

Taking text simplification to the user: integrating automated modules into a web browser

Susana Bautista
Universidad Francisco de Vitoria
Madrid, Spain
susana.bautista@ufv.es

Raquel Hervás
Universidad Complutense de Madrid
Madrid, Spain
raquelhb@ucm.es

Pablo Gervás
Universidad Complutense de Madrid
Madrid, Spain
pgervas@sip.ucm.es

Axel Bagó
Universidad Complutense de Madrid
Madrid, Spain
bago.axel@gmail.com

Javier García-Ortiz
Universidad Complutense de Madrid
Madrid, Spain
javimelot@gmail.com

ABSTRACT

There are many people who experience reading or writing problems. To address this challenge, different possible approaches can be followed: to provide technologies to ease the task of human volunteers faced with the challenge of rewriting existing texts so that poor literacy readers can read them, or to provide technologies to help poor literacy readers dealing with the challenge of understanding texts that are originally beyond their reach. Following the latter approach, the present paper describes the development of elementary modules useful for simplification processes and the integration of these modules into a web browser as web services.

CCS CONCEPTS

• **Human-centered computing** → **Accessibility systems and tools**;

KEYWORDS

Text simplification, Easy-to-read, Natural Language Processing, Web browser, Web services, Web Accessibility

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1. INTRODUCTION

Nowadays we are immersed in the so-called Information Technology Society, where there is a tendency to digitalize all kinds of information, such as recipes, payslips, news, etc., with the aim of making them more accessible to users. However, we are still far away from the ideal of a uniformly digitalized society where information is accessible to everyone, as numerous people lack a sufficiently developed ability to fluently read, write, or understand a written text. As a result, the way a text is written or information is presented may prevent some people from taking part in socio-economic activities of their society. It is for this reason that various associations work with organizations, publishing houses, and public institutions, providing instruction on how to write texts that follow established criteria for easy-to-read texts. Nevertheless, there have been few attempts to research this topic, and as a result, both organizations and individuals such as editors, writers, teachers, or translators experience several difficulties when adapting a piece of writing to easy-to-read standards.

A possible approach to solve this problem is to provide technologies to help these readers dealing with the challenge of understanding texts that are originally beyond their reach. However, the idea of producing simplified versions of texts that can be read directly by persons with reading difficulties faces two different risks. One risk is to produce a version of the text that is too simple for the intended target audience. Another risk is to produce a version of the text that no longer contains information in the original that might have been either important or particularly appreciated by the intended recipient.

Providing technologies that directly help poor literacy readers to process complex text solves these two important risks. However, it does so by introducing an interactive stage where the user attempts to read the original text, resorting to automated simplification tools to solve any specific difficulties that present problems. This type of solution may not be appropriate in contexts where quick uptake is required.

In view of these circumstances, there is a need for automated simplification technologies. To this end, the present paper presents a procedure for the development of automated simplification solutions. Text processing approaches are considered into a web browser where simplification modules are accessed as web services.

One problem that text simplification experts tend to encounter when using these tools is the fact that they lack a user-friendly interface, and they often require some background knowledge of computer science and programming. In an attempt to offer a solution to this problem, we have created applications that integrate the modules developed during the text simplification stages so that they can be easily used, either by experts who work on creating easy-to-read texts, or by the users themselves.

2 RELATED WORK

In this section, we introduce some notions relevant for the field in which our work is situated and the existing solutions in the field.

2.1 Information for all

In last years a lot of work has been carried out from different associations and projects to generate the European standards for making information easy to read and understand. According to the European Guidelines for the Production of Easy-to-Read Information, an easy-to-read text is one that contains only the most relevant information, expressed and presented in the most direct manner, so that its content may be understood by as many people as possible.

The organization Inclusion Europe² was founded in 1988. Its headquarters are in Brussels and serve as the meeting point for the associations of people with intellectual disabilities in the European Union. The organization writes and adapts readable texts in 20 European languages, and all texts that follow their guidelines are identified with a special logo designed by the organization. An on-line magazine *e-Include*³ featuring news, events and articles on different topics related to intellectual disability is published everyday.

The Pathways I project [1] (2007- 2009) aims to formalize the need for easy reading as a tool for categorizing people with disabilities. Promoted by Inclusion Europe with partners from Austria, Germany, Finland, Ireland, Lithuania, Portugal and Scotland, it attempted to address the easy-to-read movement as a whole, not only considering the method of preparation and

evaluation, but also thinking of people with intellectual disabilities as agents that compose texts. The idea continued with the Pathways II project [2] (2011- 2013) expanding their materials to other European countries such as Croatia, Czech Republic, Estonia, Hungary, Italy, Slovenia, Slovakia and Spain. Pathways II built on the heritage of the original Pathways project and multiplied its impact, covering almost all the European Union.

The Able to Include project⁴ aim was to improve the living conditions of people with intellectual or developmental disabilities (IDD). In order to do so, a set of existing technologies were integrated to create an open-source and context aware accessibility layer which, when integrated with current and future ICT tools, could improve the daily life of people with IDD by understanding their personal situations and helping them to interact with the information society.

2.2 Automatic text simplification

Manually simplifying a text is hard work in time and resources.

Nowadays, information is generated very quickly and it is impossible to manually create accessible real-time texts. In order to solve this problem, automatic text simplification approaches have begun to appear.

One of the first important approaches was the work of [3]. Its motivation for text simplification was initially to reduce sentence length as a pre-processing step for a parser. The PSET (Practical Simplification of English Texts) [4] project was perhaps the first to apply natural language technologies to create reading aids for people with language difficulties.

The system *PorSimples* [5], [6] for Portuguese was developed in order to help low-literacy readers process documents on the web. The *FIRST* (*Flexible Interactive Reading Support Tool*) project [7] developed a tool to assist people with autism spectrum disorders to adapt written documents into a format that is easier for them to read and understand. As there are many NLP tools that could be useful for text simplification experts, Hervás et al. [8] presented an application that integrated some NLP tools that could be useful for text simplification in an existing text editor.

There are also have been numerous text simplification approaches in Spanish. The main objective of the project *Simplext*⁵ [8] was to develop the product support for text simplification in Spanish for groups of people with special reading and comprehension needs. From a methodology of manual simplification defined by [9] it was possible to reduce the text complexity. Saquete [10] developed a project focused on the treatment of educational texts in Spanish in order to reduce language barriers to reading comprehension for the hearing-impaired or even people who are learning a language other than their mother tongue.

3 INTEGRATION OF SIMPLIFICATION CAPABILITIES IN A WEB BROWSER

² <http://inclusion-europe.eu/>

³ www.e-include.eu

⁴ <http://able-to-include.com/>

⁵ <http://www.simplext.es/>

Although the technological availability of computers and the Internet has benefited people with disabilities, allowing them to perform activities that until now had been denied to them. However, the set of Internet-related technologies is also creating barriers, as there are many people who have trouble when reading, writing or understanding text from web pages. Internet users usually navigate using a web browser, but not all of them can surf the Internet with the same devices or in the same way: blind people require screen reader programs to access the content displayed by the browser, visually impaired users must activate larger size fonts or turn off page colours so there is the maximum possible contrast between text and background, and people with mild cognitive difficulties may have trouble for properly interpreting web pages text and can easily become disoriented if the navigation structure of a web is complex. Simple vocabulary and syntax are the key so these users can properly understand web texts.

The work presented in this section has been developed to provide a set of tools that allows joint browsing, enhancing and editing of existing web pages. This development is composed by two different parts:

- The first is the development of an architecture of web services that are used to obtain extra information for pieces of text so they can be more easily understood. These web services are publicly available so they can be integrated into other tools if desired. Among them, for example, we have implemented a web service to obtain the definition of a word, another service that retrieves the synonyms and antonyms of a word, or another for obtaining the lemma of a word.
- The second part is a web application where we use the previously implemented web services along with the API of other services available on the Internet: translation / pronunciation of texts using the Microsoft API, search for images using Google Images and search in Wikipedia of the information related to a piece of text. The integration of all these services in a web application makes them easily usable by people with limited computer skills.

3.1 A service oriented architecture for information enhancement of textual information

The architecture is organized so each web service corresponds to a specific functionality that will help the users to understand a piece of text presented in a web browser. The implemented web services are the following:

- **Lemmatisation.** This web service returns the lemmatisation of any Spanish word. This lemmatisation service is also used by other services when looking for a

word: if the original form of a word is not found, then the lemma is used to repeat the search again.

- **Definition.** This web service provides the definitions of a word in Spanish.
- **Synonyms and antonyms.** This service provides the synonyms and antonyms for a given Spanish word.
- **Difficult words.** Given a text in Spanish, the web service returns the words in the text that are considered “difficult” to understand in Spanish.

A more detailed explanation of these web services is provided in the next subsections.

3.1.1 *Lemmatisation: a web service for the lemmatisation of a word.*

This web service returns the lemmatisation of any Spanish word. Spanish is a language where verbs, nouns and adjectives are flexed in different ways depending on number, gender, and verbal tense. Therefore, it can be difficult to understand a word (specially a verb) if it is flexed in a way that is unknown to the user. Given a word, this service provides its lemma, its grammatical category and the kind of flexion it presents (for example, the singular third person form of past perfect in a verb). This lemmatisation service is also used by other services when looking for a word: if the original form of a word is not found, then the lemma is also used to obtain the definition, synonyms, etc. This service relies on a tool available at La Universidad de Las Palmas de Gran Canaria⁶. This tool returns the lemma and other related information of a given word depending on its morphological category. The result provided by this service is an XML fragment with the following information:

- **Word:** the searched word.
- **Result:** one for each result obtained for the word. Each result contains information about the lemma, the category of the word, and the flexion (for example masculine plural for a noun or first singular person of simple present for a verb).

3.1.2 *Definition: a web service for searching the definition of a word:* This web service provides the definitions of a Spanish word provided in the digital version of the Dictionary of the Real Academia Española (RAE)⁷. A query is submitted to the RAE dictionary and the resulting information is parsed so we can obtain the different definitions of the word. In case the word is not found, it is lemmatised using the lemmatisation web service and the search is repeated with the lemma of the word. The result provided by this service is an XML fragment with the following information:

- **Word:** the searched word.
- **Origin:** the origin of the searched word (for example, if it is a derivation from Latin or Greek).
- **Definitions:** a list with all the definitions found for the word in the RAE dictionary.

⁶ <http://gedlc.ulpgc.es/investigacion/scogeme02/lematiza.htm>

⁷ <http://dle.rae.es>

3.1.3 Synonyms and Antonyms: a web service for searching the synonyms and antonyms of a word: This service provides the synonyms and antonyms of a word from a service provided by El Pais newspaper⁸. In case the word is not found, it is lemmatised using the lemmatisation web service and the search is repeated with the lemma of the word. The result provided by this service is an XML fragment containing the following information:

- Word: the searched word.
- Synonyms: a list of all the synonyms obtained for the searched word.

- Antonyms: a list of all the antonyms obtained for the searched word.

3.1.4 Difficult Words: a web service for searching difficult words in a text. Given a text in Spanish, this service returns the words in the text that are considered “difficult” to understand in Spanish. A word is considered difficult to understand if the word or its lemma does not belong to the list of the 10,000 most common Spanish words elaborated by the Real Academia Española [11]. The result provided by this service is an XML fragment containing the list of difficult words from the text.

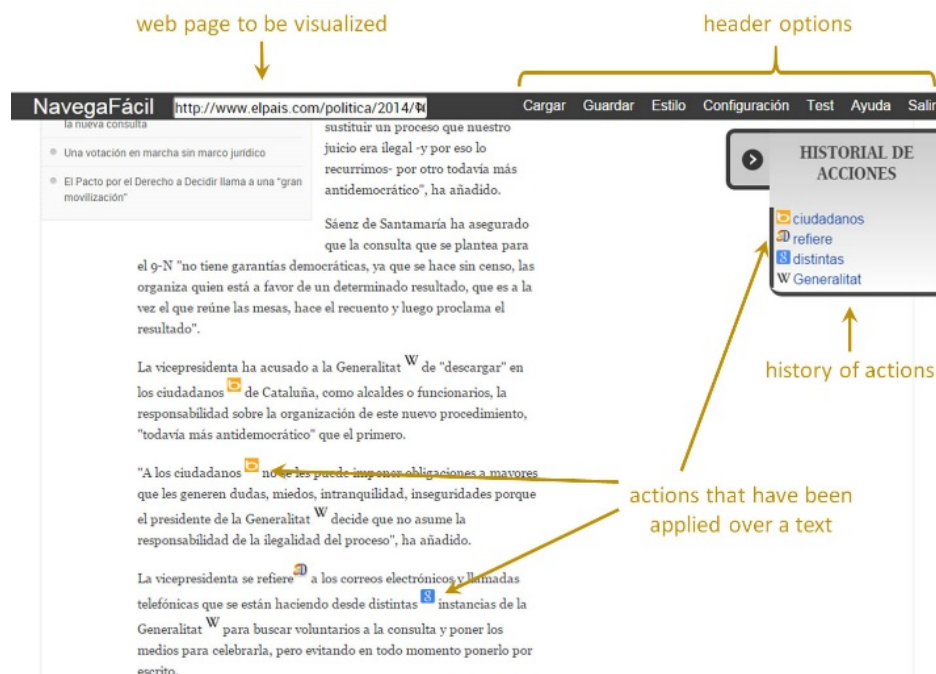


Figure 1: The EasyNavigation web application. The URL of a web page has to be introduced in the white edit box in order to start the navigation. The header contains different options for activating or configuring functionalities. When an action has been applied over a piece of text an icon appears next to the text, and the action is included in the history of actions

3.2 EasyNavigation (*NavegaFácil*) web

EasyNavigation (*NavegaFácil* in Spanish) is a web application that allows users to visualize and navigate through the original content of any other web page but with the addition of different functionalities which facilitate the understanding of the web page content by adding new information to the text. These additional functionalities are aimed at facilitating the comprehension of text semantics and the improvement of the web page design so it can be easily understood for people with any kind of disability or difficulty. Each functionality covers a small part of this process, and once it has been activated on a specific word or piece of text, it is signaled by an identifying symbol of the action itself. Therefore, the original content of the web page is almost never changed, but enriched with extra

information that the users can find useful for understanding the web content.

EasyNavigation can be accessed using any web browser. The initial web page is a blank screen with a special header and options for the configuration of the different tools. The URL of a web page has to be introduced in the white edit box in order to start the navigation. Once an URL is introduced, the complete content of the original web page is presented in EasyNavigation. From here it is possible to perform different actions in order to enhance the comprehension of the web page. Figure 1 presents an example of web page presented through EasyNavigation and the different parts of the tool that are presented in following sections.

⁸ <http://servicios.elpais.com/diccionarios/sinonimos-antonimos/>

Once we have selected a word or piece of text, the different functionalities that are available in EasyNavigation are easily reachable through the contextual menu activated by a right-click on the mouse (Figure 2 (a)). This menu presents all the actions that can be applied to the selected text. The selection of an action usually triggers the appearance of a floating window offering the corresponding information (Figure 2 (b)). When the floating window is closed a new symbol appears next to each appearance of the word or text indicating that a particular action has been applied over it. This symbol allows users to easily identify the words or pieces of text that have been somehow enriched with extra information during the navigation. If the symbol is clicked at any time it will present again the information corresponding to the action and the piece of text (Figure 2 (c))

The available functionalities can be configured at any time using the Configuration (*Configuración*) option from the website header. A list of all the possible actions is presented, so each user can configure which ones must appear in the contextual menu when a text is selected. From this configuration menu it is also possible to choose the language to be used by the translation service, and to active two other options that are applied to the whole web page and do not appear in the contextual menu (substitution of swear words and difficult words highlighting). The next sections explain the different functionalities and present examples of their use.

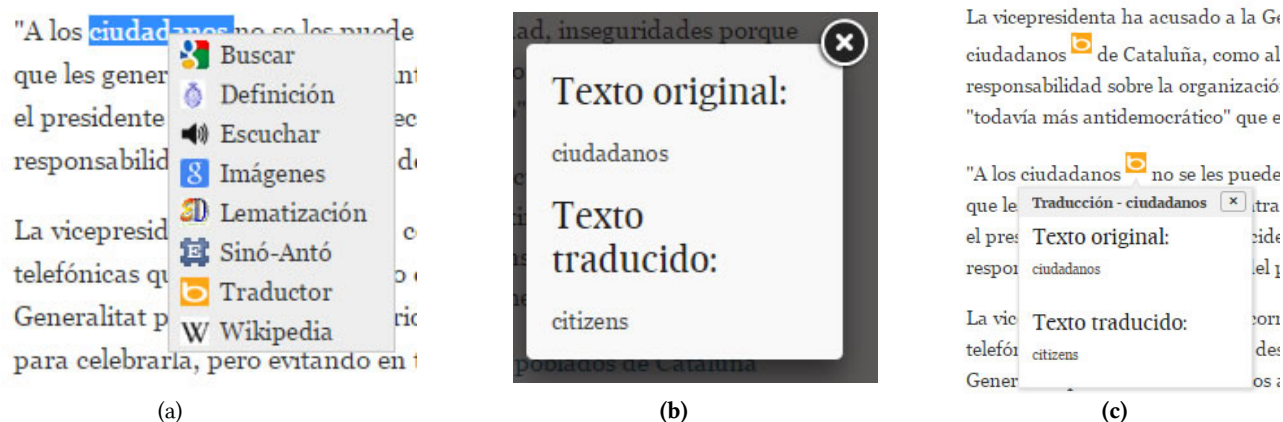


Figure 2: Activation of an available action: (a) Contextual menu. (b) Result of the action. (c) A symbol is attached to all appearances of the word or text. The action can be reactivated by clicking on the symbol

These functionalities do not modify the text, but provide additional information to an existing piece of text so that it can be easily understood. As explained before, the options that appear in the contextual menu can be configured by the users using the Configuration option from the application header.

- **Definition (Definición):** The result of this action is the definition of the selected word. In order to do so we use the Definition web service presented in Section 3.1.2. If the word is found in the dictionary its definition is presented in a floating window, and if it has not been found an information message is presented. The action can be used also with the selection of a piece of text instead of just a word, but it is less likely to find a definition in the dictionary.
- **Synonyms and Antonyms (Sinónimos y antónimos):** The result of this action is a list of the synonyms and antonyms of the selected word. This list is obtained using the Synonyms and Antonyms web service presented in Section 3.1.3, and it is displayed in a new floating window. The action can be used also

with the selection of a piece of text instead of just a word, but it is less likely to find synonyms or antonyms for a phrase.

- **Lemmatisation (Lematización):** The result of this action is the lemmatisation of the selected word. In order to do so we use the Lemmatisation web service presented in Section 3.1.1. A new floating window appears as a result of this action presenting the lemma of the word, its category and the flexion. This action can only be used with single words as we can not provide the lemmatisation of a whole sentence.
- **Images (Imágenes):** The results of this action are a set of images that represent the word or text selected. This information is obtained from the Google Images API9, and it is possible to navigate through different images using the arrows appearing at both sides of the floating window where the images are presented.
- **Google Search (Búsqueda):** This action searches in Google the word or piece of text selected, and presents the results in a new browser window. The new windows is outside the navigation through

⁹ <https://developers.google.com/image-search/>

EasyNavigation, since this functionality is likely to be used to learn more about a concept, probably by visiting more than one page, as opposed to other services that are used for quick reference.

- **Wikipedia:** The result of this action is the Wikipedia page corresponding to the word or piece of text selected. This information is obtained using the OpenSearch module of Wikipedia¹⁰, and it is presented in a new floating window.
- **Translation (Traductor):** The result of this action is the translation of the text selected. The target language of the translation is chosen in the Configuration option from the website header. This action relies on the Microsoft Translator API¹¹ and presents the results in a new floating window.
- **Listening (Escuchar):** The result of this action is the sound reproduction of the text selected. In order to present this information we use an Microsoft Translator API¹² that provides this functionality. A multimedia player is presented in a floating window.

3.2.2 EasyNavigation functionalities which apply to the whole web page content. The functionalities listed above are applied to words or pieces of texts the user has selected when browsing a web page. In addition, there are three functionalities in EasyNavigation in which the results apply to the whole content of a web page.

- **Difficult words highlighting (Marcar difíciles):** The result of this action is the same web page the user is consulting in EasyNavigation, but highlighting the words that have been considered difficult. This action is not activated using the contextual menu but in the Configuration option from the website header. The list of difficult words is obtained using the Difficult Words web service presented in Section 3.1.4.
- **Deletion of swear words (Eliminar palabrotas):** The result of this action is the same web page the user is consulting in EasyNavigation, but swear words are detected and substituted by appropriate synonyms. This action is not activated using the contextual menu but in the Configuration option from the website header. An example of use can be seen in Figure 3, where the text *hijo de puta* (son of a bitch) has been substituted by *tonto* (fool).

Un periodista acusa a Alonso de llamar “hijo de puta” a Mattiacci



¹⁰ <http://en.wikipedia.org/w/api.php>

¹¹ <http://msdn.microsoft.com/en-us/library/ff512423.aspx>

Figure 3: A piece of text where swear words have been substituted by more appropriate synonyms.

- **Style (Estilo):** Some types of disabilities (e.g. color blindness or dyslexia) may require the adaptation of the presentation of a text so it can be easier distinguished by the user. With this option, reachable through EasyNavigation website header, it is possible to change the size of the font or the colors of text and background in the web. Figure 4 presents an example of text before and after being modified using these options.

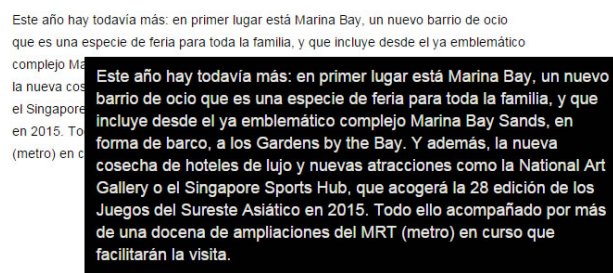


Figure 4: An example of text with changes in font size and color.

3.2.3 History of actions. In addition to the symbol that appears next to a text indicating that a particular action has been applied, the users can also consult the history of actions taken so far in a side menu signalled by a black arrow. When the black arrow is clicked a list of actions appears, each one containing the symbol corresponding to the kind of action and the text that was used in the action. If the user clicks in any item of the list, the action is triggered again and the result obtained before is presented again in a new floating window.

3.2.4 Save/Load: Once the users have been enriching the web page they are consulting, it is possible to save all the information added to the page. This option is also useful if some kind of content editor, tutor or teacher wants to prepare a web page so other people with any kind of disabilities are able to see the page and understand it with the help of the added information. The enriched web is saved using the option *Guardar (Save)* of the website header. A link is provided so the users can share or store it anywhere. In addition, the web page is stored in EasyNavigation.

If users want to reopen a web page previously stored in EasyNavigation they can use the *Cargar (Load)* option of the website header. These options presents a list of the stored web pages with information about the site they belong to, and the date and time when they were stored.

¹² <http://msdn.microsoft.com/en-us/library/ff512423.aspx>

3.2.5 Help. In addition to these previous functionalities, an extra Help option is available in the website header. This option shows a new floating window where the usage and functionalities of the application are briefly explained, giving instructions about how a web page can be presented in EasyNavigation, and how each functionality works.

3.3 Evaluation of EasyNavigation

An evaluation of EasyNavigation was carried out in order to know how people can make use of its tools and to detect possible errors when they use the application. Using the facilities of the Computer Science School of the Universidad Complutense de Madrid, the web application was presented to a group of students of the school, all of them native Spanish speakers. A total of 16 students participated in the experiment. During the activity, students were first asked to load the web page of a daily Spanish newspaper (El Mundo¹³), where they had to use every tool available in EasyNavigation in order to check their functionalities. Once they had tested the web application over the same web page, they were asked to freely use the tool with different websites. Finally, they were asked to fill out a form stating their opinions on the different parts of the application.

A Google form was designed for the questionnaire. This form consisted of 26 questions to evaluate each part of the web application, along with questions to collect demographic and personal data and more general questions about the general experience of using the application. Most questions had to be answered using a Likert scale of 5 options (1-worst, 5-best), although some of them were designed as free opinion questions. Some questions were about specific parts or options, and others were about their opinion of the kind of information they could access through the application or about its positive or negative aspects. The questionnaire was divided into three different parts:

- Options in the website header. These included Configuration, Style, Save/Load and Help.
- History of actions.
- EasyNavigation functionalities.

3.3.1 Results for the options in the website header. The participants were asked to evaluate the options in the website header and whether they were easy to use. In addition, there were some questions about the displayed information and about whether they considered something was missing or inappropriate. The responses indicated that 87.4% of the participants evaluated positively these EasyNavigation options. In particular, the Help option was found very useful with a total of 82.5% of positive evaluations. From the point of view of the Save/Load options, the users were asked whether they found them useful and easy to use. The answers complained about small problems found during their use, but 82.5% of users said that the tools were easy to use and 77.5% of them considered the tools useful. In general, the users did not miss any kind of

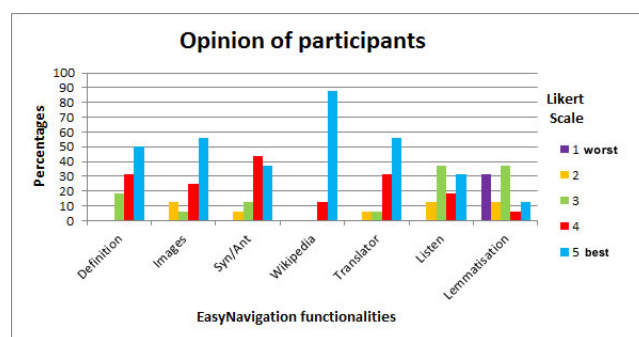
information in this part of the application, and the participants were satisfied with the content and the information in the website header.

3.3.2 Results for the history of actions. Analyzing the results for this part of the application, we could observe that there was a visibility problem with the history of actions appearing on the right side of the window. Many participants said that they were not aware of this option until they were told where it was. We also asked them whether they considered this functionality as helpful, and whether its position was appropriate. The answers showed that only 43.75% of participants considered the history of actions as helpful. The position was considered appropriate but only after the option is presented to the users and its purpose explained, which reflects an interface issue.

3.3.3 Results for EasyNavigation functionalities. The participants were also asked to evaluate the set of EasyNavigation functionalities for enhancing the web page content with extra information. These tools are available through the contextual menu activated by a right-click on the mouse. In general terms, 81.20% of participants considered adequate the use of the contextual menu and the information offered in it.

We also asked them to evaluate each functionality separately. The answers can be seen in Figure 5. As we can see in the figure, there is good acceptance of the tools except in the case of the *Listening* and *Lemmatization* options. For the *Listen* functionality, many participants were neutral about its utility. *Lemmatization* was the least valued tool, and most participants stated that they did not understand its purpose and because of that they did not use it in their tests. The best evaluated tools were *Wikipedia* and *Translation*.

3.3.4 Discussion of the evaluation. Overall, the results obtained during the evaluation were quite positive. The participants showed a high acceptance for the application, its options and functionalities. Among the comments made by the participants, we have to emphasize the case of the *Lemmatization* functionality.



¹³ www.elmundo.es

Figure 5: Opinion of participants for each tool in the contextual menu. Percentages indicate the number of answers for each value of the Likert scale.

Many of them said that they did not understand its purpose and asked about how it should be used. It is important to note that all participants were native Spanish speakers who did not have problems with the flexion of Spanish words. When the participants were briefed on the specifics of the tool, they generally acknowledged that it could be useful for people learning Spanish.

When the participants were consulted about how they would improve the application with extra functionalities, most of them said that it was already quite complete, and some suggested the addition of a tool for the display of videos related with a word or piece of text.

3.4 Discussion of the integration of simplification capabilities in a web browser

The main aim of this development was to integrate into a web application a set of tools for simplification and customization of web pages in Spanish. In this case, the users who are navigating the Internet are the ones enhancing and transforming the content of a web page according to their needs. Reading comprehension capabilities vary from one person to another, so it is useful for them to be able to choose which tools they want to use, and when and how they prefer to apply them.

In order to design and implement an architecture integrating these tools for different needs, we decided to implement a web service for each functionality available in the web application. This approach offers a number of advantages:

- Allows the easy integration of external tools.
- Applications can communicate independently of the platform or programming language.
- Anyone can use the available tools in different environments: mobile applications, for the addition of functionalities to web pages, etc.

After the evaluation, we understand that this model based on the integration with a web browser is appropriate for users who need to control the simplification process when navigating web pages. Finally, the project is available on Google Code¹⁴ as free software that can be used, modified or distributed for anyone who desires to use and/or improve our tools.

4 CONCLUSIONS AND FUTURE WORK

We have designed and implemented a set of simplification tools in the form of web services that are integrated into a web application for the navigation of web pages. In this case, the user is the person who wants to navigate through Internet but will find problems because of any kind of disability.

This implementation is structured as the integration of different tools covering individual functionalities. Therefore, the current implementation can be easily extended by including

additional simplification components in the future. Moreover, the tools could be easily improved or replicated to work with other languages.

Based on the simplification operations applied by the user and saved in the log/history of actions, it could be possible to include the components that allow for the automation of the simplification process in the future. The information from the log/history of actions can be used for a database that stores applied simplification operations, which can be suggested for similar words or phrases in other texts. In addition to that, it can help understand how end users simplify texts, what the most common transformations are, whether they are performed in a specific order, etc.

The integration of web services through EasyNavigation could also benefit from the use of more advanced NLP tools. For example, some participants in the evaluation complained about how the search for images did not take text context into account. For example, if a user looks for images of the word “bank” like in “the green bank in the park”, the obtained images will be those of a bank office. The integration of an intermediary tool of word-sense disambiguation (WSD) before using other tools will improve the results when there is ambiguity in the meaning of a word.

Another interesting functionality that could be added to EasyNavigation is the definition of user profiles such as elderly people, children, non-native speakers, dyslexics, etc. After a thorough study of the necessities of each kind of user, the web application could be dynamically configured depending on the profile of the user who is going to use it. In any case, users would be allowed to configure the different tools as required, and then store their preferences associated with their profile.

The contribution presented in this paper aim to facilitate new user-centered model of text simplification. Whether the users are editors adapting texts using easy-to-read materials or end users who want to access web information, it is important to provide tools that can help them with their different needs and that can be configured according to the task they are performing at a specific moment.

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¹⁴ <https://code.google.com/p/proyecto-sistemas-informaticos/>

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