I-Transfer: the User's Platform for Content Conversion

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Abstract. This paper presents a solution that is currently being developed, for students to easily convert contents into the formats that best fulfill their needs. The basis for this solution is an XML standard file from which different format outputs are generated automatically. We here describe the creation process of a paper format, a Web format, an accessible Digital Talking Book (DTB) format and, more specifically, our recent work in automating audio generation using Tech to Speech (TTS) technologies. The user interface will be designed following a user centered design (UCD) perspective and set of methodologies and following e-learning and accessibility standards. We believe that the possibility to adapt the output format to meet the student needs will result in an increase of their satisfaction, not only regarding their interaction with the system and the converted contents or course materials, but also regarding the students' overall learning experience.

Keywords: E-learning contents, e-learning standards, usability lab, human-computer interaction, accessibility.

1 Introduction

The UOC, in English, Open University of Catalonia, is a completely virtual university founded in 1995. It currently has more than 35,000 students and offers 19 official undergraduate degrees as well as several graduate programs. UOC's virtual campus is an integrated e-learning environment that allows students to pursue their studies completely online except for final exams, when appropriate.

All learning materials were written specifically for e-learning purposes. As a result, a total of 1,000 course materials have been developed for UOC's students. Since these materials were created so long ago, when it was required to update and improve them we encountered important inconveniences; for example, modifying their interface in order to increase accessibility and usability was extremely costly and by no means automatic.

In previous work, we developed an automatic system for treating contents based on e-learning and accessibility standards and using UCD and human computer interaction methodologies to design the output, with the objective to increase students' satisfaction. Consequently, the contents' edition would need to be independent of their output format. Empirical HCI methods were then used to evaluate and analyze the usability, ease and satisfaction of use of those formats.

When we evaluated the possible initial formats to work with, we decided to focus on two main formats: paper and web, their accessibility and usability. The paper format best suits students when continuous reading is required; in this context, the student sometimes prefers a pocket book and other times, a folio size. The added value of the web format is the interactivity and the possibility to quickly search for a specific concept. Different formats are then needed to satisfy user's needs at different times, in different moments, and in different ways. Our study concluded that one same user may require all formats depending on their lifestyle and personal characteristics.

For example, a virtual university student that wishes to advance in her studies while commuting to work on the train will need a light weight and fit-in-the-bag format (i.e. chapter pocket book format). But she might also wish to work on an assignment during lunch hour at work for which she will need to quickly find the meaning of concepts, definitions, email the professor for questions, etc. (i.e. search-based course material), and will also want to work on her studies at night, when the children are asleep and the energy level is low and attention span barely gone. In this case, she will require a more passive yet stimulating format (i.e. a DVD format, so the user can sit down, relax and learn). In conclusion, user studies contributed to identify the above and other multiple formats that a virtual university would require to provide in order to facilitate and motivate users' learning experience.

Now more than 500 contents are in XML so we can easily build many output formats. XML offers important advantages for big volumes of similar contents like our 1,000 different course materials:

- We can generate different output formats from one unique source with lower costs since the cost to generate XML is similar to the one to generate HTML.
- XML facilitates the introduction of a continuous improvement process of formats and interfaces, because by changing the XSL filter all contents are modified at the same time.
- It helps in the semantic markup, once the content has been atomized and identified as many superior markup layers (which relate elements) as needed can be created.
- The generation of SCORM-compliant materials from XML facilitates their later management in different e-learning platforms.

We automated the generation of three formats requiring the development of two different conversion engines. We fabricated two forms of book (pocket and folio) and a Web format based in standards of e-learning. The engines for automatic transformation were developed in XSL technologies and Java when needed.

The goal of the project described in the present document is to explore other outputs more than paper and web and, more precisely the automation of audio generation using Tech to Speech (TTS) technologies, as well as the development of a platform where authors can import their contents, for example those spread across blogs and wikis and obtain quality without extra effort pdfs and audio files.

2 Developing new formats

When we evaluated the possibility to develop new output formats we first analyze the great amount of electronic gadgets available in the market. Not all of them are optimums to reproduce educational contents of a university that are mostly textual. Examining user behaviour in a domestic environment we noticed that personal computers remain as the main point of access to information. Although TV is becoming more and more popular for educational purposes the truth is that the most obvious use of multimedia TV is using interactivity inserted in the middle of movies. Other approaches are needed to reuse textual contents at home.

Nevertheless mobile devices open new ways to deliver textual contents. These gadgets usually have a small screen. To offer educational materials in the form of text is not a good idea. Better than this is to transfer the content into voice using Tex to Speech (TTS) technology. The student then is free to be in touch with the information while driving, moving on a bus o even walking on the street. As well as the process will be automatic there is no extra charge to the institution.

But TTs is not a mature technology. Commercial solutions are not oriented to read long sentences. As far as the most of the clients of TTS tools are Call Centres the solutions are ready to read short sentences in an emphatic voice. The quality for long speaking not allows using them for commercial purposes.

TTS uses audio libraries to generate voice. The audio libraries contain fragments of phonemes. These fragments come from human speaking. Audio libraries used by commercial TTS tools have been recorded by speakers trying to be emphatic. What we wanted is to develop a library ready for reading long speeches, with a soft and clear voice. Our goal is not to imitate the human voice but to be capable of retain the attention of the listener during a few minutes.

At the same time we are going to put into practice a second strategy that is based in the techniques that the radio professionals use in their daily work. Radio media use different tools to keep the attention of the listeners as the use of different voices and jingles. The writing style is taking into account to allow a fluid reading. We want to summarize all this knowledge in a voice scriptorium, a style book that our voice contents are going to follow.

3 Developing accessible interface

There are several actions on the Internet aiming to standardize accessibility. From these, two key norms have to be considered, the "section 508" [11] and the Web Accessibility Initiative (WAI) [15]. This last norm is divided in tree levels: A, AA, AAA. The level AA of WAI is similar to "section 508" as shown by the Thatcher analysis [14], which is the standard we aim to have for all our developments.

During our research process, we also found several proposals of specific formats for disabled people. One of these was the Digital Audio-Based Information System (DAISY) [4], a new technology to develop and distribute books and contents. With DAISY it is possible to use the Digital Talking Books (DTB) in order to meet the needs of visual impaired people. This format combines audio files with structure files in order to offer simple navigation for the user. Books in DAISY format grant greater speed of reading and greater easiness of access to different parts of the book. This format can be read by small portable devices and by a personal computer with special software like the system to play digital talking books on a PC analyzed by Morley [7].

Our work to design accessible interfaces undertook two parallel tasks. One focus was aimed to obtain interfaces designed by usability methods in WAI AA level, and the other, the development of an automatic generator of the DAISY format. The WAI AA level focus is straightforward and there is automatic software to analyze the results like Bobby [2]. However, to develop a digital talking book in DAISY format we needed to create a concrete file structure.

The file structure we developed has an initial file named discinfo.html, in which DAISY players can found all our books. From there, the DAISY players go to the first file of a book named ncc.html. The ncc.html file contains the book index to allow for easy navigation and the references to the *.smil files. With the smil files we synchronized the navigation and the audio files.

4 Developing the I-Transfer platform

As an institution UOC is ready to create and manage contents developed in XML. Different outputs – ready to print, high quality PDF, accessible webs – are created from a single file marked as xml. Editors have been trained in XML technology and as a service XML technology is available to all authors. Therefore, a proper level of training is needed to manage the system. Authors are usually not capable to use it by themselves. The lack of training prevents authors to make good use of the benefits.

At the same time, we have noticed that blogs and wikis are becoming more and more popular. These tools simplify the way an author can publish his or her ideas. The problem appears when writers wish to automate the edition of their blogs or wikis in high quality printed materials or audio versions.

Because of the above mentioned reason, we are going to develop a web platform for different type of users, those in the industry that will be properly trained and all non-technical and non-trained users of wikis and blogs. These group of users can easily import their wikis and blogs and edit them, and transfer these contents to good quality audio and pdf format.

5 Conclusion

The work described in this paper is the starting point to begin developing the I-Transfer platform, an application that transfers contents to adapt to the user's needs. Using XML we can easily and iteratively work on the process of improvement based on usability and accessibility premises. Moreover, the improvement of TTS systems will allow delivering content to mobile devices, the next phase of the I-Transfer platform.

The project's final goal is to improve the opportunities of contact or interaction between the authors, the information itself and the learners. This platform opens new possibilities for all users, as they will now be able to listen to blogs while driving or consulting a wiki during the bus journey to work, amongst many other possibilities, some defined in this document and some to be developed..

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