MAKING AN ACCESSIBLE FORUM MORE USABLE FOR BLIND USERS: A CASE STUDY

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Abstract

In this paper, we show in which way an accessible forum can be used as an educational tool and can be improved by making it more friendly to vision impaired users. For this purpose, we considered an online course for ECDL (European Computer Driving Licence), specifically addressed to blind and low vision people. First, we describe the use of an accessible forum during an online course for the ECDL and then we present a set of criteria created in order to improve Web site usability. Finally, we discuss in which way the application of our criteria can improve the navigation in the forum, once the forum has been accessed.

Keywords: accessibility, usability, user interfaces, design principles, blind, visually impaired

1.   Introduction

The Internet has become a very useful vehicle for educational purposes, information exchange, and communication among people. Web sites, E-mails and Forums offer helpful opportunities for distance education and learning courses, especially for people with disabilities. In fact, increasingly, print-based

information is being substituted with its digital equivalent. Today, the web, along with email, Web sites, online courses, and forum, provides the main channel for a variety of education-supporting resources.

Text-based computer conferencing has several potential teaching benefits (Funaro and Montell, 1999), including drawing in shy students, facilitating peer-to-peer learning, and helping teachers monitor their students' understanding of course topics. In (Tanimoto et al., 2002) an example of an online support in distance-learning is discussed. INFACT-FORUM is designed to achieve those benefits under the tight control of instructors and teaching assistants. Its support for separate small groups within an overall course forum is one property suitable for teaching but of little use in other online communication applications.

Therefore, for all these reasons, it is really important to make such services universally accessible and easy to use also for vision impaired users, who are obliged to use special devices, such as screen readers. Accessibility is necessary to guarantee universal inclusion; usability is necessary to make Internet navigation more effective, efficient, and satisfactory.

We aim at combining accessibility and usability, since both aspects are crucial for people with special needs, whose navigation possibility is strictly related to the assistance provided by particular devices. Indeed, accessing information is fundamental but being able to "exploit" it is important as well, especially when such information regards education and working areas.

The University of Washington through a series of online distance lessons deals with typical strategies for working with students who have various types of impairments (DO-IT). In particular, it is discussed how employing universal design principles when initially designing a course using instructional strategies for inclusiveness, Web pages, and interaction creates an accessible environment for individuals with special needs.

This work describes how usability and accessibility principles should be considered in designing of a more usable user interface of an interactive online forum. In particular, the usability criteria proposed in previous works to improve Web site navigation are applied to the forum UI. This case study refers to an online course for European Computer Driving Licence (ECDL) provided by the Italian institute I.Ri.Fo.R. for the blinds.

In the following sections, after discussing related work, and the proposed usability criteria, first, we consider issues in web navigation for sightless users when interacting through a screen reader and voice synthesizer; next, the scenario related to the online ECDL course and the forum used for distance-lessons is described. In the third section, the main aspects to be considered in designing of a more usable forum interface are discussed. Lastly, as a concrete example, how the forum UI can be improved is illustrated.

1.1   Related work

To assist designers in handling Web pages, well-defined criteria and guidelines must be provided to guide them in the development process of more usable and accessible Web sites.

Regarding accessibility, the W3C Consortium is one of the main sources of information, tools and resources. In the WAI (Web Accessibility Initiative) activities, a set of specific guidelines and recommendations has been defined: "Web Content Accessibility Guidelines 1.0" (WCAG 1.0) (W3C, 1999). Currently, a new version 2.0 of Web Content Accessibility Guidelines as a Recommendation is in progress (W3C, 2004a). In addition, other accessibility guidelines have been defined by section 508 standards. A number of tools (e.g., BOBBY, LIFT, and WebSat) have been proposed to identify accessibility problems mostly following the guidelines of Section 508 and W3C. A list of evaluation and repairing tools can be found in (W3C, 2004b). Many detailed usability guidelines have been formulated for both general user interfaces and Web page design (Nicolle, 2001; Scapin et al., 2000). Up to now, usability and accessibility guidelines have been proposed separately; in (Leporini and Paternò, 2002; Leporini and Paternò, 2004) an integrated approach is proposed: A detailed discussion on accessibility and usability requirements for visually-impaired persons is carried out, since both aspects are crucial for navigation by means of assistive devices. In fact, even if a site is in principle accessible, because it completely complies with technical accessibility standards, it can still be so hard to use for people with disabilities that they may not succeed in reaching their goals.

There are various international projects involving accessibility and usability of user interfaces for people with special needs. Stephanidis' group has long been working on user interfaces for all, elaborating methods and tools allowing the development of unified user interfaces (Grammenos et al., 2000;

Stephanidis et al., 1998). In the AVANTI project, a "Unified Web Browser" has been developed: it employs adaptability and adaptivity techniques, in order to provide accessibility and high-quality interaction to users with different abilities and needs (e.g., blind users or those with other disabilities). A specific study concerning accessibility of on-line library resources was carried out in (Schmetzke, 2002). The NOVA project, sponsored by the Manchester Metropolitan University studies the usability and accessibility problems of the sightless and visually-impaired when retrieving information, with particular focus on access to Digital Library systems (Craven and Brophy, 2003). Last, in (Brajnik, 2004) the author discusses the limits of universal design and analyzes the use of a text-transcoder to furnish a text interface equivalent to the original. In particular, for people using a screen reader (which gives modal access) user bandwidth decreases (e.g. actions take longer) while tasks become more difficult since additional actions are required. Therefore, when designing accessible interfaces it is very important to maximize the "quality of use" for persons with disabilities.

In fact, it is very important to consider user needs from the very beginning of the design phase of the interface.

1.2   The proposed usability criteria

Accessibility can be obtained following the WAI guidelines. The experience clearly shows that in many cases a little effort can give extremely relevant improvements, even if some goals are not so easy to achieve. Usability takes into account the intended tasks and the user community the system is addressed to. Usability can take advantage by adopting some techniques intended for design for accessibility. The usability of a Web site depends on many aspects. In order to improve the navigability through a screen reader, we proposed 19 criteria (Leporini and Paternò, 2004) that we have divided into three subsets according to different aspects of usability indicated by the standard usability definition (ISO 9241): "effectiveness" criteria (5) ensure the accomplishment of the task, for example using a logical partition of interface elements or ensuring a proper link content, "efficiency" criteria (10) shorten the time required to complete that task, for example using proper names for frames, tables and images or providing importance levels for the elements or identifying the main page content; "satisfaction" criteria (4) provide Web pages with minor additional characteristics (addressed to improve the navigation) without the need to use specific commands. The 19 formulated criteria address usability issues of Web interfaces when a screen reader is used. The criteria intend to be general principles that should be considered by Web designers/developers during the development phases of a Web site. Such principles are aimed at structuring user interface elements and content of the page, as well as providing additional features, which can help users to move about better in the Web site through a screen reader. Some possible examples of criteria application are: appropriately marking the navigation bar and side-menu; logically spreading out the content in the page; using meaningful names and labels for textual/graphical links and buttons; keeping consistency among pages. Many criteria affect visually the Web interface (e.g. coloured areas or element magnifications), whereas others are detected only by the screen reader (e.g. hidden labels or names of frames). A complete list of the criteria can be found in (Leporini and Paternò, 2004).

2.   The scenario

2.1   Navigating through screen reader

Usually the analysis of digital obstacles for the disabled only addresses accessibility, although usability is fundamental for simplifying both navigation and interaction for users using assistive devices or those with special needs. Blind users navigate the Internet by using a screen reader, which announces the page content, whereas visually-impaired users can interact by means of magnifying programs. For users with

certain disabilities such as vision or hearing impairment, or movement difficulties, the layout and structure of the interface play a meaningful role. When navigating by a screen reader the user perceives the page content in a different way from its rendering on the screen. Although sites may adhere to accessibility recommendations, users can still experience navigational problems. This is partly due to the fact that Web pages are increasingly designed for parallel or non-serial navigation, offering a variety of options within one page (frames, tables, drop down menus etc). Parallel design can cause problems for users who are navigating the site using assistive technologies which force them down a serial (or linear) route, for example a screen reader reading out every hypertext link on a page one by one.

In brief, the main problems for a blind person navigating through screen reader are:

- o *Lack of context* – Navigating by screen reader (or a magnifier) the user accesses only small portions of texts and may lose the overall context of the current page.
- o *Information overload* - The unchanging portions of the site (menu, frames with banners, etc.) may overload the reading, because the user has to read through all the items nearly every time, thus slowing down navigation.
- o *Excessive sequencing in reading the information* - The command for navigating and reading can force the user to follow the page content sequentially. This may provoke great frustration in the user.
- o *Keyboard navigation* – Blind users do not use the mouse function (i.e. pointing, scrolling, selecting, etc.) for moving around the page; but instead move by means of keyboard commands, such as Tab key, arrow keys, and so on. Consequently, navigation around a page is slowed.
- o *Screen reader interpretation* - The screen reader deals with Web page content in a manner that differs greatly from visual rendering. This requires a certain expertise in advanced screen reader and browser commands and orientation oneself within the page content can require considerable effort.

Thus, although the Internet is a precious source of information and offers great availability of services (e-learning, e-business, e-government, etc.) all these drawbacks can discourage blind and visually-impaired users from accessing on-line services. A more general discussion about several issues related to visual layout and different perception can be found in (Pitt and Edwards, 2003; Leporini et al., 2004).

The screen reader referred to in the following is Jaws for Windows (Damery, 2003) which is the most frequently used by blind people the world over. JAWS gives quick access to the information in a logical format. JAWS also provides more information about the structure and organization of web pages. The information comes right from the HTML used to create the page. Thus, features of HTML allow screen readers to provide detailed information about web pages. Hence, tables, lists, headings, and so forth are all announced. Users can navigate within Web pages by the Virtual Cursor, read web pages using standard JAWS reading commands, tab through links and easily follow them, display lists of links or headings to quickly find and move to what you need, and easily move to and fill out web based forms. For instance, by pressing a letter the focus moves directly to tables, headings, or lists. Therefore, developers should build Web pages so that users can get advantages from special commands.

2.2 Distance learning ECDL course and supporting forum

The European Computer Driving Licence (ECDL) is the world's leading end-user computer skills certification programme (ECDL-F, 2004). The ECDL is a test of practical skills and competencies and consists of seven separate modules covering computer theory and practice. In this work we refer to an online ECDL course given to visually impaired people from the I.Ri.Fo.R., an Italian institute aimed at providing educational and research support for the blind.

This long distance course consists of two main parts: first one, the distance lessons, and second one, an online forum where teachers, tutors and participants can interact. Seven forums are available to the participants, one for each module.

The distance lessons are available in html format so that users can access them like Web pages. Web pages are well-structured by using heading levels for partitioning the content in paragraphs and sub-paragraphs. Furthermore, shortcuts are assigned to allow a quick navigation.

Each module is partitioned in several lessons. Every lesson consists of various html pages which can be downloaded from the online forum in a compressed format. Each lesson can be downloaded weekly. At the end of each module, some questions and exercises are delivered online.

In addition to downloadable lessons, tutors and participants interact at distance for two hours weekly. In fact, in order to best support teaching process, an online forum was implemented. A forum consists of a collection of users, a collection of messages, and mark-up. The intended use of a forum is to support learning in a single course, or over several lectures. Each forum has associated with it a separate database that stores its information. A user interface is developed for interacting with users.

All the participants can post messages, and they can reply to any message. Each question is written in a separate page linked from the topic list contained within a main page. The replies for a certain message are placed in its page linked from the relative topic link.

The goal of this work is discussing how such a supporting tool for long distance learning can be made accessible and especially usable for visually impaired users.

3.   Improving the Forum Navigability: proposed guidelines

In this section we discuss about main aspects that should be considered in designing a forum user interface for blind users. Before discussing about the usability principles for a forum UI, we would like to focus on those issues should be considered when a user interface is developed. In order to improve Web navigability, developers should keep in mind how the screen reader handles the Web page layout, and how blind or visually-impaired users perceive page content and interact with the interface. The main issues in UI design are:

A. **Page content serialization.** The JAWS screen reader takes the page source and serializes its content (link, edit field, button, cell, and so on). Also frames or blocks <div> are lined up, without taking into account specific positions assigned by CSS properties. Basically, JAWS reads the code as it was written and lines up the page content in the form of a single column. Thus, the order in which the blocks <div> and the frames are written is very important.

B. **Navigation by Tab key and special commands.** It is important to remember that a blind user usually prefers to visit the page link by link (by Tab key) or using special commands in order to move quickly around the pages. Hence, it is important to favour navigation via keyboard by assigning a scale of importance to the links, applying shortcuts to main elements, using specific tags such as <Hn>, and so on. Furthermore, many special screen reader commands operate well only if the developer has applied specific tags or attributes, or appropriate criteria have been followed.

C. **What is offered by a visual layout differs from one provided for aural perception.** Often when developers design a Web page they provide some useful information by means of visual features, such as position, colour, separating blank spaces, formatting features, and so forth. For instance, some secondary information is put on the side so that users can recognize it immediately. It is important to provide the same "message" to a blind user by other means (e.g. using a table, a heading, a hidden label, etc.).

Considering all the above issues as well as accessibility and usability difficulties resulting from the screen reader, we propose that the following principles must be considered in the design process of an online forum interface layout:

1. *Making simpler the message list*
    Regarding the list of messages available within the forum it is important that the list is easy to be navigate. Usually a table is used for rendering message data. Most important and useful data, such as topic subject, number of replies, names of the first and last authors as well as time and date of last reply message, should be shown. No other information or no particular links should be added. Then, messages should be ordered in a decreasing chronological order.

2. *Making clearly identifiable the topic subject*
    Topic subjects should be put as links, so that users can navigate easily through Tab key. Otherwise, if topic subjects are not links, users are obliged to read in sequential way. Besides, an additional specific notation could be used to mark message links having new replies in order to facilitate their detection.

3. *Highlighting the most recent messages*
   When messages are updated due to presence of new replies, it is important detecting them quite quickly. A different chronological order or a given marking could be applied. Also a strategy based on importance levels of links could be used.
4. *Well-structuring the replies of a message*
   Pages containing the main message and its replies have to be structured by partitioning all the messages. For instance, heading levels, or separate tables could be used for rendering each message.
5. *Providing a quick access*
   For most important functionalities, such as "posting a new message", "replying to a message", or "modifying a message", a quick access should be provided through shortcuts.
6. *Focusing main fields in composing or replying*
   When a new message or reply is composed, the main edit fields should be easily focused. Shortcuts or Tabbing levels could be used. Also applying different colours or font size could be useful for low vision users.
7. *Getting attention by sounds*
   Assigning various sounds for alerting users could make more efficient the system. For example, when a new topic or a reply message is available different sounds could be applied to distinguish them.

4. Examples

In this section, two samples are considered in order to show how navigability of an accessible forum can be improved. We refer to the forum associated to the ECDL course introduced in section 2.2. In specific, we would like to discuss the following two cases:

❖ How the list of messages is structured and how it can be improved;
❖ How a page of a message with its replies is structured, and how its can be better organized;

However many other issues could be described, such as composing a new message, replying to a message, organizing or grouping the stored messages for a better search, and so on. Herein we limit us to consider the reading case.

4.1 List of messages

The main page to be taken into account for skimming through available topics is the message list. In this page most important information about each topic (i.e. a message) is summarised; precisely, for each message some useful data are accessible: topic subject, number of available replies, author and date of the message and of the last reply. In addition, all messages are listed in decreasing order, so that the most recent message is the first of the list. In order to read a specific message, the user has to click on its link whose text is the topic subject. Next figure shows a list portion of messages related to the forum associated to the ECDL fourth module (i.e. excel).

In the figure a portion of messages is shown. The list is rendered through a data table where each row contains information related to a single message. Every row is composed from 8 data objects: subject, number of replies, first and last author of the topic, last date and three action links ("block topic", "delete topic" and "unblock topic").
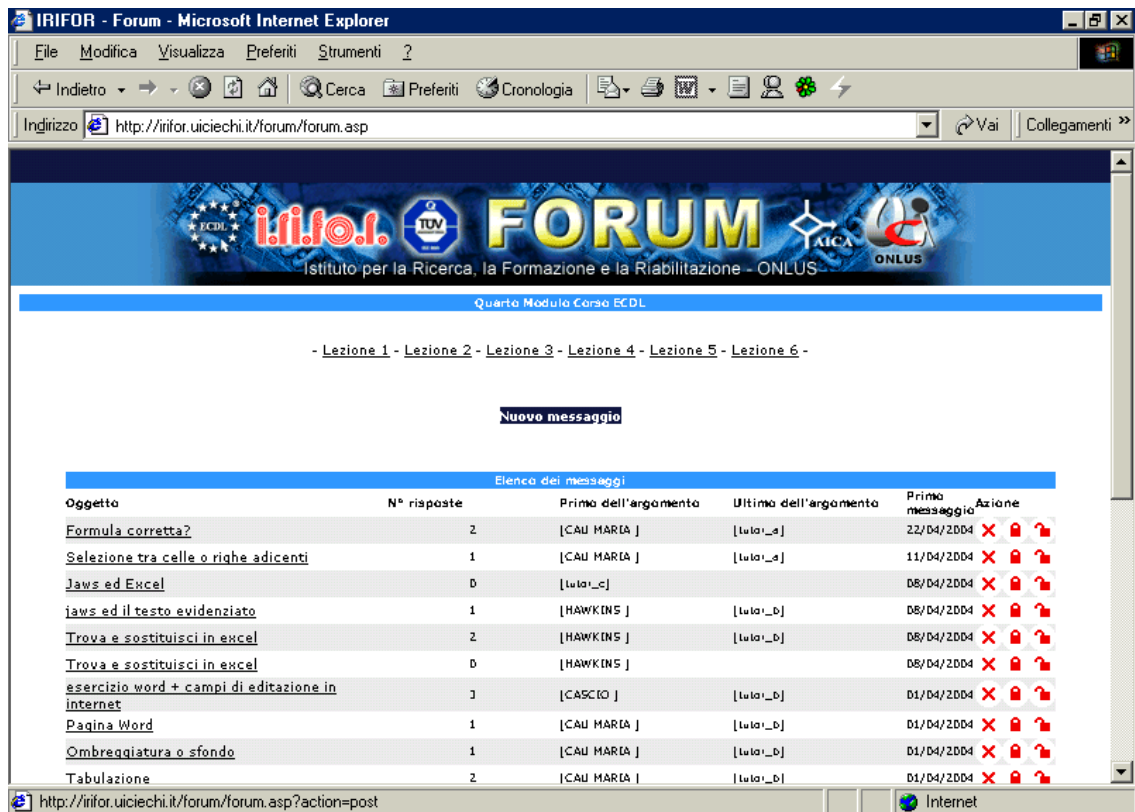
Figure 1 - List of available messages in the ECDL 4° module forum

Visually all this information appears in a compact manner. A sighted user can have an overview about available topics very quickly by simply looking along the first column. When a new message is inserted by someone, its subject is placed at the top of the column. A similar situation occurs when getting the other information, especially the number of replies in order to know if a new reply is available. Unfortunately, when interacting through voice synthesizer reading is much more tedious. As the table is linearised, it is more difficult monitoring all topics.

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Sezione di Forum dell'IRIFOR

Quarto Modulo Corso ECDL

-
Link Lezione 1 -
Link Lezione 2 -
Link Lezione 3 -
... -
Link Nuovo messaggio

table Caption: Elenco dei messaggi
Summary: tabella riportante l'elenco dei messaggi
Table with 6 columns and 22 rows
Oggetto
N° risposte
Primo dell'argomento
Ultimo dell'argomento
Primo messaggio
Azione
Link Formula corretta?
2
[CAU MARIA ]
[tutor_a]
```

22/04/2004
Link Cancella argomento di discussione
Link blocca argomento di discussione
Link sblocca argomento di discussione
Link Selezione tra celle o righe adiacenti
1
[CAU MARIA]
[tutor_a]
11/04/2004
Link Cancella argomento di discussione
Link blocca argomento di discussione
Link sblocca argomento di discussione
...

Table 1 - Portion of message list read by Jaws: the data related to only two topics are shown

The user who navigates in sequential way through arrow keys (or Tab key) is obliged to read too many data. in particular, the links for blocking, unblocking and deleting each topic are tedious and not so useful. Also when a link list is generated by a Jaws command, for each topic four links are available, but only one is important (i.e. the link of the topic subject). As a result, looking for a certain topic requires quite long time, and the reading results frustrating. Therefore, the suggestion is avoiding all the links which are not particularly necessary. In this case just topic links could be preserved (e.g. "formula corretta?").

Another inconvenient regards the monitoring of new messages. About new topics there are not particular difficulties in identifying them since a new one is automatically placed before the others. So, when the page is updated, the new topic link results the first of the message table. Differently, a new reply for an already existing topic is more difficult to be recognized. In fact, when a new reply for a certain topic is added by some user, the number of replies is increased. A blind user who monitors the list for a new message is obliged to move up and down within the page through arrow keys: a sequential reading is needed for getting the number of replies regarding a specific topic. Thus, if there are few messages (i.e. few rows), that is feasible; otherwise the reading becomes too much tedious. Moreover, if the updated topic is in a row high-number, the user could not notice it at the risk of loosing the new message. In order to solve these negative aspects, specific techniques could be applied. First, when a new reply is added to a certain topic, the table could be rebuilt moving the updated topic in the first row. In practice, this is the same method already used for new topic: it is automatically placed in the first row of the table. Alerting by a sound could be a second way to inform the user on the presence of a new topic or reply. A different sound for a new topic and a new reply could be chosen. For low vision users, different colours and font size could be used to focus changes.

4.2   Reading of a message and its replies

Let's consider now when a topic link is clicked from the message list being within the main page. A new page related to the chosen subject opens (See Figure 2). In this page the main message regarding that subject and all its replies are shown.

At top of the page the links for downloading the single lessons are still available. Next, there is the layout table used for rendering the message and its replies. Table 2 shows how the screen reader interprets the page content.
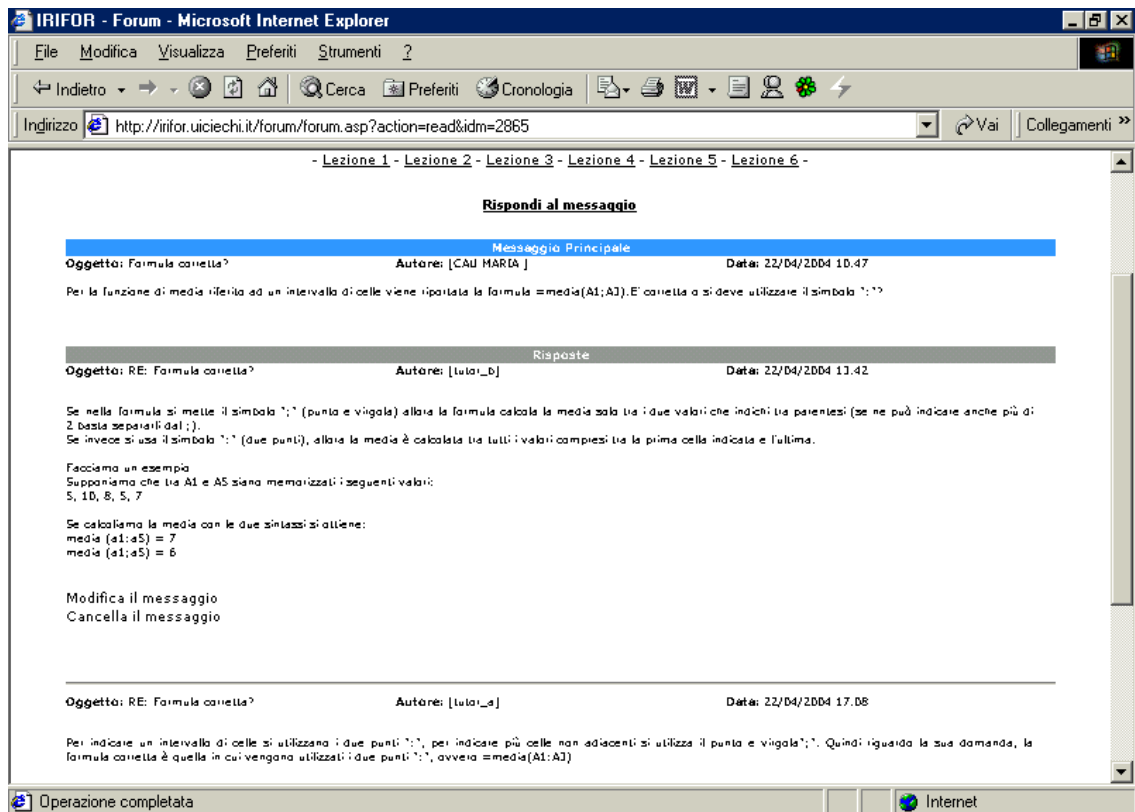
Figure 2 - Page containing the replies to a specific topic

Summary: tabella riportante le risposte al messaggio
Table with 3 columns and 8 rows

Messaggio Principale
Oggetto: Formula corretta?
Autore: [CAU MARIA]
Data: 22/04/2004 10.47

Per la funzione di media riferito ad un intervallo di celle viene riportata la formula =media(A1;A3).E' corretta o si deve utilizzare il simbolo ":"?

Risposte

Oggetto: RE: Formula corretta?
Autore: [tutor_b]
Data: 22/04/2004 13.42
... text of the first reply ...

Link Modifica il messaggio
Link Cancella il messaggio

Oggetto: RE: Formula corretta?
Autore: [tutor_a]
Data: 22/04/2004 17.08
... text of the second reply ...
Link Modifica il messaggio
Link Cancella il messaggio
table end
Link Rispondi al messaggio

Table 2 - How the table rendering the main message and its replies is read by the screen reader

After having announced the links for downloading single lessons, the screen reader recognizes the reply table. First of all, the main message is read, then its two replies are located. The word "Risposte" (i.e. replies) indicates starting of the reply section. Each reply has two links: "delete" and "modify". When the user navigates link by link through Tab key, he/she hears the same two links again and again. This makes not usable the page navigability. Furthermore, the replies are placed one under the other; a new answer is added at the end of the table. This means that in order to read all the replies, especially the new one, a sequential reading is required. In few words, it is not easy skimming through the replies. Thus, it makes the reading quite slow.

In order to improve navigability, we suggest applying heading levels (i.e. tags <h1>…<h6>) to the "author name" of each message. In this way, a better reading results. In fact, now by using a specific jaws command (insert+f6) an index list of all the replies can be obtained: With up or down arrows each message can be easily identified by the name of the author. In addition to heading index, the user can skip heading by heading (next and previous) also through a given key ("h"). Noting that we suggest to assign an heading level to author name rather than to subject or date, because probably the subject is the same for all the replies (e.g. "re:…"); that is due to the automatic addition by server. If the subjects were different, it would be better assign a tag <hi> to them. A good solution could be provided by enumerating the reply messages and adding the author name to them; e.g. as "1 author name", "2 author name", and so forth. Then, headings could be created adding time and date to each "n author name". For instance, a heading could be like "1 tutor_b: 17:01 04/27/2004". As result, when the user gets heading list, he/she can identify quickly how many reply messages are within the page and jump to one through its number as well.

Regarding the link "reply to message", it is placed at the top or the bottom of the table (just outside of it). Its location is easy to be identified in a visual layout as it is more compact. Whereas, when navigating in sequential way through the screen reader, that link is not easily reachable. For this reason, a quick access could be provided by adding a shortcut to such link; for instance, the letter "r" could be assigned. In this way, at any time the user can press the appropriate shortcut (e.g. alt+r) to reach very quickly the link for replying to the message.

In order to improve the usability for a low vision people, the messages could be identified through a different colour. For example, the heading of each message could be coloured with a specific colour. An added reply could be coloured with a specific colour, so that user can quickly detect if a new message is available. In addition, a link allowing to open a new window in which the text message can be visualised with a larger font should be another improvement.

5. Conclusions

The long distance learning plays a meaningful role in educational purposes especially for people with disabilities. For this reason making accessible and usable all the resources and tools employed in distance courses is very important. In this paper, first we introduce the main accessibility and usability issues regarding Web navigation for visually impaired people. Then after having presented a ECDL distance course, how an online forum can be implemented as teaching support is presented. Next, two examples are illustrated in order to discuss how an accessible forum can be made more usable. Lastly, on the basis of previous proposed criteria to improve Web site usability for blind users, a set of design guidelines specifically for forum implementation is proposed.

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