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