Accessible Multilingual Web for Seniors and Challenged People

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Abstract. In this paper we argue that the Web today should be multilingual and customized to the elderly and physically and/or cognitively challenged. Although Web applications today are advanced in many ways covering sharing, storage, and management of Web content, and enhance exchange, extensibility, reusability, and operating system independence, many Web applications are still inaccessible for a particular group of challenged people. In spite of the fact that with the increase of Web applications and particularly Web 2.0, a lot of people turned from passive receivers to active participants, the older Web users and/or people with disabilities are still passive receivers (if participants at all). Age-related declines in hearing, vision, and cognition can hinder older users from visiting some websites; many websites do not provide screen readers or magnifiers for visually impaired people or voice regognition software for motor disabled people. Multilinguality in the Web is very important particularly for these challenged people, as in addition to their advanced age and disability level, they may not understand or speak the lingua franca English (in which most websites are available and the voice recognition software works with).

Keywords: Ambient Assisted Living, Disabilities, Elderly, Multilinguality, Web

1. Introduction

The Web had undoubtedly changed many aspects of our everyday life. Web 2.0 with social media interaction, sharing and exchanging digital data morphed the passive Web users into actors. Web 3.0 or the Semantic Web incorporating semantic metadata, enables Web users to search, find, share, and combine information in an intelligent and effective way. e-Government, e-Health, e-Commerce, and e-Learning are some research fields where the Web has been playing an important role revolutionizing the way information is managed and shared. Web applications, including calendars, webmail, online editors and spreadsheets, wikis etc. enable search, storage, processing, maintenance and generally process management, but another important issue, which often lacks attention in the Web, is multilinguality. Multilinguality breaks the barriers of digital divide created by monolinguality problems, connects people throughout the world, promotes international services, and produces products simultaneously (simship) all over the globe. However, much important information is not translated into other languages apart from the lingua franca English in many domains in the 2/3 parts of the world (X,X[1]). Although there are projects with annual corresponding workshops, such as the Multilingual Web[2] and the Multilingual Semantic Web[3], which show industry-academia collaboration for future multilingual Web applications, a particular group, i.e. the elderly (65+) and people with physical or cognitive disabilities are not regarded as a target group, let alone that it should be prioritized.

This paper argues that the Web should be accessible to the seniors and challenged people, and that multilingual Web applications should be embedded in smart devices existent in smart home environments.

The paper is laid out as follows: In section 2 we provide some statistics about how many older users use the Web and for which reason. Section 3 describes the research of ambient assisted living (AAL) and the role of multilinguality in this research area (subsection 3.1). We conclude this paper with a future overview in section 4.

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[1] X because of anonymity reasons.
[2] http://www.multilingualweb.eu/, 07/07/11
[3] http://msw2.deri.ie/, 25/07/11

2. Web for older users

In order to make websites multilingual for the seniors and the challenged people, statistics-based information and empirical data are needed to identify and then collect the websites that are mostly visited by this target group, so that they are later localized in another language and culture. As for who is regarded as an older adult, according to the World Health Organization, "the UN agreed cutoff is 60+ years to refer to the older population", however "at the moment, there is no United Nations standard numerical criterion"[4]. Discussion about age-related limitations is outside the scope of this paper, but information can be found in the W3C literature review[5] about Web accessibility for older users. This W3C review provides various usability studies and studies of users' with specific disabilities as well as guidelines and recommendations. More precisely, W3C has a Web Accessibility Initiative which has released guidelines relating to:

i)   the presentation of content (Web Content Accessibility Guidelines[6]), including adaptable, predictable, and navigable content;

ii)   the accessibility of user agents, including browsers[7] (User Agent Accessibility Guidelines), so that the UI is perceivable, operable, and understandable;

iii)   the requirements of authoring tools, including blogs and online forums, for the creation of accessible content (Authoring Tool Accessibility Guidelines[8]).

Guidelines for designing elderly–friendly websites have been also developed by the U.S. National Institute on Aging and the National Library of Medicine.

A Eurostat community survey on ICT usage in households and by individuals in 2005 showed that the people in the age group 65-74 who use the Internet are only 10%. According to [1] older US Web users visit government websites (100%), do product research (66%), purchase goods (47%), make travel reservations (41%), look up religious and spiritual information (26%), and do online banking (20%). [2] conducted another study about older French users of the Web (age 68-73 years) and drew the conclusion that health was the most looked for topic online, followed by recreation and travel, and services. A study by BurstMedia[9] in 2008 stated that 55+ people search the Web for local/national news (55.9%), shopping/product info (44.0%), health info (42.5%), international news (38.9%), travel info (38.2%), and food information/recipes (34.1%).

As for the type of Web content which targets more at older than younger people is online advertising. The study by BurstMedia highlighted that 43.8% of people of age 35-44 believe that online advertising focuses on people their age, while 83.2% of those 55+. [3] stated that experienced older users can scan pages as well as younger users, but newer elderly users can find busy pages and pages with irrelevant material, such as adverts, distracting.

To sum up, from these studies we can deduce that only a few people in the age group 65-74 use the Internet and they mostly visit government-related sites, read local news, and do shopping/product research. Instead of that, a lot of online advertising is targeted at this sensitive and persuadable group of people.

The step which follows the collection of this data is to customize those most visited websites, so that they are i) accessible and ii) multilingual. The first point is about the conformance to the aforementioned guidelines, and generally speaking, includes both linguistic and cosmetic changes of the usual Web content. The linguistic changes include, among others, usage of the imperative form of verb and avoidance of technical terms, and the cosmetic ones concern, for example, that the visited links should change colour, and websites should provide a "make the writing bigger" link [4]. Noteworhy is that according to the study [2], only 19.9% of those 55 or older say that websites are designed for people their age.

As for the second point, according to the "Internet World Stats" in 2009 English is the top language in the Internet with 464 millions of users, followed by 321 Japenese and 131 Spanish. It is worth mentioning that in the years

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[4] http://www.who.int/healthinfo/survey/ageingdefnolder/en/index.html, 25/07/11

[5] http://www.w3.org/TR/wai-age-literature/, 06/07/11

[6] http://www.w3.org/WAI/intro/wcag.php, 25/07/11

[7] http://www.w3.org/WAI/intro/uaag.php, 25/07/11

[8] http://www.w3.org/WAI/intro/atag.php, 25/07/11

[9] http://www.marketingcharts.com/interactive/older-web-users-online-content-ads-aimed-at-young-4210/, 06/07/11

2000-2009, the growth in Internet for English is 237.2%, while for Chinese is almost 4.5 times higher with 1,018.7%. This shows the tendency towards a Web where English is not the lingua franca any longer.

3. Ambient Assisted Living (AAL)

Apart from websites, today there are pervasive, intelligent, and hiding Web Information and Communication Technologies (ICT) placed in smart home environments where the challenged people live. Ambient Assisted Living (AAL) refers to intelligent assistant systems for a better, healthier, and safer life in the preferred living environment through the use of ICT. Speech recognition and synthesis as well as gesture recognition are some application fields of ICT. A challenge posed to speech recognition software is elderspeech recognition; [5] stated that elderspeak is marked by simplified syntax, a restricted vocabulary, high pitch and exaggerated stress and intonation, a slow speech rate, repetition and redundancy, and special forms such as diminutives and tag questions. [6] point out that speech technologies should accommodate to their users' needs, such as adjasting volume, intontation and sentence structure, and modelling elderly speech in speech recognition software.
At the German Research Center for Artificial Intelligence (DFKI), University of Bremen, there is a Bremen Ambient Assisted Living Lab (BAALL) which is an apartment suitable for the elderly and people with physical or cognitive impairments. The BAALL contains all standard living areas (home office, bedroom, bathroom and dressing area, living and dining room, kitchenette) and was constructed according to the design-for-all principle according to the Casa Agevole at the Sta. Lucia research hospital in Rome (see [7]).
In BAALL the *Bremen Intelligent Wheelchair* (Xeno, Otto Bock) as well as the *Intelligent Walker* serve mobility assistance. Both the wheelchair and the walker are upgraded with sensors and actuators to assist safe driving (braking, automatic obstacle avoidance) as well as navigation to known destinations. Users can interact with the wheelchair through spoken dialogue (currently in English and German); gesture input recognition is currently under development.

3.1 Multilinguality in the Bremen Ambient Assisted Living Lab (BAALL)

In this section we describe why multilingual Web applications are needed in AAL and BAALL specifically. Navigation with the *Wheelchair* or *Walker* as well as controlling smart devices or lights are very important tasks in BAALL. As aforementioned in 3, those tasks can be carried out through speech interaction which is currently feasible in English and German only. This limitation prevents using the wheelchair in non-English or German speaking locales. In order to make the wheelchair applicable in home environments in other locales[10], speech software should come with language and acoustic models of more than one or two language(s). We designed a prototype enabling multilingual dialogue based on a speech-to-speech translation system. More information can be found in X (X). We combined three free and/or open-source systems (speech recognition system, Machine Translation system, and speech synthesis system) to enable language-independent dialogue.
The advantages of having Web applications users in AAL (of any age group, but particularly the seniors) speaking in their mother tongue are higher instinction, autonomy, easiness of usage, confidence, independence, and user-friendliness in human-machine interaction (HMI).

4. Conclusion and Future Overview

The ageing phenomenon is reality today, as the world average of 65+ people was 7.6% in 2010 and will be 8.2% in 2015[11]. Ambient Assisted Living aims at an improved lifestyle of the elderly and people with disabilities. We argue for a not only accessible, but also a multilingual Web in assisted living environments. In our opinion, an accessible Web for the elderly and people with disabilities is indispensable, while a multilingual accessible Web brings further advantages, such as flexibility, independence, confidence and seamless HMI.
The years with people sitting in front of a computer screen in order to access the Web have passed and a new era of intelligent hiding Web applications has come. In this paper we shed light on i) accessible and multilingual websites for elderly and ii) multilingual Web ICT in smart home environments which are designed for elderly and

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[10] This also entails research projects which involve collaboration between not only English or German speaking countries and testing scenarios in multilingual and -cultural settings.
[11] http://www.un.org/esa/population/publications/WPA2009/WPA2009-report.pdf, 06/04/11

physically and challenged people. Most visited websites and ICT in AAL should be customized to this particular group, be accessible and multilingual, so that the challenged population is not discriminated against the non-challenged people.

Making the Web accessible and multilingual for this particular group needs interdisciplinary research. Technology in healthcare, health informatics, and translation and localization should be intertwined in order to achieve that goal. Involving the elderly for Web design, global legislations and regulations (such as the Unified Web Evaluation Methodology 1.0 for the European Union), guidelines and standards as well as research projects, tutorials (as the W3C industry session about accessible Web **-** Accessibility for differently-abled and elderly hosted at the 20th World Wide Web Conference[12]) are some measures which can enhance that. As for the research that should be carried out towards healthy ageing, the European Commission suggests demographic and epidemiological research on ageing and disability, predicting the size and nature of the ageing population of the future, and acquiring information as inputs to policy and planning.

We close this paper with some good initiatives, projects and tools with the hope of seeing more of these in the near future and learning from their findings. The EASTIN-CL[13] project supports the social participation of disabled and elderly people by providing a crosslingual and multimodal portal containing information on assistive tools and technology. This project, among others, supports input and output device-independence, cross-lingual retrieval, and Machine Translation for both queries and documents. In addition, the Public Health Portal of the European Union[14] provides links to the EU activities related to public health, ageing and care for the elderly, social policy, and EU initiatives to improve information on accessible tourism for disabled people. A search engine designed for the seniors is ETSIN [8] which was designed using the Google Web API and includes less buttons, no advanced search, easier editing text in queries, and also a bullet list for viewing all the sentences of the summary compared to Google. The results showed that simple interfaces but including important functionalities and also visual icons are preferred by the older Web users. Last but not least, [9] carried out a survey on the website compliance level to senior-friendly guidelines and the results showed that the majority of the sites complied to guidelines related to basic navigation and content phrasing and style, but not to guidelines specifying text size, text weight, line spacing, textual links with graphics, or site map availability. Such studies, but also observational studies and interviews are some steps of involving the challenged people in the design of customized websites and testing adapted applications.

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[14] http://ec.europa.eu/health-eu/my_health/elderly/index_en.htm, 06/07/11