



Ilse Bierhoff, Henk Herman Nap, Wil Rijnen, Reiner Wichert

Partnerships for Social Innovation in Europe

Proceedings of the AAL Forum 2011 Lecce



PROCEEDINGS

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Ilse Bierhoff, Henk Herman Nap, Wil Rijnen, Reiner Wichert (eds.)

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Tablets helping elderly and disabled people

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Abstract— The article introduces the basics by which tablets are considered as appropriate tools for integration and promotion of the elderly in the digital world. To prove this, the paper presents three research projects carried out by CESyA that integrate Automatic Speech Recognition (ASR), Voice Synthesis, subtitling, audiodescription or audio navigation tools into tablets for encourage autonomy and personal growth for the elderly and for people with disabilities.

I. INTRODUCTION

As people in many countries of the world become technologically competent, elder people will be ready to use Information Technologies (IT) in most aspects of their daily lives [1][2].

When considering the number of people having significant impairments and typical age distributions that show that, for age ranges over 50, hearing and visual impairments become progressively common, we can safely say that the number of homes having at least one person with hearing or visual problems is also very high and that it will increase in the coming years.

Among the recent devices that have been made available in the market, tablets are creating a great impact and almost every month a new device is announced that goes beyond previous ones in portability and performance. Touch screens are improving their performance exponentially, their responses being immediate and reliable; they support many gadgets and are able to run many applications, zoom is everywhere available, their autonomy is constantly increasing... and they are lighter than ever!

It is reasonable to foresee that in the next future most people will own and use tablets in their daily life. They would carry them permanently and even people that will be elderly by then would also be familiar with those devices.

Tablets offer the possibility to integrate technologies, at this moment applied to mitigate age related hearing or visual impairments into a single device that is affordable, popular, portable and easy to use. This is the reason why the Spanish

Centre of Subtitling and Audiodescription (CESyA)¹ has been involved in different research projects to develop both applications and interaction models that are based on the use of personal devices especially focusing on tablets in the last two years.

CESyA is a long-term research project at the Carlos III University of Madrid financed by the Spanish Ministry of Health, Social Policy and Equality. CESyA is specialized in research, training and implementation of accessibility to audiovisual media in the fields of television, theatre, cinema, education, web and other cultural events and venues such as conferences and museums

The most relevant technologies considered by the CESyA in its strategy are Automatic Speech Recognition (ASR), Voice Synthesis, the basis to address subtitling, audiodescription, audio navigation, etc.. The different applications developed can turn the tablet into a guide for the visual impaired and an interpreter for the hard of hearing.

Experience with new tablets confirms that this new technology could be a perfect user device and could overcome sensorial disabilities in different real-time scenarios. The Carlos III University of Madrid has developed several applications within research projects in which user experiences have demonstrated their applicability.

II. APEINTA

The first one is related to education, where tablets have been used as student devices in and outside the classroom in the scope of the APEINTA project. Other experiences based on tablets in the education field prove that tablets improve learning efficiency [4]. APEINTA is a Spanish educational project that aims for inclusive education for every student of all abilities in and out of the classroom [3]. This project applies computer science to overcome barriers that unfortunately still exist today in the educational environment. Nowadays, some researchers are working in lectures transcription based on Automatic Speech Recognition [5]. Three different services are proposed by APEINTA: Firstly, a **real-time subtitling service** is provided, so students can use their tablets for reading the verbatim discourse of the teacher. This service uses ASR mechanism and subtitling standards for automatically provide real-time subtitles. This service is useful

¹ CESyA: Spanish Centre of Subtitling and Audiodescription.
<http://www.cesya.es>

for all those students who have temporary or permanent hearing impairments or for foreign students, for instance. Secondly, a **text-to-speech service** is provided, allowing students with speaking problems to participate during the classes with their comments or questions. Students can use their own tablets for writing their questions and comments and submit them to the APEINTA text-to-speech server, which will convert normal language text into speech and it will be repeated aloud in the classroom with a computer voice. Finally, APEINTA provides students with an **accessible educational platform** in the Web, where every student can access pedagogical resources from their tablets at any-time, nevertheless of their personal and access characteristics.

The project has received two awards, the FIAPAS² award in 2009 for research and innovation in education (provided by the final users of APEINTA) and the “2011 Web Accessibility Challenge sponsored by Microsoft: Delegates Award” during the W4A 2011 Conference (a scientific award).

Students can use different personal devices in the APEINTA project, like mobile phones, PDAs, laptops (see Figure 1), etc. During last months, the project has incorporated the iPad as client device; user’s experience confirms that iPad is widely accepted for use [6]. More information can be found at <http://www.apeinta.es>.

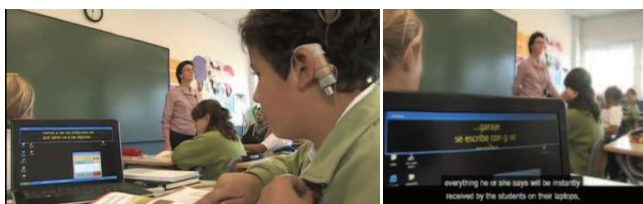


Fig. 1. Laptops used in the classroom for receiving real-time subtitles of the verbatim discourse of the teacher.

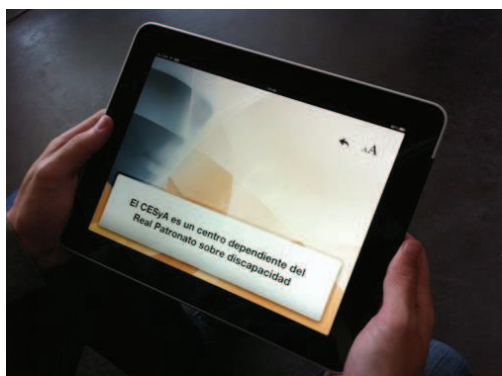


Fig. 2. APEINTA on iPad for reading subtitles in classroom

The experience in this area can be easily translated to other environments and users where the same impairment barriers exist, especially for elderly people hearing impaired. CESyA is extending the services based on speaker’s speech transcriptions with the help of an Automated Speech Recognition (ASR) system, to the scenarios of conferences

and live events where an automated audio-to-text is required. Elder people, who in many cases can not follow the audio or visual communications in the conference, will be able to access the captions in their personal devices (tablet PC, Smartphone, laptop, etc.). In addition, audiodescription could also be provided in the tablets without the need of special devices.

III. UC3MTITLING

Another experience lies in the field of captioning in Theatres, where the use of tablets to show subtitles has been successfully tested as a valid alternative where screens on the stage are not possible. Carlos III University in collaboration with CESyA has developed an application to support different accessibility services in tablets and other devices. UC3MTitling is a software tool which incorporates the necessary procedures to control, on site or at distance, the synchronized projection of accessibility elements (subtitles, video for sign language and audio description) through the different channels associated with the theatre where the play takes place. This system carries out subtitling in the real time of events for an audience, without the need for highly qualified personnel. Its area of application is live events based on a pre-established script such as theatre, conferences, ceremonies, etc., which allow the synchronized broadcast of any accessibility element for a live event as it unfolds, and at a low cost. This subtitling system not only allows individuals with impaired hearing or sight to be able to follow such events, but the rest of the audience can also benefit from them, thereby achieving complete integration for disabled persons and conditions on par with the rest of the audience.

The main advantage of this system is that the technician can carry out the synchronization of the elements without actually having to be in the theatre where the performance is taking place, with the use of an Internet connection. In this way, once the technician begins broadcasting the accessibility elements, they can be broadcast in the theatre by different channels depending on their features: texts for titles, audio for audio description and video for sign language. In addition, because of the high degree of compatibility of the chosen formats, the play’s audience can simultaneously consult them from different devices: tablet, Smartphone, PDA, etc.

The use of tablets and similar personal devices for subtitle display allows in addition the use of different subtitle languages, user selectable.

UC3MTitling has been successfully tested in several performances and included in regular theatre representations at Centro Dramático Nacional (CDN), in the framework of collaboration with CESyA whose aim is to set up functions of this type on a regular basis during the 2011-2012 season of the of CDN programming. This agreement is within the framework of social awareness and action for accessible culture that the CESyA is carrying out.

² FIAPAS is the Spanish Confederation of Parents and Friends of Deaf People (www.fiapas.es)

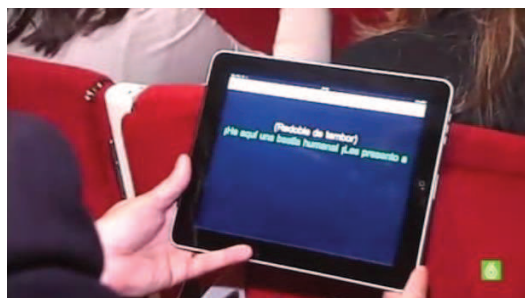


Fig. 3. UC3Titling being used live in a theater

UC3MTitling and several user interviews appeared in the news at TV channel la Sexta in relation with the performances at the Centro Dramático Nacional:

<http://www.youtube.com/watch?v=8DI8GKhn3KI>

IV. GVAM

Also an application for tablets and associated technologies has been developed: GVAM is a research and commercial project carried out by CESyA and Dos de Mayo company for the development of Multimedia Accessible Guides (MAG) for museums [7]. GVAM is a management and publishing system for contents and guided tours designed specifically for exhibition spaces like museums or fairs. It aims to facilitate and expand publication and edition techniques for these institutions in an accessible manner. This integral technological solution to cultural spaces is being already implemented in several museums in Spain. GVAM has been developed in collaboration with associations of people with disabilities and the Ministry of Culture. After five years of work, GVAM offers a unique system that ensures the accessibility to all the contents and interfaces for the general public, not through alternative means, but universally.



Fig. 4. The GVAM Accessible Multimedia Guide

GVAM Spanish technology is supported, from the beginning, by a clear vocation for experimentation and innovation. It has its own technology, both hardware and software, ensuring maximum versatility in customizing and publishing the application.

The GVAM application makes accessibility to guided tours possible to people with sensory disabilities by means of several accessibility resources that every visitor can freely activate to adapt to her or his needs. Some of them are real-

time subtitles, audio description, audio navigation, sign language videos, high contrast option or magnifier, all of them synchronized on the same device. GVAM guides have an indoor location system that allows visitors to find their position in the exhibition space at all times and know how to reach places of interest. This system is especially useful for blind people. The GVAM guides can also offer itineraries based on time available, interests, subjects, or didactic criteria adapting its contents to other groups like children and people with mental disabilities.

Its online CMS (Content Management System) allows exporting the multimedia application not only to the GVAM mobile guide but also to all types of mobile platforms, websites and social networks. In addition the CMS has two important automatic content generators, one for synthetic speech in several languages and one for subtitles. This enables the museum staff to quickly update and extend the accessible tour guide in a more economical and efficient way.

More information: <http://www.gvam.es/>

V. SYNCHRONIZED SUBTITLES IN LIVE EVENTS

Tablets are also suitable devices to present synchronized subtitles that result from the real-time processes required for live subtitling in conferences and live events where a pre-recorded script is not available. Subtitling of live events is a complex and expensive process where the required immediacy limits the quality of the result in terms of content and speed. As a result, subtitle synchronization is a challenging issue of the accessibility to live-multimedia that is especially relevant as subtitles delays with regard to the audio have a disturbing effect on users that has a great impact on the audience in terms of comprehension when subtitles are presented on the screen several seconds later than audio/video. To solve this problem, University Carlos III of Madrid has developed and patented a model for real-time synchronization of subtitles and audio/video that allows subtitles generated by means of Automatic Speech Recognition tools to be displayed on screen several seconds later but individually aligned [10]. The model allows the synchronization of subtitles to audio before reproduction, compensating the individual delays produced when obtaining subtitles from speech in real-time, so that users that require subtitles may have the option to experience a quasi-live synchronised alternative. Key aspects of the proposed solution are the techniques to calculate individual subtitle delays with regard to the audio and video, and their use to create a slightly delayed version of the live television program with synchronized subtitles. One of the scenarios where this approach fits better is the use of tablets in live conferences or events, where tablet resources (screen and audio) can be used to provide elder or disabled users a synchronized version of the audiovisual scene. This synchronized version occurs several seconds later but has the advantage of subtitle to audio synchronization in a personal, non-disturbing device, while allowing people to enjoy the experience of being present at the live event together with the rest of the audience. The application of real-time subtitle synchronization in tablets to improve accessibility in live events will be felt as an improvement for an increasing

number of people, and the Spanish Centre of Subtitling and Audiodescription continues its research lines in this area

VI. CONCLUSIONS

These experiences can be considered as a base to deal with similar situations where audiovisual and interactive accessibility resources as subtitles are created in real-time like in conferences, guided tours, etc. When combined with the automatic speech recognition and speech synthesis capabilities developed by us or already integrated in many of the today tablets, the use cases for visual and hearing impaired people are endless. Subtitling, audiodescription, voice synthesis and automatic speech recognitions are necessary complements to growing acceptance of tablets among elderly people nowadays as a support and communication tool. An example found in http://news.yahoo.com/s/ytech_gadg/20100423/tc_ytech_gadg/ytech_gadg_tc1762.



Fig. 5. Frame from "Virgina's new iPad" video.

The Spanish Centre of Subtitling and Audiodescription (CESyA) is a Public Reference Institution under the Royal Board on Disability of the Ministry of Health and Social Affairs and is co-funded by the Carlos III University of Madrid. CESyA is a multidisciplinary research project led by Carlos III University of Madrid to promote a wider accessibility to audiovisual media through the services of subtitling and audio description. Its most relevant objectives are the research, training and contribution to initiatives in standardization, communication and social awareness for audiovisual accessibility in the fields of Digital Television, Cinema, Theater, Web, Education and other venues and cultural events such as Museums and conferences. <http://www.cesya.es/>

Short Bio

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M. de Castro, A.G. Crespo, A. Iglesias and J.L. Pajares are members of the Spanish Centre of Subtitling and Audiodescription research team, and professors at Carlos III University of Madrid.

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