Producing Accessible Slide Presentations for Scientific Lectures: a case study for the Italian University in the Mac OS X environment

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Abstract

Slide presentations pose relevant accessibility problems to blind and partially sighted students, especially in STEM studies. Many of these issues have been tackled by experimental researches over the last ten years. Nonetheless, most of these works have addressed Microsoft Windows applications for slide production. In recent years Mac systems have got more and more widespread, even in the academic environment, therefore techniques to produce accessible slide presentations by Mac are needed. This paper introduces a case study for the production of slide presentation for STEM studies in the Mac environment. This work is based on an Italian experience.

1 Introduction

In this paper, we present a case study of the production of accessible slide presentations using the Mac environment. The experience is the outcome of an experimental study conducted with a blind student of Computer Science at the University of Urbino, Italy, with the objective of producing accessible study material for a course on Multimedia Systems.

1.1 Slide presentations in teaching scientific subjects

Scientific lessons and university lectures are characterized by the wide use of slide presentations, not only in supporting oral explanations, but also as supplementary study material. Slide presentations are usually structured to convey key concepts through concise sentences, visual cues and graphical representations (e.g., flowcharts, cognitive maps). Furthermore, slide presentations are employed to gradually introduce related concepts (e.g., in a formal proof) by means of visual effects, such as making some slide portions appear or disappear. These characteristics turn out to be very effective for sighted readers, but they may lead to accessibility issues. Indeed, development environments like PowerPoint and iWork Keynote place a strong emphasis on animations and visual transitions, effectively placing the focus on a sighted audience.

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1.2 Accessibility problems with slide presentations

Visually impaired students face many difficulties when it comes to follow STEM (Science, Technology, Engineering, and Mathematics) lessons presented by means of slide presentations, even if they are given them in advance, because of the intrinsic inaccessibility of Microsoft PowerPoint (PPT) files. In addition, STEM material heavily relies on the use of mathematical content—especially formulae—inserted into the slides, either as images or via tools like Microsoft Equation Editor. These formulae are inherently not accessible for a visually impaired user, unless a comprehensive textual description is provided.

The problem of accessibility of slide-based presentations has been repeatedly raised in the literature—e.g., [5, 3]. Students are seldom given slides in PDF format, rarely as an accessible PDF format, and even then, they will not be able to access the formulae in it, because the image of the expressions lacks its alternative description, which is readable with a Braille display and/or a screen reader. Thus, there is a need for a third party to produce an accessible version of these files.

1.3 The Italian scenario

Over the last decade, in Italian universities, support centers for students with special needs have been established. As for blind and partially sighted students, these centers especially cater for the production of study material in accessible formats. The workflow can be sketched as follows:

1. University professors prepare their study materials (e.g., lecture notes, slide presentations, exams) usually not taking into account accessibility principles in the production of digital documents.

2. University support centers adapt the study materials by converting them to equivalent documents in accessible formats for students with special needs.

It should be remarked that, in Italy, the DAISY format [6] has not gained widespread acceptance as a standard yet, therefore many differences exist among university support centers as for the choice of the target accessible format. This leads to a lack of reusability of these documents.

With regard to slide presentations, university professors often employ Microsoft PowerPoint or they sometimes generate inaccessible PDF files. It is remarkable that, over the last two years, more and more professors have been also using a Mac computer with iWork Keynote for their presentations. In this context, it is vital for the production workflow for adapting slide presentations to be very efficient, so that students can have their materials available in time for their lectures: in fact, many lecturers tend to read their own slides while explaining, so the students have the chance to follow the lecture exactly as their classmates. Therefore, the more efficient and reliable the workflow to adapt slide presentations in accessible format is, the more effective and useful is the service provided by the university support centers to disabled students.

1.4 The choice of the MAC environment

In recent years, we have witnessed a more widespread adoption of Apple computers: their market share in 2009 is nearly the 10% for the first time ever. This is particularly true for the academic environment—in areas like Biology, Apple computers represent the most

commonly used computing platform. In addition, many people tend to prefer their stability and ease of use as compared to Windows or Linux machines. Thus, it is more and more common to meet someone who owns a Mac.

We should also remark that guidelines for producing accessible slide presentations have not up to now taken into account the Mac environment (e.g., the @Science guidelines did not mention Apple computers in their suggested workflows).

1.5 Student's requirements

The student subject of this case study asked us to convert four PDF slide sets (used for the lectures of the Multimedia Systems course at the University of Urbino) into RTF files, with the mathematical expressions in them transcribed into LaTeX.

1.6 Related work

The problem of producing accessible versions of slide-based presentations has been addressed in the literature. WebAIM [8] has designed a comprehensive set of guidelines to enable the production of accessible PowerPoint presentations—heavily biased on PowerPoint's capability of generating HTML equivalent of slides. Several projects, e.g., PowerTalk [2], have enhanced the capabilities of PowerPoint with speech synthesis.

An extensive literature exists addressing the issues of producing accessible mathematical content. For a comprehensive survey, the interested reader is referred to [7].

2 Producing accessible presentations in a Mac environment

The @Science Thematic Network [1] has defined a set of guidelines to create or convert digital documents to an accessible format. However, they did not mention how to apply such guidelines in a Mac environment.

At the beginning of our work, we expected the task to be a simple exercise based on the application of the established guidelines; in particular, we expected the @Science Network guidelines to be easily applicable to Mac software, even more because many Windows tools are also available in Mac OS X. However, there have been some issues worth analyzing, as discussed in the rest of this manuscript.

2.1 The @Science Network Guidelines

One of the most challenging issues in making STEM slides accessible is how to manage mathematical formulae. The @Science Network guidelines to produce accessible study materials basically suggest to open up each and every formula in a given document with *Design Science MathType* [4], to choose there the appropriate translation format (in this case, LaTeX), and copy/paste the LaTeX translation into the target file.

Unfortunately, although we had Design Science MathType installed and we were using OpenOffice.org Writer/Impress* and/or Microsoft Office for Mac, we found out that many guidelines suggested by the @Science Thematic Network were not applicable within the context of a Mac environment.

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*http://www.openoffice.org

We started looking for a quick and reliable alternative processing workflow to produce accessible documents.

2.2   Description of the workflow

We were given PDF files of the original PowerPoint slide presentations. The formulae in them had been inserted by means of the Microsoft Equation Editor. At the moment of our work, we had the OpenOffice.org, and the NeoOffice[†] suites installed on our MacBook Pro, as well as the iWork 2009 suite, Microsoft Office 2008 for Mac, and Design Science MathType for Mac. After a series of attempts to elaborate an efficient workflow in Mac, we devised the following workflow (summarized in Figure 1):

1. Open the original PDF document using the Adobe Acrobat Reader;

2. In Acrobat Reader, choose "Save as text (accessible)." This outputs a standard txt file;

3. Open the txt file with iWork Pages '09;

4. In iWork Pages, select the "Export" option and choose the RTF format;

5. Open the RTF file and edit it with OpenOffice.org Writer (or NeoOffice Writer - but there are some errors while opening a NeoOffice Writer file in OpenOffice.org Writer, and vice versa).

The resulting RTF file will contain all the text that was present in the PDF slides, except for the formulae, which are imported as a meaningless set of characters. It is easy to locate the places where every expression—both inline and display—is supposed to be.

At this point, we have to face the longest and trickiest operation. We need to manually reintroduce every formula using MathType. After choosing the LaTeX translator, we only have to copy and paste every formula in its place. Here is where Microsoft Office for Mac comes to help us: instead of having to manually insert every formula in MathType, we can select and copy it into MathType. Thus, we will only have to copy and paste it into our RTF target file, significantly reducing the production time.

In Table 1, we report the production times for the different sets of slides, highlighting the number of formulae as these take longer than anything else in the production of the accessible documents. We used OpenOffice.org Writer as our word processor.

Table 1: Production times of the four presentation sets for the Multimedia System course

Number of slides	Total number of formulae	Production Time
17	72	1h 36'
15	79	1h 52'
19	115	2h 34'
19	102	2h 24'

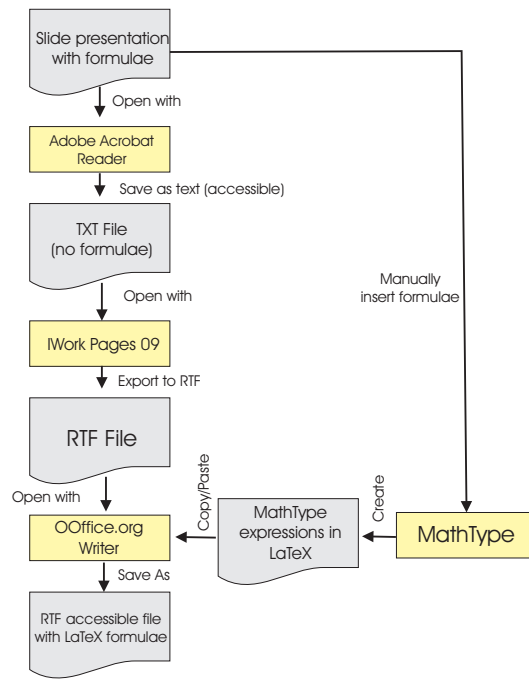[†]http://www.neooffice.org/neojava/it/index.php

Figure 1: The transformation workflow

2.3 Images

We were not asked to insert a description of any of the images that appeared in the original presentation. However, making images accessible implies either that the blind student is given a tactile representation (e.g., raised dots images, swell paper) or he/she is given a detailed description of every image. In the former case, the student can explore the images by himself/herself, along with the slides content, exactly as a sighted student would do.

Giving a correct and useful description of an image is a problem, because STEM subjects require a high degree of precision, which is only achievable if the person producing the accessible version of a document knows the subject matter. We should underline that having to describe every image would significantly increase the production time.

3 Conclusions and future directions

We showed that it is possible to produce accessible documents in a Mac environment, slightly modifying the workflow suggested by the @Science Network guidelines.

The student who asked for our collaboration found the files accessible and suitable for his learning needs: in particular, he was able to read and understand the LaTeX formulae contained in the RTF documents we produced.

Future work will concern how to insert MathML in slide presentations in the Mac environment. An interesting avenue that is worth exploring is related to the novel capabilities introduced in Microsoft Office 2007. Office 2007 allows documents to be exported in a novel XML format, called Office Open XML (OOXML). OOXML offers an explicit collection of

markups for the description of all components of a PowerPoint document—e.g., charts, documents structure. Mathematical formulae are encoded in OOXML using MathML. Since MathType is capable of handling MathML content, we can envision the possibility of *automatically* extracting MathML formulae from OOXML document and generate LaTeX via MathType conversion, further enhancing production time.

References and Notes

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