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2014

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Procedia Computer Science, Amsterdam, v.27, p.168-175, 2014

<http://www.producao.usp.br/handle/BDPI/44823>

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5th International Conference on Software Development and Technologies for Enhancing Accessibility and Fighting Info-exclusion, DSAI 2013

An accessible video player for older people: issues from a user test

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Abstract

There is a huge availability of videos that have been produced in a very fast and wide way, along with the popularity of Internet. This scenario should be carefully considered by the video authors since many users have different needs. It is important to keep in mind the accessibility requirements so that any user can overcome the barriers to access content regardless of their limitations imposed by either impairment or some temporary restriction. The current video players present barriers for many people, especially to the elderly, and one of the main barriers is the restriction to reproduce videos accessible on the Web. This paper describes a research, and the design and evaluation of an accessible video player (called Facilitas), in which a user test with older people is conducted. As a result, we discuss the issues reported by older people and the controls that were developed to assist them.

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Selection and peer-review under responsibility of the Scientific Programme Committee of the 5th International Conference on Software Development and Technologies for Enhancing Accessibility and Fighting Info-exclusion (DSAI 2013).

Keywords: Accessible Web Videos; Accessible Media Player; Facilitas.

1. Introduction

The recent production and availability of multimedia Web contents have increased [7], boosting Web accessibility initiatives and attracting researchers from different fields due to the social inclusion contributions involved and challenges to make the huge amount of Web multimedia content accessible. Accessibility requirements must be considered so that any user can access content regardless of the limitations imposed by either impairment or some temporary restriction [14].

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The W3C (World Wide Web Consortium) has standardized a set of guidelines to make multimedia content accessible. Recommendations for making Web content more accessible are described in Web Content Accessibility Guidelines - WCAG. Guidelines for designing user agents to help disabled people are described in User Agent Accessibility Guidelines - UAAG. Guidelines to define how authoring tools should help Web developers produce Web content are accessible in Authoring Tool Accessibility Guidelines - ATAG. A problem to include those guidelines in Web content is that the designer needs to choose how they should be implemented, by, for example, considering the codification language or browser. When multimedia content, as video, is included in Web sites, the video access must be included in the code and the interaction with the users must be intuitive.

Many older people have age-related impairments that can affect how they use the Web, such as declining: vision including reduced contrast sensitivity, color perception, and near-focus, making it difficult to read web pages; physical ability including reduced dexterity and fine motor control, making it difficult to use a mouse and click small targets; hearing including difficulty hearing higher-pitched sounds and separating sounds, making it difficult to hear podcasts and other audio, especially when there is background music; and cognitive ability including reduced short-term memory, difficulty concentrating, and being easily distracted, making it difficult to follow navigation and to complete online tasks. These issues overlap with the accessibility needs of people with disabilities. Thus, websites and tools that are accessible to people with disabilities are more accessible to older users as well [11]. The median age of the total population in developed regions is increasing rapidly. In this regard, the median age in 2045 will be 46 years old and it is expected that the number of people over 60 will triple in the world by 2050 [8].

Some researchers have studied the accessibility guidelines explaining how accessibility barriers in elderly are not resolved and in which there is a need to keep working [8].

In fact, we observe that there is no research on the reduction of accessibility barriers to zero, therefore we argue that a video player must be designed to minimize the accessibility barriers without disregarding. This paper describes the research, design and evaluation of an accessible video player, in which a user test with older people was conducted. A video player, called Facilitas Player, was developed as a prototype in order to provide the rationale of how some of those barriers or limitation could be overcome. We propose and have tested new controls, such as links and search (to cite some), which enable users to navigate through the video searching in closed caption or audio description. Such controls were designed to be compliant with W3C guidelines, especially UAAG.

The paper is organized as follows: Section 2 discusses the related work and the W3C guidelines are presented in Section 3; Section 4 describe a brief survey with older people; the of Facilitas Player is presented in Section 5; Section 6 discusses the evaluation with older people; finally, Section 7 concludes the paper and suggests some future works.

2. Related work

It is common that older people is not interested in using computers or has never used one or they have little computer experience [6]. This paper is focus on older adults who have little computer experience. "Older adults" is related to people who are 40 years old or more. However, the difficulties due to cognitive impairment are constant over time, independent of the experience of TIC [10].

According to González [4], some basic controls are necessary to obtain an accessible media player: play, stop, resize and volume. The authors describe some additional controls: enable/disable subtitles and audio description, search in the caption text, forward or delay seconds within a reproduction, change the size, font or color of the text, help documentation, among others. They also report the requirements concerning accessibility close to usability: maintain accessibility features configured by the users, enable/disable and adjust accessibility features, provide information about keyboard shortcuts, enable navigation through the content, use keyboard to move through the menus, and enable users to set their preferences to configure the keyboard shortcuts.

Moreno discussed accessibility for media players on the web, comparing YouTube, BBC iPlayer and CCPlayer, all of them developed with Flash technology [7]. They are embedded in a web page and enable users to access the content without another application opening. To the best of our knowledge, CCPlayer was the most

accessible player reported in the literature until [7] developed an accessible HTML5 Media Player using not only HTML5, but JavaScript and CSS as well. The player has the following controls: play, stop, rewind seconds, forward seconds, volume controller, audio controller, caption on/off, audio description on/off, help guide and select caption language, but it does not support search functionality (Fig. 1a).

YouTube is the most popular video search system on the web and provides some controls (Fig. 1b), like captions, screen resize, automatic transcription and subtitles, which could help accessibility issues. However, subtitles are difficult to operate in some browsers and are not accessible by the keyboard. Another problem is that screen reader tools for the visually impaired people cannot always distinguish the function of controls implemented in Flash, therefore some screen readers cannot access controls at all. Aiming to achieve an accessible Video Player, we have developed complementary technological solutions, provided in Section 5.

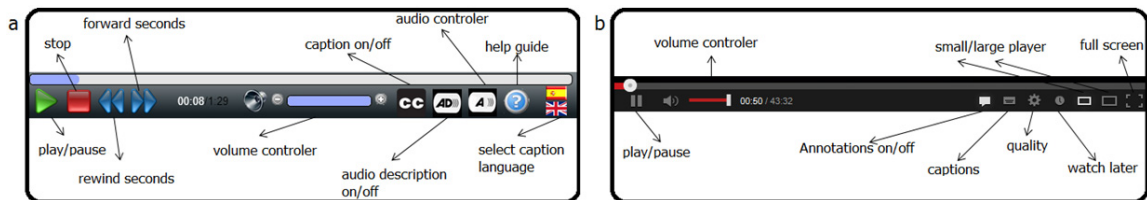


Fig. 1. (a) Accessible HTML5 Media Player Controls. (b) YouTube Controls.

Some researchers developed a video player that adjusts the current playback speed [2]. Our video player has forward and rewind controls. Others researchers collected and analyzed 187 noncommercial videos uploaded to YouTube, tested the videos with physically disabled users and showed that although many people with motor impairments find these devices empowering, accessibility issues still exist [1]. Other researchers claim even if the tags are provided for a whole video, they may describe only a small part of the video content. Therefore, when searching for video information via tags, users are often bewildered by the vast quantity of seemingly unrelated videos returned through video search engines and must browse through each video to find the interesting parts [6].

As can be seen, issues on Web video accessibility still need to be studied. The research found in the literature focuses on specific guidelines of W3C, emphasizing some functionalities different from the traditional ones. CCPlayer has search, but not audio description. Moreno's player has audio description, but not search. YouTube has automatic transcription and subtitles, but screen readers cannot access its functionalities at all.

3. Web Accessibility Guidelines

The WCAG documents explain how to make web content more accessible to disabled people [12]. The ATAG documents define how authoring tools should help Web developers to produce Web content that is accessible and in conformance with WCAG. ATAG documents also explain how to make authoring tools accessible so that they can be used by people with disabilities [14]. The UAAG documents provide guidelines for designing user agents to reduce Web accessibility barriers for people with disabilities. User agents include web browsers, media players, plug-ins and other types of software that help retrieve, render and interact with Web content [13]. A user agent that conforms to these guidelines will promote accessibility through the user agent interface and other internal facilities, including the ability to communicate with other technologies (especially assistive technologies).

As discussed in Section 2, related works have explored some guidelines, especially basic functionalities with another different functionality, but more functionalities still need to be tested. Some guidelines, as provide text configuration (Guideline 1.4), provide synthesized speech configuration (Guideline 1.6), configure and store preference settings (Guideline 2.7) and customize display of GUI (Guideline 2.8) have never been explored.

Most players also use Flash technology; however, it is not accessible for assistive technologies in most cases. The only player developed with HTML5 technology is Moreno's player [7], but some functionalities have been added, because HTML5 provides only basic controls: play/pause, volume and full screen.

4. A brief survey with older people

Our purpose was to assess users and their needs. We performed a preliminary user survey on how older users watch videos on the Internet and which functionalities they use. There were 15 unpaid participants in this survey. We monitored older people at a local Educational Institute for two months. The older participants regularly frequented the Institute to attend to Informatics courses for elderly.

We asked them to answer a questionnaire with 18 questions. Among the questions, we asked them about the video players more commonly used, and the first five players more used were YouTube, Globo News, Terra News, UOL News and Google. Most of the participants used basic controls of the video players: play/pause, stop, change the caption size and full screen.

Another question we asked for them were regarding to the problems they commonly faced when they wanted to watch a video. Eight participants reported problems with the idiom (53%), five with the caption size (33%), five with low volume (33%), five with unavailable caption (33%), four with the video quality (26%), two with fast caption (13%) and two with plugins (13%). Other reported problems were the contrast of captions, small screen, going back (rewinding) to some part of video to hear it again and fear to make mistakes and close everything.

Based on the problems reported by the participants, we identified a set of accessibility issues to be addressed in the development of a video player prototype. At the beginning, we implemented and tested some functionalities which were prescribed in UAAG guidelines; such as: to provide access to alternative content (Guideline 1.1), to provide text configuration (Guideline 1.4), to provide volume configuration (Guideline 1.5), to ensure full keyboard access (Guideline 2.1), and to provide text search (Guideline 2.4). Next, we tested as a new feature: link control to mark the parts of the videos. All these functionalities were implemented in the prototype Facilitas Player.

5. Design

The design involved a brainstorming and sketching initial drafts of the design based on findings from the previous brief survey. We have developed an accessible media player, Facilitas Player, using HTML5, JavaScript, jQuery, jQuery UI and CSS to provide functionalities to make videos accessible. The attributes are included in <video> tag. The player is made as a jQuery plugin, therefore, by simply calling \$(selector).facilitasplayer(options) the Facilitas player will be loaded. Since it is a jQuery Plugin, its architecture is based on Implicit Invocation, i.e. after initialized, all controls and listeners are instantiated and the player is ready to receive event notifications from the video tag and/or from toolbar buttons. When an event notification is received, it invokes all procedures registered for that event. For instance, when the time changes, the video sends a notification announcing it. The player receives the notification and updates its interface, rounding the milliseconds to seconds and displaying the elapsed time of the video to the user.

The current controls include basic controls as play/pause, stop, rewind, forward, volume controller and full screen and new controls as caption, search, links, speed up, speed down, configuration, help, and light on/off. Some functionalities of accessibility also include highlight and keyboard access.

Some of the accessibility features of current media players are in conformance with the UAAG: G1.1: Alternative content, G1.3: Highlighting, G1.4: Text configuration, G1.5: Volume configuration, G1.8: Orientation in Viewports, G2.1: Keyboard access, G2.4: Search, G2.7: Preference settings, G3.3: Help and G2.8: Toolbar configuration. Four of those functionalities are present only in Facilitas player: list with search result, toolbar configuration, light and links.

Link control enables the developer to add links to the video creating links to divide videos into parts. Each link is linked to a specific time in the video. Links provide a short description of the video content and a long description when the link is selected, facilitating the search of videos. For instance, in Fig. 2, the video has six links. If we select the "Tip: dark chocolate" link, the video skips to the third link time and a long description appears.

The search control enables the search for a word or phrase that appears in the subtitle text. The player will show all results and when a result is selected, it skips to that point on the video. For instance, in Fig. 2, we searched for

the word “butter”, returning a set of two entries. When a result is chosen, the player reproduces the selected part of the video.



Fig. 2. Facilitas Search Control and Link Control.

A light functionality is represented as a lamp icon on the video (Fig. 2) and is used to distinguish the video from the rest of the page. Another functionality of Facilitas Player is the configuration, which enables text configuration to change style, color and size in real time, as shown in the bar at the right side of Fig. 3. A control to move the Facilitas toolbar still in development, the toolbar will be docked at the top or bottom of Facilitas Player. A control to change the caption background color was developed (Fig. 3).



Fig. 3. Facilitas Caption Background Color.

A Help Control show the keyboard shortcuts of Facilitas Player (Fig. 4a). Finally, each control have a description to facilitate the navigation (Fig. 4b).

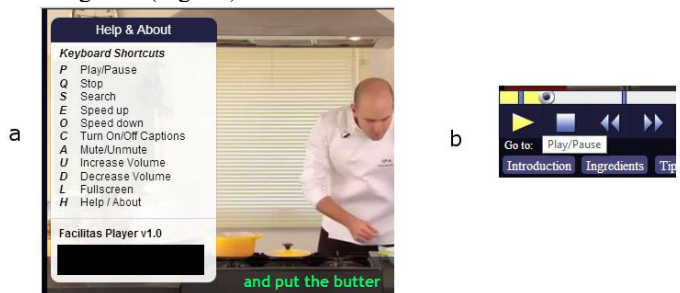


Fig. 4. (a) Facilitas Help Control and (b) Facilitas controls names.

6. A user test with elderly to evaluate Facilitas player

We performed an experiment to know the important functionalities of videos and those the participants chose to complete some tasks. The participants were provided with five videos using Google Chrome browser. We have asked them to choose two of them. They completed a series of tasks in which they had to answer three questions for each video. The first two tasks were questions about the video content. For each question about the video content, they had to show the scene where the answer could be found. They used some controls to find the scene: search, link, rewind/forward and time bar. The third task referred to subtitle configuration and they used the settings panel to configure the color, size and font.

We used five videos with subtitles in Portuguese for the testing. Two of them have audio in English and three in Portuguese. For each video, we created between 2 and 7 links (5 on average). The videos lasted 4 to 10 minutes (6 on average) (See Table 1).

Table 1. Features of videos.

Video type	Audio	Subtitle	#Tags	Time
Cooking video	Pt	Pt	7	4:25
Documentary	Pt	Pt	6	10:17
Comedy TV show	En	Pt	4	5:58
Terror film	En	Pt	2	4:29
Comedy Film	Pt	Pt	5	4:08

We used two applications of Morae software[†], i.e. Recorder and Manager, to facilitate the research process and data analysis. Recorder enabled the capture of audio, video, user input and on-screen activity. Manager application enabled the analysis of the video records.

Fifteen older people participated in the experiment (Table 2). Their age ranged from 40 to 82 years old. Ten participants were female. Each participant spent approximately 50 minutes on the experiment. The participants chose two videos based on their preferences. Most of them have visual impairment. The users' impairments are exhibited in Table 2.

Participants P1, P4, P9, P13 and P14 have used the computer more than 6 years. P5, P7 and P12 between 2 and 4 years. P15 between 4 and 6 years. The rest of them use the computer for less than 2 years. Following, the main issues reported by those people, related to their personal difficulties during the user test are:

- About *cognitive difficulties*: the main difficulty is memorization. P3 has difficulty to memorize acronyms (msn, like of facebook, FW, CC, CCO, etc.), she said that understanding the acronym is very difficult because it is necessary understand the new generation's logic. P2 moves the mouse around the video player controls and can see the button's names, she loves it because she forgets frequently the control functionality and every time that she make some task, she always reads the control name. P3 also reads controls' names and appreciates it. P9 said that he likes to read the links' names because he did not remember what it was.
- About *difficulties to deal with the computer*: P6 used the computer 6 months ago and she reported she had faced many difficulties to use the videos during the test, but she has reproduced successfully the video as well as configured the caption text. P10 said that the age is a problem to manipulate the computer because the programs have many information and the applications are frequently updated. P11 said that she wants to learn how to use the basic things such as skype or google, she also said that videos are important but she needs more practice; about the video player, she liked the search control.
- About *motor difficulties*: P9 and P10 have difficulties moving the mouse.

[†] Morae Software - <http://www.techsmith.com/morae.html>

Table 2. Participant's Characteristics.

	Age	Gender	Visual Imp.	Hearing Imp.	Motor Imp.	Cognitive Imp.
P1	63	M	Some	-	-	-
P2	82	F	Some	Some	Some	Some
P3	66	F	Some	-	-	Some
P4	70	M	Some	-	-	-
P5	62	F	Big	Big	-	Some
P6	59	F	Some	-	-	Some
P7	60	M	Some	-	-	-
P8	80	F	Big	Some	-	Some
P9	66	M	Some	-	-	Some
P10	66	F	Some	Some	-	-
P11	45	F	Some	Some	-	Some
P12	40	F	-	-	-	-
P13	67	M	Some	-	-	Some
P14	59	F	Some	Some	-	-
P15	52	F	Some	-	-	-

Following, the main issues reported by those people, related to the usage of Facilitas, during the user test are:

- About *video player controls*: all the participants watched the videos with captions. The captions configuration seem to be an essential resource to them because, for example, P1 said that caption is important for who has hearing impairment. P14 liked the black border of caption text; she suggested that the captions could appear slowly. Besides, P1, P2, P4, P5, P6 and P8 have difficulties to identify the controls, since they wanted to change the caption color or caption size, and they made confusion about which control needed to use (CC and configuration). As a result, the Facilitas prototype should be redesigned regarding to this issue, to make sense for elderly. All participants tested the caption color background, P3, P6, P7, P12 liked black and transparent black. P13 said that the caption background depend on the video background.
- About *links*: P1 did not use them, but he would want to add links. P3 used them and said that links are the localization of a video moment. P5 said that she did not add links because she needs familiarize with the video. P13 said that links are useful when he wants to return to a particular part of the video.
- About *search control*: P1 and P12 have difficulties identifying which control use to search; they confuse search, caption and configuration. P1 and P3 watch videos to learn languages, so P3 has focused on search control because she thinks that it is a tool for reviewing the meaning of the word she did not understand during her study. P15 thinks that the search control is faster than other controls when a person searches a specific portion of the video.
- About *speed down control*: P3 said that for studying idioms it would be interesting to hear the word pronunciation. P8 enjoys watching ballet and could use the speed down control to see the movements. P13 enjoys the speed down control because he watches horseracing and he would use it to watch with details the winner horse.

During the user test, the participants could suggest *new resources* to be implemented in Facilitas. Participants P3, P9, P10, P12, P13 and P15 suggested using a new control to rewind 10 seconds and to forward 10 seconds. The new controls would help the older people to be more precise to get back and forward at different parts of the video. P4 suggested a new control to mark some parts of video to show them again to other people, since he is a speaker. P5 suggested a new control to capture images of video, since she likes to paint pictures. Participants P1, P7 and P9 have problems to watch videos in other language (different of Portuguese). They suggest adding a control to change the audio language. P5 has difficulty to understand how to use the video player controls and suggests

making a documentation explaining each control.

7. Conclusion and Future Work

This paper described a research about the issues related to accessible video players. Our goal was to gather impressions of older people, regarding to a design of a prototype developed as an accessible video player. A user test was conducted with 15 older people and a set of issues was reported by them, regarding to the main difficulties they faced when using the prototype.

The user test also provided important results about new controls, links and search, which will help to improve Facilitas Player. The users have enriched the requirements for an accessible video player and the current functionalities were discussed and evaluated for those older people.

Older people have cognitive difficulties, especially memory difficulty. Some controls of a video player should support them in this issue. In case of Facilitas, the links controls help to return to a particular part of a video that the participant did not remember. The names of controls help to remember the functionality they forgot. As future work, we propose adding some functionalities to Facilitas Player: documentation, language, preference settings and annotations.

Acknowledgements

The authors would like to acknowledge CAPES (PEC-PG) for the financial support provided to this project.

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