

## PLACES – A Web Platform for Accessibility

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### ABSTRACT

How many times a person does not understand a video because cannot access its sound? How often persons have wondered about how interesting it would be to have a certain book in audio format, to continue reading while doing other activities?

With the exponential growth of digitization of information in contemporary society, it is essential to adopt accessibility policies to technologies and information systems.

The provided information should be considered for different users and different usage contexts. The more versatile or flexible the format is, the more useful and effective it can be for everyone.

Aiming to contribute to an increasingly universal design, an online platform with tutorials that provide guidelines for creating accessible digital documents formatted in Word, PowerPoint and HTML was implemented. In addition, two experimental tools were provided: one for reading mathematical formulas written in MathML and the other to convert to text and speech simple SVG images, allowing the user to navigate through the description.

The challenge is, on one hand, to give users knowledge about tools that already offer resources to create accessibility, and that due to general lack of

information are simply just not used; on the other hand, as done in the following chapter on HTML, to review the usefulness of fundamental aspects and some strategies to create and provide information.

### 1. INTRODUCTION

Disabled people represent a significant part of the World's population; an estimate is 10% to 12% [1].

The University of Porto has 133 students with special needs [2] in a universe of 31 676 students [3], totaling 0,4%. This rate, that is much lower than the global estimate, may point that the University does not have the necessary means to provide users with special needs conditions to accomplish their studies. Among these accessibility accommodations, there surely figures study material suitable to users with special needs. The study materials are mostly Word Documents, PowerPoint presentations and HTML pages, in which are embedded images, charts, graphics, etc., all defined as complex contents.

The idea for an initiative that would comprise a set of tutorials and tools to deal with the problem of creating accessible digital documents came from a group of people with interests in the context of Web accessibility and usability. The resulting project team includes mostly staff from University of Porto, and also an element from the ACCESS Unit from the Science and Technology Foundation (FCT). Once internally approved at the University of Porto the project was subsequently granted complementary funding from the Calouste Gulbenkian

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Foundation. This allowed us to take the first steps in building the target Online Platform for Accessibility, that was designated as PLACES.

On the first page of PLACES there is a short definition for this accessibility platform: “tutorials to make the task of producing and making information available more agile and fast for those who produce and more accessible for those who want to access and view this information” [4].

## 2. LITERATURE SURVEY

With this project, there is a set of goals to achieve, some of them already mentioned above:

- Simplify the task of producing and providing accessible information;
- Deconstruct two prejudices about information accessibility :
  - a) Something useful only to people with disabilities;
  - b) Very difficult to build;
- Build a site that provides information on a universal format;
- Gather in one place and with a practical and simple format, relevant information on production/construction of accessibility.

In fact, one of the motivations that led the group of authors to undertake this work was the conclusion that the relevant information in this area is scattered in different sites. Sometimes not in a user friendly way which. This makes difficult the task to whoever wants to produce in an accessible way and contributes to the strengthening of the prejudice that associates accessibility to complexity.

Except for the contents of the "Research and Development" tab on the PLACES webpage, the subjects developed on the other tabs can easily be found in multiple and different sites on the internet.

For example, the international DO-IT Center website, from the University of Washington, promotes the success of individuals with disabilities in postsecondary education and careers, using technology as an empowering tool [5].

The Accessible Technology Coalition website is designed to make access to accessible technology (AT) easy and available to everyone. They also provide the service “Ask an Expert” for assistance, webinars and in person trainings as well as a podcast interview series [6].

Closer to the goals we set ourselves (albeit with a focus on Apple technologies), is the site iMore. iMore is a source of information for iPhone, iPad, Macs, and Apple. Featuring in-depth news and analysis, daily tips and how-to, the latest apps and accessory reviews, and podcasts [7].

CAST webpage comes from a non-profit research and development organization that works to expand learning opportunities for all individuals through Universal Design for Learning. CAST offers a wide range of learning tools for students, teachers and parents [8].

There are other projects inside the University of Porto that aim to promote digital accessibility. The office of New Technologies in Education (NTE) presents a set of guides that help the academic community in creating accessible documents. These documents present the best practices and techniques to make sure that information is available for everyone. They are easy to read and have the follow step-by-step methodology. Topics covered relate to the major issues that faculty, staff and students have to face when creating documents for print and electronic format [9].

The novelty of PLACES is the format in which the tutorials on accessibility are provided – simple and short – allowing a more pragmatic, objective and practical use of the contents.

Additionally, PLACES includes innovative tools like the converters of mathematical formulas and SVG images to text and speech.

Audiomath 2005 was the landmark for the automatic reader of math expressions in MathML, presentation format, through a text-to-speech engine with cursor-enabled intra-formula navigation capabilities for improved cognitive results [10]. This approach was and still is innovative in the literature.

Regarding the SVG image converter to text and speech, the literature is rich in examples of raster image analysis but there is no equivalent to SVG. This potential handicap led to the adaptation of some of the methods employed in raster images. Examples of this are automatic image description by Ordonez et al. [11], a structure that generates text descriptions of images and video content based on image study by Yao et al. [12], and a preliminary proposal of Castillo-Ortega et al. [13] to linguistic description of images. Although describing images is not the goal, the contribution given by Ferreira and Freitas [10] regarding the automatic reading of mathematical formulas in MathML, both situations assume a common point, a document-based format of XML and the way the "navigation" occurs in a mathematical equation can find some parallelism in the textual description of an SVG image.

## 3. STRUCTURE OF PLACES

### 3.1 Main Page

The PLACES website (<http://www.up.pt/places>) consists of a main page that gives access to the seven areas of its structure (see Figure 1):

- Word;
- PowerPoint;
- HTML;
- R&D (I&D);
- Bibliography (Bibliografia);
- About (Acerca);
- Contacts (Contactos).



Figure 1. PLACES main Web page (partial view).

This first page contains two introductory videos. The first one presents the accessibility platform and the second explores the definition of accessibility. Both videos, as well as all other videos existing in PLACES, are subtitled and have, in some cases, the contents translated into Portuguese Sign Language (LGP-Língua Gestual Portuguesa) by an interpreter appearing in a special region of the videos (see Figure 2).

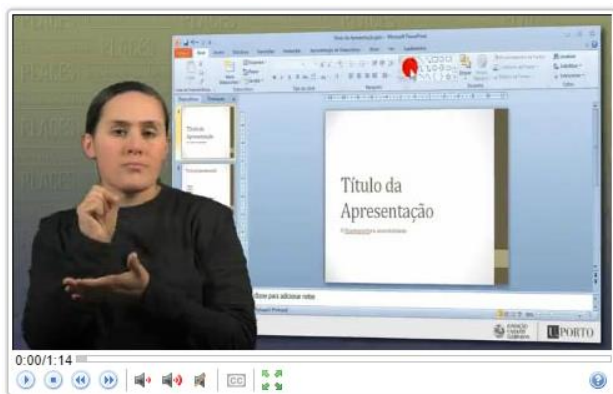


Figure 2. Video with transcription to LGP.

Still on the first page, a link is provided where users can download an e-book with all the contents of the site.

### 3.2 Word

In the section on Microsoft Word various issues are covered.

In styles and formatting, the focus is on the use of fonts and creation of headers (see Figure 3).

In the part related to images/graphics the essential rules of introducing this type of content, creating of alternative texts and inserting index graphics images are covered.

Regarding the use of links, it is shown how to add an external link, how to create a marker and how to create a hyperlink to a bookmark. It is also explained how to change the text of a link and how to add a tooltip.

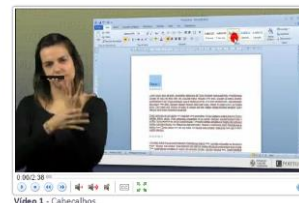
The issue of tables is to tackle with reference to the formatting of the header rows and inserting a summary and a title.

The creation of forms was not forgotten, showing the main rules to follow if we want to make them accessible.

Converting a Microsoft Word document to Portable Document Format (PDF) also requires certain procedures so that the final result is accessible. Thus, it is explained how the marking in PDF works.

The part related to Microsoft Word closes with an explanation on how to use the accessibility check for Office.

Criação de cabeçalhos (ou títulos)



Para marcar texto como cabeçalho/título o Word dispõe de um mecanismo com vários níveis hierárquicos de cabeçalho/título aos quais estão associados estilos pré-definidos. A marcação dos conteúdos deve pautar-se sempre pelo significado estrutural dos seus elementos: cabeçalhos, parágrafos, listas, tabelas, etc. Lembre-se que o importante é marcar corretamente o nível hierárquico do cabeçalho/título de acordo com o seu enquadramento no texto. O estilo pré-definido para cada cabeçalho/título pode ser personalizado de acordo com as regras de design tipográfico por si definidas.

Para atribuir um cabeçalho/título:

1. Digite o texto do seu título e seleccione-o;
2. No separador **Base** do grupo **Estilos**, clique no estilo desejado. Por exemplo: **Cabeçalho 1** ou **Cabeçalho 2**. Se não conseguir ver o estilo que deseja, clique no botão **Mais** para ampliar a galeria **Estilos Rápidos**.



Figure 3. Creation of headers (partial view).

### 3.3 PowerPoint

The Microsoft PowerPoint part begins by introducing the use of master slides, with various hypotheses of building a new slide. The introduction of images follows what has been said on the Microsoft Word part, with the fundamental rules and placement of alternative text.

This part ends with information on how to convert a Microsoft PowerPoint to a PDF with markings.

### 3.4 HTML

The part on HTML starts with a brief reference to its definition and history, along with the initiatives undertaken to make the Web accessible.

Starting from the basic structure of an HTML page (see Figure 4), reference is made to build headers, description of graphics, marking column and association of these to a cell in a data table, efficient description of these same tables and the cautions one must have when developing Web forms.

The association of HTML elements to styles using CSS and making the latter accessible are also discussed.

This part ends with the presentation of an emerging specification of the World Wide Web Consortium (W3C): Accessible Rich Internet Applications (ARIA). For example, reference points are explained, within an HTML page, using the ARIA attributes "role", "property" and "state".

Uma página HTML é também ela um "objeto" que obedece a uma estrutura bastante semelhante a este "ser". Também ela tem uma cabeça, com início <head> e fim </head>, um corpo, delimitado pelas tags <body> e </body> e este é composto por vários elementos. Em vez de tronco, pernas, mãos, braços temos cabeçalhos (<h1>, <h2>, ..., <h6>), parágrafos (<p>), listas (<ul>), tabelas de dados (<table>), e mais uns quantos outros elementos. Tal como num ser humano, que é possível delimitar, ou seja observar onde começa e onde acaba, também o início e o fim de uma página Web se encontram delimitados: o seu início com <html> e o seu fim com </html>.

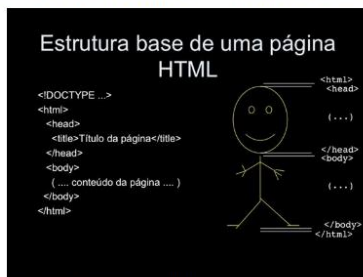


Figure 36 - Estrutura base de uma página HTML

Se criar uma nova página Web num editor de HTML, por exemplo no Adobe Dreamweaver, o código que vai aparecer é exatamente uma estrutura do tipo:

```
<!DOCTYPE ...>
<html>
  <head>
    <title>Título da página</title>
  </head>
  <body>
    ( ... conteúdo da página ... )
  </body>
</html>
```

Figure 4. Basic HTML structure (partial view).

### 3.5 R&D (I&D)

This part of PLACES is still under development and includes two projects developed at the University of Porto.

One of the projects addresses the problem of editing and reading mathematical formulas. We have created a reader for this type of content based on AudioMath [10]. The reader interprets the MathML mark-up language. After interpreting the code, the reader writes the formula in clear text and vocalizes it in natural language. The user is allowed, in a fashion still unique in the literature, to navigate across the formula elements with the cursor and examine the expression details for a good understanding.

The second project enables the analysis of SVG images containing simple geometric shapes, pointing the type of elements (triangle, square, rectangle, circle, ellipse and polygon), the position of each element, fill colour and thickness and colour of the perimeter. It attempts to make an interpretation of the set of image elements according to the Gestalt theory, regarding symmetry, alignment and group formation [14]. The converter provides a textual description of the image and vocalizes it in natural language. The converters also allows the user to browse or navigate in the image description (see Figure 5 for the SVG converter).

### 3.6 Bibliography (Bibliografia), About (Acerca) and Contacts (Contactos)

In "Bibliography", the team presents the consulted sources to make the tutorials.

The "About" page includes references to the team responsible for the design, content writers, editors, supporters of PLACES, partner entities and acknowledgements.

On "Contacts" an email address is available as recipient of any issue related to PLACES.

## Conversão de SVG para Texto e Fala

### Navegar pela descrição de Imagem C.svg

A descrição está dividida em quatro níveis, aumentando o seu detalhe desde o nível 1 até ao 4. Para navegar pelos níveis use as teclas "cima" e "baixo" do cursor ou carregue nas teclas 1, 2, 3 ou 4.

A imagem está dividida em nove partes iguais. Conseguirá **navegar pelas partes da imagem** com as seguintes teclas: "Y" - superior esquerda, "U" - superior central, "I" - superior direita, "H" - central esquerda, "J" - central, "K" - central direita, "B" - inferior esquerda, "N" - inferior central e "M" - inferior direita.

Poderá **navegar pelos elementos** da imagem, nos níveis 3 e 4, usando as teclas "esquerda" e "direita" do cursor.

Também existe a possibilidade de **navegar pelos tipos de elementos** da imagem, nos níveis 3 e 4, recorrendo às teclas: "R" - retângulos, "Q" - Quadrados, "L" - Losangos, "T" - triângulos, "C" - círculos, "E" - elipses, "P" - polígonos e "A" - linhas. Para sair da navegação pelos tipos de elementos use a tecla "Z" ou selecione um nível qualquer.

Para parar a descrição use a barra "ESPAÇO".

### Descrição simples

A imagem é um retângulo horizontal, branco e com 3 elementos.

Os elementos são 3 círculos, formando 2 grupos.

O círculo 1 tem, de diâmetro, um sexto da largura da imagem, está preenchido a laranja, com perímetro de espessura fina, em turquesa e situa-se na parte central esquerda da imagem. O círculo 2 tem, de diâmetro, um sexto da largura da imagem, está preenchido a laranja, com perímetro de espessura fina, em turquesa e situa-se na parte superior central da imagem. O círculo 3 tem, de diâmetro, um sexto da largura da imagem, está preenchido a laranja, com perímetro de espessura fina, em turquesa e situa-se na parte inferior direita da imagem.

Converter outro ficheiro SVG

Figure 5. Conversion of SVG image to text and speech.

## 4. PLACES WEBSITE STATISTICS AND USER SURVEYS

Between October 14<sup>th</sup>, 2013 and October 14<sup>th</sup>, 2014 there were 5502 session visits made to PLACES by 4633 users. Each session lasted on average one and a half minutes.

A total of 8571 pages were viewed, with an average of 1.6 pages per session.

Users from Brazil account for 51% of the total, followed by users from Portugal with 41% and 2% users from Angola.

Users have a return rate of 16%.

A recent survey by the Faculty of Arts of the University of Porto gathered 62 answers from potential PLACES users. Users were invited by email to take an online survey.

The first question was "Do you know PLACES – Accessibility Platform (<http://www.up.pt/places>)"? 20.7% of the users answered "yes".

The second question was "Did you use PLACES before"? 17.2% of the users answered "yes".

From then on, the questions were only for users who had used PLACES before.

The third question was "Did you find answers to your questions"? 64.3% of the users answered "yes".

The fourth question was "Is the content well structured"? 92.3% of the users answered "yes".

The fifth question was "The content is comprehensible"? 92.3% of the users answered "yes".

The last question was "Would you recommend PLACES"? 92.3% of the users answered "yes".

On the free comments section the most relevant issue has to do with the divulgation of PLACES to a broader group in order to be well known. This is an issue to be

constantly addressed. However, having this objective in mind, the team of PLACES has participated already in some important events like INCLUDIT 2014 – 2nd International Conference on Inclusion and CIUD 2014 – 2nd International Congress of University and Disability.

On the other hand, analysing the answers to the third question, PLACES must extend its knowledge base in order to address more user questions.

## 5. CONCLUSIONS

The main objective of PLACES is to provide information on how to make accessible documents produced in commonly used programs or languages, like Microsoft Office and HTML.

PLACES is, therefore, a project to be always in constant (re)construction to keep track of what is emerging, but also to be able to integrate additional content formats and program versions.

The team responsible for PLACES would like to continue to have the support and participation of all stakeholders and include new ones, e.g. in the translation to different languages of the available content (including Sign Languages from different countries) and suggestions or even joint construction of new content.

It is also a site, which by its structure and shape, proves to be very suitable for use in the context of training in this area. The licence type the authors chose for this project allows anyone to use its contents according to their needs.

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