GameAbilitation + ArtAbilitation

Ludic Engagement Designs for All (LEDA)

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Published in:
Accessibility, Inclusion and Rehabilitation using Information Technologies

Publication date:
2011

Document Version
Publisher's PDF, also known as Version of record

Accessibility, Inclusion and Rehabilitation using Information Technologies

La Havana, Cuba 13 - 15 December 2011

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Universitat de les
Illes Balears

Accessibility, Inclusion and Rehabilitation using Information Technologies
AIRTECH 2011

Accessibility, Inclusion and Rehabilitation using Information Technologies
AIRTECH 2011

Editores: Antoni Jaume i Capó, Alejandro Mesejo Chiong.

ISBN: 978-84-695-0590-8

PREFACE

After years of collaboration between the University of the Balearic Islands and the University of Havana in the areas of rehabilitation, inclusion and accessibility using information technologies, the idea of organize a conference on these subjects is came up.

AIRtech2011: Accessibility, Inclusion and Rehabilitation using Information Technologies have aimed to establish an open exchange dedicated to the presentation and discussion about accessibility, inclusion and rehabilitation using Information Technologies. As main topics are those relating to the application of information technologies in accessibility to enable people with functional limitation to perform tasks that they were formerly unable to accomplish, in inclusion for people with different abilities and preferences, and in rehabilitation.

During the review process, 15 summaries were selected from 40 submitted to AIRtech 2011. Unfortunately due to the economic situation, many authors could not attend in person at the event and for this reason was to enable a virtual session. All accepted summaries have been invited to publish the extended article to a book and selected summaries have been invited to submit an extended paper to the special collection: Accessibility, Inclusion and Rehabilitation using Information Technologies of Journal of Research and Practice in Information Technology (JCR indexed, Impact Factor 2010: 0.205).

We think AIRtech can be an interesting discussion meeting about these subjects, and repeat the conference in other locations.

Antoni Jaume-i-Capó
Alejandro Mesejo-Chiong
Editors.

INDEX

Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

GameAbilitation + ArtAbilitation:

Ludic Engagement Designs for All (LEDA)

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Abstract. This contribution presents two conferences, GameAbilitation and ArtAbilitation, representing a trans-disciplinary research platform that emerged from a mature body of work investigating ICT across functional diversity of ability. The work questioned requirements of cybertherapy systems based upon gameplay and creative expression experiences. Supplementing traditional intervention whilst planning ahead to address societal demographic predictions of increased aged and disabled persons was explored. The need for ICT solutions parallels forecasts of service industries' predicted inability to cope with such increases. The conferences offer a podium for sharing such work with an aim to inform whilst inspiring collaborations and advancements. The research platform was coined by the author as Ludic Engagement Designs for All (LEDA).

Keywords: Health Games; Rehabilitation/Habilitation; All ages; All abilities; Play; Creative expression; Ludic Engagement, Interaction Design.

1 Introduction, Background and Concept

SoundScapes [e.g. 1, 2, 3] is a mature body of research investigating ICT across functional diversity of ability. It originated from preliminary research starting in 1985. Creative expression and play resulting in fun interactive experiences for the end-user is the catalyst from which cybertherapy system requirements are questioned. Thus 'art' in the form of making 'music', digital 'painting', controlling robotics as well as playing video games were explored as cyber-content. Requirements for apparatus and method to supplement traditional intervention whilst planning ahead to address societal demographic predictions of increased aged and disabled persons was explored.

Conceived via exploring custom-made apparatus with various disabled people, the work progressed through studies of various worn biofeedback systems. It was advanced by innovating bespoke apparatus to achieve unencumbered biofeedback through gesture-control of cyber-content. A patent resulted from the research [4].

The research platform emerged from investigations of how contemporary digital environments can be created to be accessible and inclusive whilst being programmed to respond to human control data sourced from a range of different abilities in order to manipulate the same human's subsequent interactions.

Programming decisions relate to feedforward (i.e. means of control) and feedback (e.g. audio visual content) as well as the mapping choices. Ideally, in the context of this research, the human participant experiences the system as intuitive and fun, where challenges can be achieved and success rewarded. In such immersive environments the interactive stimulus influences the participant's efferent-afferent neural feedback loop closure. Thus, actions can be intentional as well as subliminally driven by the information exchange between innate systems. In this way interventions can be designed according to the participant's profile and the healthcare goal for a program of treatment. However, participant profiles differ as does development and progression as a result of intervention. Another significant variable is the session facilitator who has a range of responsibilities including changing system parameters during in-action intervention to prevent mismatches between player ability and cyber-content difficulty. This is needed as systems able to automatically adapt to match the participant's nuance of ability progress by automatically incrementing to maintain challenge and engagement, thus achieving a flow state, are rarely used in this context. However, predictions of service industry overloading from increased aged and disabled suggest that automated artificial intelligent technology solutions such as Dynamic Difficulty Adjustment (DDA) are required to empower such complex balancing between the human and the system [5]. Such is discussed in GameAbilitation and ArtAbilitation.

2 Emergent Conferences

The conferences GameAbilitation and ArtAbilitation were conceived to offer a platform for knowledge exchange and sharing of work relating to the discussed research (LEDA). A goal is to inspire trans-disciplinary collaborations to advance the field. The inaugural conference was held in Denmark in 2006. Annual events were subsequently held in Denmark, Portugal, USA, Chile, and is again in Denmark 2011.

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

Users and Experts Regarding Orientation and Mobility Assistive Technology for the Blinds: a Sight from the Other Side

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1 Introduction

The standard regulation ISO 13407 "Human-Centered Design Processes for Interactive Systems" [1], proposes the inclusion of the potential users since the first developing steps of any project. However, this recommendation is not always taken into account. This study presents the results of a set of qualitative interviews with potential users of Assistive Products –APs- for the blinds, and experts in related fields, describing how assistive technology is perceived by this collective, main problems of already proposed aids and several design recommendations.

2 Methodology

In the development of this study, we performed 11 interviews to different professional and personal profiles, related to blindness, rehabilitation, psychoacoustics, computer science and music.
More in detail, the experts interviewed can be classified in the following non-exclusive categorization:

- Blind people: 6
- Psychology and rehabilitation professional profile: 2
- Technical professional profile : 4
- Experts in assistive products: 5
- Experts in music: 3

The interview presented 3 open questions:

- Problems to solve in the blind's daily life, regarding orientation and mobility (question asked only to blind interviewed people and experts in this field).
- Known systems or devices related to these problems, and critics to them.
- Proposals and advices about new systems (at user or technical level).

3 Results

The answers are organized following the questions.

- The main problems in the daily life are related to getting oriented in unknown spaces (subway stations, feeling "in the middle of nowhere" and the problem of echoes), with the inaccessibility of visual information (lack of Braille panels) and undetectable obstacles with the cane of dog-guide (bollards, containers, mail and telephone boxes or scaffolds).

- Users do not have a deep knowledge of proposed APs, and they only report to know some of them. The main critics to known APs are headed by the price, being the main constraint to their democratization. Moreover, there are not scaled economies for this marked and the public is thin. Another related perceived problem is who takes care of the sustenance of the system. The weight is another important problem of most of commercial APs, as well as the usability, i.e., how complex is the device and its use: "Users got crazy with the ultracane". This parameter is related to a long training time, as it is the case of the VAS [2] or the VoICe[3].

- The advises given for every new AP are related to the previous critics: Low price, possibility of integration in the cane, water resistant, easy to operate (specially for the elder people), portable, take into account people who does not hear well enough, different profiles for different capabilities, moderated complexity and higher functionality, potential users group as wide as possible, not ostentatious apparatus, different functioning in the training that during the normal use. Over all, users reclaim not to generate an unrealistic expectative when presenting new devices.

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

A Review of Mobility Technologies for the Blinds

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1 Introduction

Mobility is a basic capability to live an independent life, moving safely through unknown paths. If some sensitive organs are affected, this independency can be put into question. Thus, assistive technology has been proposed and widely used for a long time to help different disabled collectives to improve their daily life and independence. Although the technological applications for mobility of the blinds started long time ago (as it is the case of the Noiszewski's Elektroftalm (1897) or the D'Albe's Exploring Optophone (1912) [1]), in this study we will only focus on modern assistive products. The objective of this study is to provide a useful taxonomy of the existing Electronic Travel Aids –ETAs-, as well as a renewed state of the art of such devices and systems.

2 Methodology

The retrieve of information has been performed using peer and non peer-reviewed English literature, from the Web of Science meta-database and from academic or commercial web pages, when needed. The search took place between September 2010 and February 2011, with the following keywords: "ETA", "Electronic Travel Aid", "Assistive product" and "Assistive technology" together with "blind" and "Mobility".

The classification of the ETAs is complex, since many parameters are involved, such as technology, way of use, information provided, spatial implementation, etc. In this study we classify the ETAs regarding the use and technology, and we provide one example of each subset.

3 Results

The search process retrieved 80 assistive products, being proposed 17 of them from 1940 to 1970 and the rest from 1970 to the present (see table 1). This search found many non-commercial projects which are not available for the blind community, as well as an explosion of this field in the last 10 years. This increase of research works show how important is, nowadays, the collaboration between technology and social care. However, the market does not allow spreading properly this technology and, hence, it remains in an unusable state.

Table 1. ETAs classification and examples.

Use	# ETAs found	Technology	Example
Torch-like	4	Infrared	The UCSC Project [2]
		Ultrasounds	The Polaron [3]
Cane-like	13	Infrared	Tom Pouce [4]

		Ultrasounds	The Digital Ecosystem Sytem [5]
		Laser	The Laser Orientation Aid for Visually Impaired (LOAVI) [6]
Belt	7		NavBelt [7]
Wearied	11		Guelp Project "Haptic Glove" [8]
Head-mounted	18		Computer Aided System for Blind People (CASBliP) [9]
External	10		RIAS [10]

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

A Review of Orientation Technologies for the Blinds

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1 Introduction

As stated in [1], "Orientation" means to "know where he (she) is in the space and where he (she) wants to go". Blind people find some extra problems to perform this task. Thus, some assistive products have been developed to help them, the so-called Electronic Orientation Aids –EOAs-. This study provides an abstract of a review research, classifying and analyzing the historical development and the pros and contras of each technological solution in the field of orientation of blind people.

2 Methodology

The search was performed over the Web of Science meta-database, as well as non peer-reviewed literature from online English catalogues or reports of specialized enterprises and published Ph.D. Thesis from academic institutions. This search was performed between March and June 2011 with the different combinations of the keywords "Assistive product", "Assistive technology", "EOA" and "GPS", with "blind" and "Orientation".

The set of the EOAs can be divided into two former groups, regarding the surrounding in which they can be used: Indoor and Outdoor. Likewise, the way the information is given to the user allows another classification, depending on the paradigm implemented. In this study we classify the EOAs regarding the environment and the technology, and we provide one example of each subset.

3 Results

The search process retrieved 34 orientation assistive products, most of them working outdoor with GPS technology (16). The research field is constrained by the price of technology, and the democratization of the GPS has increased, since the year 2000, the available orientation tools for the blinds.

Table 1. EOAs classification and examples.

Use	# EOAs	Technology	Example
Indoor	8	IR Beacons	The Cyber Crumbs [2]
		RFID Beacons	BIGS [3]
		Laser Beacons	The Instrumentation Cane [4]

		GSM	PYOM [5]
		PC based	Subway Mobility Assistance Tool [6]
Outdoor	19	Tactile Maps	NOMAD [7]
		GPS	BrailleNote GPS [8]
		Compass	The University of Osnabrück Project [9]
Mixed	7	IR Beacons	The Easy Walker [10]
		GPS+Bluetooth	Indoor Navigation System [11]
		Image Processing	Body Mounted Vision System [12]

The way the information is given to the user is restricted to synthetic voice giving directional orders and the "clock" paradigm, orienting the user by means of a clock metaphor. There is one exception, the Body Mounted Vision System, which transmit by means of tonebrusts the error of the correct way.

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

A Television-based Gesture Controlled User Interface for Inclusive Design

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Abstract. We have developed a gesture-controlled user interface (GCUI) application called OpenGesture, to help users carry out everyday activities such as making phone calls and controlling home appliances. OpenGesture uses simple hand gestures to perform a range of tasks via an augmented reality television interface. This paper introduces OpenGesture, and reports evaluative studies of its usability, inclusivity and effectiveness.

Keywords: Gesture control, inclusive design, augmented reality.

1 Introduction and objectives

The evolution of diverse technologies has in turn led to diverse styles of interaction. For example, most people use a keyboard and pointing device (e.g. a mouse) when they interact with a computer, even though this is not the optimal solution for all types of users [1]. Most people also use a remote keypad to control their televisions, they use a push-button interface evolved from an 'old-fashioned' telephone to interact with their mobile phones, and a proprietary handset evolved from a joystick to play computer games. More novel interaction is increasing in popularity, especially touch-screen technology (e.g. Apple I-touch/phone/pad) and motion-sensing technology, as in the case of the Nintendo Wii. However, many users still experience problems with such interactive devices.

The main objective of the study presented in this paper is to evaluate whether a gesture controlled user interface (GCUI) could be effectively used by people who may feel uncomfortable using typical handheld devices, perhaps because of difficulties associated with dexterity and/or visual and cognitive impairment – problems often evident with some older and disabled users. GCUIs have proved popular in computer gaming recently (e.g. Microsoft Kinect), but there has been limited research into their effectiveness in more serious scenarios.

To perform our evaluation, we developed the OpenGesture application, an open source augmented reality application, which enables users to undertake everyday tasks via a television screen (for example interacting with appliances, using the telephone, switching lights on and off, and answering the door). After running the application (which is initiated by selecting a pre-configured television channel), a user can see his or her image on the television screen, which is filmed through a connected webcam. The user can point at different icons using hand gestures to perform various

tasks. When the user points or makes a gesture to an icon on the screen, OpenGesture executes the related task or command.

2 Methodology

Two main evaluation studies were undertaken, using methods and techniques suggested by Rubin et al. [2]. The first concentrated on usability and inclusivity evaluation, and the second focused on the timing of gesture interaction. Three scenarios were selected for the sessions to provide realism: inspecting the status of a refrigerator, making a phone call, and using a DVD player. A total of 70 participants took part in the evaluations, 22 of whom were identified as older or disabled users. Each participant signed their consent to undertake the tests. Sessions were recorded for later analysis. During the test sessions, participants were asked to contribute their observations about any surprises and issues. After the sessions were completed, participants were interviewed and filled out a usability questionnaire.

3 Results

All tasks were successfully completed by all users and no-one expressed any problems with using the interface. Each task was timed, and an analysis was undertaken correlating the users' ages with task completion times. Predictably, older users took more time on each task, leading us to identify age-related Fitt's Law constants for GCUI interfaces.

The questionnaire responses were converted to numerical values by transposing the Likert scale used in the questionnaire ranging from a score of 5 (for strongly disagree) up to 1 (for strongly agree). Means for each question ranged from 2.69-3.21, with the standard deviation for each question between 0.74 and 1.1. These neutral results suggest that the GCUI interface was acceptable, if not embraced with enthusiasm. However, there was no significant difference in the evaluation across the age groups, suggesting that OpenGesture does offer inclusivity.

Acknowledgments. This work was supported by the Overseas Research Scholarship Award Scheme (ORSAS), UK.

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

Accessibility as a Service: A Scalable Service for Automatic Generation of Sign Language Videos

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Abstract. People with disabilities have serious difficulties to access information. The information and communication technologies are rarely developed taking into account the specific requirements of these potential users. In this paper we explore the concept of "accessibility as a service" by proposing a cloud computing service to help deaf people to access digital content. Our objective is to automatically generate and embed a sign language video layer into multimedia contents accessed through this service, addressing the presentation of digital content to the needs of deaf people.

Keywords: accessibility; sign language; cloud computing; machine translation

1 Introduction

Deaf people have serious difficulties to understand and communicate by texts in spoken languages. In Brazil, for example, about 97% of the deaf people do not finish the high school [2]. There are several works in the scientific literature developed to address their communication limitations [1][3-7]. These works offer technological solutions for daily activities, which enable deaf people to watch and understand television [3], to interact with other people [1][4-7], among others.

In this paper we explore the concept of "accessibility as a service" by proposing a scalable cloud computing service able to automatically generate and embed a sign language (SL) video into a regular multimedia content, improving its presentation to the needs of deaf people. It is composed by a set of sub-services (or software components) that allow the automatic generation of sign language videos (i.e., without the interference of an interpreter) from the audio or subtitle tracks of a video submitted to the service.

2 The proposed service

In this section we briefly describe the architecture of the proposed service (see Figure 1). An important aspect on our design is the use of a **Sign Language Dictionary** to store the visual representation of signs. Thus, the Sign Language Dictionary can be defined as a set of tuples in the following format:

$t = < g,v >$, where:

- g is the gloss (or a code of the sign);
- v is the visual representation of the sign.

The service works as follow. Initially, a filtering process is applied in the submitted multimedia content to extract audio or subtitle tracks. Afterwards, a subtitle extraction or speech recognition process is applied to convert this subtitle or audio stream into a sequence of words in the source-spoken language. Then, this sequence of words is automatically translated to a sequence of words in the target sign language (i.e., a sequence of glosses).

The sequence of glosses is then sent to an Exhibition component that associates each gloss with a visual representation of a sign stored in a Sign Language Dictionary. Thus, the sequence of glosses is mapped to a sequence of visual representations that will be synchronized with the audio or subtitle track to generate the sign language video.

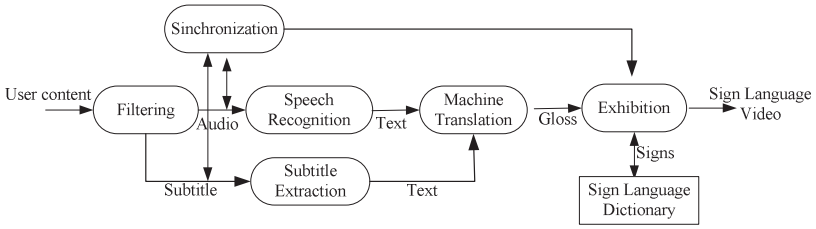

Fig. 1. Schematic view of the proposed service

3 Conclusions

In this paper, we presented the architecture of a service for improving the access of deaf people to digital multimedia content. This proposal addresses accessibility features by automatically embedding sign language videos into multimedia contents submitted by the user.

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

Development of an interactive kiosk with screen amplifier targeting low vision and old-aged people

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Abstract. Nowadays, the interactive kiosks are used in different solutions from ATM terminals to tourist information. However, usually these solutions cannot provide accessibility features for low-vision and old-aged people. This work presents a proposal of an interactive kiosk with multisensory resources.

Keywords: low vision, magnifier, multisensory systems

1 Introduction

The World Health Organization (WHO) estimates that in 2006 approximately 37 million people were blind and 124 million had some type of visual impairment, a number that is growing year after year. In order to ensure social inclusion of these people, governments of different countries have been investing heavily in public policies that allow the development of technological solutions suitable. In this context, computers are the key solution with their general and application-specific software that include among others educational, office, e-commerce, and e-banking applications. However, despite the advances already made, we are still far from ideal situation. An example is the automated teller machine (ATM) that with captions and images of reduced size does not satisfy the visual impairment people and the elderly either. For both, where the glass is not enough anymore, the reading of a simple text may turn an almost impossible activity. Currently, some technical aids not only blind but also for people with low vision and older people are available, such as Braille devices (Braille Wave [1]), screen readers (HAL [2], JAWS[3]), and screen amplifier software (Lunar [4], Bidarra et al., 2009 [5]).

2 Objective

The main objective in this work is to develop an interactive kiosk with features of both accessibility and usability for people with low vision and older people.

3 Methodology

The proposed solution works in three interaction axes: visual, auditive, and tactile. The software layer is implemented over the Linux Operating System and the AT-SPI[6] accessibity layer, providing a free software solution.

- Screen magnification: the magnification of text and images and additionaly has other features that enable the user customization of the screen elements. These features include the selection of the background and foreground color; the application of computer graphics algorithms for the image processing and smooth contour lines; contrast and brightness ratio definition.
- Auditive feedback: screen reader activation/deactivation with the speed and voice defined by the user.
- Tactile feedback: an adapted mouse is implemented in this work and it is fully integrated with the AT-SPI layer. The mouse vibrates when placed on any relevant information (menu item, icon or internet page link) on the screen, alerting the user about the occurrence. The feedback circuit in the mouse is constructed to obtain a low cost and an easy implementation.

In addition, the software provides a profile saving feature using a login and password, allowing a fast configuration of the system, easing the utilization and avoiding repetitive and boring actions.

4 Results

This is a work in progress. The validation of our solution is in progress with the four Brazilian public schools. Despite the target audience of this project are the students with low vision, this solution can be extended for banks and government department of Justice and Health as well.

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

Automated Multi Sensory Rooms for a More Humanized Care

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Abstract. The controlled multi-sensory environment or room for snoezelen is associated to an environment where the patient's senses are stimulated. Usually the professionals should dedicate much of their time to management of both the hardware of the room itself and all the information around patient treatment, session design and patient's evolution. The affordability of the solution proposed and the issues we address in this work are mentioned problems, the hardware management and the information management in automated multi sensory rooms.

Keywords: Multi-sensory rooms, automatization, snoezelen.

1 Introduction

The idea of employing multi-sensory environments was first introduced in the 1960s. It was in the 70s when the concept of Multi-Sensory Room emerged. It is associated to an environment where the patient's senses are stimulated. This is done in order to improve sensory perception and communication skills among other capabilities.

These indoor environments are integrated by a number of different stages where patients interact with stimulus sources such as light, music or aroma. Therapists program the type, sequence and duration of each session according to the patient's evolution. This therapy has been traditionally used on people suffering from many mental disabilities: cerebral palsy, autism, hyperactivity etc. More recently it has proved efficient in other areas such as aging treatment or psychiatry.

Manufacturers offer a variety of stimulus sources allowing different ways of interaction. Therapists are able to select the most adequate tools for the type of patients they usually work with, and arrange the best possible configuration of the room.

What we found in our visits to multi-sensory rooms where patients suffering from cerebral palsy were treated, was that professionals should dedicate much of their time to management of both the hardware of the room itself and all the information around patient treatment, session design and patient's evolution. As a result, the availability of a therapist to work with patients at the different stages of the room was compro-

mised. At this point, we realized that information technology could free therapists from much of their management work thus allowing them to spend more time with their patients.

The issues we address in this work are both mentioned problems:

- Hardware management
- Information management

For the first one, we have developed an automation system capable of managing all existing electrical and electronic devices on the room. By means of a commercial low cost input/output card attached to the computer and a Java application program, the computer can control lighting and music at the room, turning on and off the different installed machines and implementing the sequence of events previously programmed by the therapist. The computer turns on the machinery associated to the first stage and keeps it working until the programmed time is consumed, then turns it off and proceeds to the next stage, thus inviting patient and therapist to move on as well. Background lighting and sound are controlled alongside. There is no need to leave the patient alone at any time, unless it is recommended for a certain therapy.

Let us insist on the affordability of the solution proposed. The hardware required to implement this system is integrated by the input/output card whose cost is negligible compared with that of the computer where it is installed, and some additional relays to open and close electrical circuits.

Unlike the hardware devices, the software has been specifically developed for this project. It includes the programming tools required to design the whole sequence of events at the room, and also data management capabilities. A database has been created in order to store patient's data, responses to the therapy and any further relevant information. The application program has been developed as a portable solution. Stored on a memory stick, it can be executed in any computer with an installed Java virtual machine. This capability is available in most computers by default; otherwise it can be easily installed. The therapist can work designing personalized sessions for all patients off-line, store them on the memory stick and execute on the multi-sensory room's computer afterwards.

The whole system has been successfully tested and it has been positively assessed by therapists. It addresses most of their needs providing a comprehensive and affordable solution. As a future trend, we have realized that the generation of printed reports describing patient's evolution would be very helpful. We haven't included this capability in the current version due to the lack of standardization in this area. It is assumed that the Administration will require such reports in the future but their standard format has not been released yet.

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

Tactile Map: a tool for social and spacial inclusion

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Abstract. Develop and construct a tool to help the displacement of individuals with visual impairments whose walk the campus of the University of Campinas-UNICAMP is one of project that provides accessibility and autonomy in the use of urban space. The environment of the University expressed the configuration of a city, therefore, plan and improve the accessibility of this architectural environment, presents with of a challenge to allow spatial orientation, inclusion and reduction of social barriers. The design, implementation, manufacturing and use of this type of equipment is an interdisciplinary activity that is based on studies and research that integrate fundamental areas like Architecture and Urbanism, Electrical Engineering / Electronics, Computer Engineering and Education.

Keywords: Universal Design, Tactile Map, Social Inclusion.

1 Introduction

The talking tactile map is a tool that provides information about the environment and helps users with different visual abilities to move around independently and safely, helping to create a mental image of the space around them. Thus, tactile models aim to increase the possibilities of transmitting spatial information to visually impaired by helping to identify shapes, objects and obstacles in the path, reproducing paths [1]. Considering the seven principles of Universal Design it is be possible to include tactile maps in the application of three of them: 1. information noticeable to users with visual impairments. 2. flexibility of use by any user. 3. equitable use of the environment [2].

2 Goals

The design goal was to draw up an instrument reading tactile in 03 dimensions, with sonorous information about the course of an Accessible Route. The equipment was made from urban graphic design of the campus, including information on the location of buildings, and streets. The model has an electronic system consisting of sensors associated with their objects (buildings and street layout). When pressed these sensors emit sentences identification about each object

3 Methodology

The methodology used was based on qualitative research, with participatory activities. The tests to verify the usability of the model were performed with volunteers, individuals which visual impairment. This activity, called Reading Dynamics aimed to understand the usability and effectiveness of the model applied with three distinct stages: 1. Preliminary dialogue with the user in order to clarify the objectives of the research, about the safety procedures and preserve the integrity, privacy and confidentiality of information collected; 2. Free exploration of the model by the user for the purpose of familiarization with the equipment, exploration of the Route; 3. Discussion about the quality of the instrument: tactile features, materials used, the contrast between the textures, subtitles readability, audibility of auditory information, degree of security to manipulate, difficulties to use and spatial orientation.

4 Results

The implementation process of the talking tactile map for the State University of Campinas involved the discussion of strategies that enabled the transformation of a real space, in scale, keeping the physical characters of this space. The developed instrument has been used experimentally by people with visual impairment who attend the campus. This action has fostered discussion of accessibility involving the inclusion of talking tactile maps as tools that contribute to spatial and social inclusion of people with visual impairments.

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

Improvement of the Emergent Language Assisted Intervention Program (PILAE)

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Abstract. Changes carried out on the PILAE environment are described. The multimedia interface has been improved. A graphic motor has been integrated with video and animations support. A program database engine has been improved in order to increase the number of available symbols and exercises and to get greater flexibility in user's management.

Keywords: Aided Language Intervention Program, Complex Communicative Needs, Learning Environment.

1 Introduction

Aided Language Intervention Program (The PILAE, Spanish acronym) is a language intervention program intended to contribute to the development of linguistic competence of people with complex communicative needs. The PILAE is an accessible program for physical disabled population for symbol lexical learning and for the development of semantic and syntactic abilities.

2 Aims

The aim is to carry out changes on the previous version of PILAE to improve its power and flexibility. Changes are related to a) The improvement of the user interface and b) The improvement of the database management system that increases the num-

ber of available symbols and exercises, and c) The use of multiplatform programming environment.

3 Method

Main innovations are: 1) Compatibility with different operating system (Windows, Linux and MC OS X). A multiplatform programming environment is been used (the free distribution libraries QT [1]; 2) Two independent modules: a) The Management Module (MM) that includes an initial screen that allows users' selection without the need of closing the multimedia environment. The application works in full screen which improves visualization. Main buttons have been enlarged. The left side of main screen is used to visualize submenus and videos. SQLite [2] is the new database management engine, it allows the use of relational tables. Programming with QT allows the use of CSS [3] labels, improving customizable options. The program may be accessed by keyboard and mouse or by a switch with automatic scanning. QT libraries have support for tactile screens and gestures with multiple fingers. b) The Execution Module (EM). Its aim is to simplify the initiation session menu. Customized virtual tutors are integrated that will explain the targeted exercises.

4 Results

Expectations are to obtain: a) greater applicability due to the multiplatform programming environment; b) major operability due to the changes incorporated in the database management module; c) more user's adherence due to the incorporation of videos and animations; d) more versatility from QT libraries incorporation and e) better follow-up of the exercises due to virtual tutors incorporation.

5 Significance

The PILAE provides access to a learning environment that allows the development of receptive language skills through symbolic vocabulary learning and the aural feedback that the program provides. It also helps to develop expressive linguistic competence through the learning of morpho-syntactic Spanish structures in a sequenced order.

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

Matching Needs and Capabilities with Assistive Technology in an Amyotrophic Lateral Sclerosis Patient

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Abstract. The assessment process devoted to match needs and capabilities with assistive technology for an amyotrophic lateral sclerosis patient is described.

Keywords: Lateral Amyotrophic Sclerosis, Needs, Capabilities, Augmentative and Alternative Communication, Assistive Technology.

1 Introduction

Individuals with Amyotrophic Lateral Sclerosis (ALS) lose the ability to initiate and control all voluntary movement although the muscles responsible for eye movement are usually, but not always, spared. Speech language pathologists and occupational therapists can assist individuals with ALS to maintain their ability to communicate using compensatory strategies and Augmentative and Alternative Communication (AAC) aids and Assistive Technology (AT).

2 Aims

The aims of this research are a) The assessment, recommendation and implementation of AAC aids and AT to a patient ALS and b) Matching technology to his needs and capabilities.

3 Method

The participant had spinal ALS, had no speech, no hand function and no mobility. In matching needs and capabilities to AT a series of steps were taken. First, documen-

tation of participation patterns and associated communication needs. For communicating wants and needs unassisted methods were needed, but high-tech was a priority for producing written products about a wide-ranging topics and content. Second, the assessment of current and anticipated physical, cognitive, visual and hearing capabilities. The patient had neither visual acuity problems nor any suspect of cognitive impairments. AAC intervention would consist of computer adaptation by means of mouse alternative access, eye tracking was considered; and alternate keyboard access. Third, the assessment of social and care support systems. The spouse, daughter and the patient's father were the available people to interact with the participant. Fourth, the identification of AAC options: The patient required high-tech AAC solutions that allowed him for communication in multiple environments. He needed a laptop with prediction, storage and retrieval. As he was a literate he needed to create his own novel utterances using text-to-speech options. Computer adaptations for augmenting written communication began with software that supported alternate keyboard access: OnScreen [1] an on-screen keyboard was selected for brief text; for longer text Dasher [2] was the choice, and Iriscom [3] was selected as the eye-movement access. Finally, the AAC recommendation included a laptop with synthetic voice with appropriate mounting. The subject went through very few changes in his initial equipment decision.

4 Results

AT was used at any time of day during all time required for composing his messages; it was used at any communicative situation; AT was used on the one hand with different communicative partners and it was used with friends on email and on social networks as Facebook. All communicative needs were met. About social network monitoring, the patient was social engaged as he had different communication partners (life partners, good friends; acquaintances and strangers in the community).

5 Significance

The use of aided technology and AAC has enhanced the social participation of the subject through increased interactions with other and his involvement in decision making.

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

Issues of Gesture Tracking for Rehabilitation

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Abstract. The correct realization of rehabilitation exercises is a key point to achieve an optimal recuperation for older people. In this work, we propose the utilization of a low cost tracking system based on Kinect which can be used in order to supervise a simple rehabilitation exercise. We describe a set of features that could be extracted from a physiotherapist guided exercise. The obtained trajectory can be used to compare with a real patient exercise and determine its correctness.

Keywords: Tracking, Skeletal representation, Elderly rehabilitation

1 Introduction

Rehabilitation is a core element in the practice of medicine for older people involving multidisciplinary team working[1]. The specific goals are most commonly mobility and self-care without the assistance of another person. In reviewing progress with rehabilitation, achievement of specific goals should be monitored.

For this aim, computer based systems may provide a way to assist in the control of the exercises performed by elderly patients at home[2]. It is crucial to have a low-cost equipment for monitoring the rehabilitation exercises in relation to predefined ones, determining and correcting possible deviations. In this paper we are focused on simple exercises for older people. The main exercise consists in bending a leg from a sitting position. It involves the flexion of the knee (Fig. 1b).

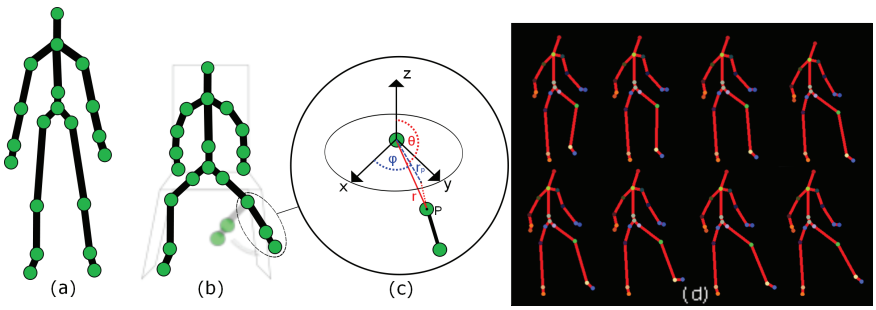

Fig. 1. a) Skeletal representation of Kinect. b) Exercise representation. c) Cartesian and Spherical Coordinate System. d) Exercise tracking by using Kinect.

Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

2 Issues of Gesture Tracking

The principal **objective** of this work is to track simple exercises focused on older people in order to check, with a certain probability, if it has been performed correctly compared with a reference exercise. Principal issues are:

-Skeletal Tracking. Kinect[3] is one innovative system that allows monitoring the motion of a human body. This system consists of a camera and a depth sensor which enables the estimation of 20 major points positions. These points correspond to a wire frame body skeleton (Fig. 1a) and they can be used to record the variation of the patient movement, with a minimum rate of 30 fps.

-Feature Extraction. Once the guided exercise is set, the specialist performs it in order to determine a set of features. First, it is necessary to record and fix the starting and ending point of the cyclical exercise. Then the trajectory is recorded, obtaining the positions of the skeleton points along the movement. The average time and the number of frames for an exercise cycle are calculated and adjusted to an average trajectory. Finally, some frames of the patient's exercise are discarded or interpolated to adjust them to the average number of frames.

-Exercise Supervision. We present an approach which combines the Cartesian and the Spherical coordinate systems. Considering the mentioned knee exercise, it is necessary to establish two oriented coordinate systems, at the hip and knee points. Then, we can determine the radius r (distance between origin and points), the inclination θ and the azimuth φ (Fig. 1c). We obtain a set of angles$(\theta_{high}, \varphi_{high}, \theta_{low}, \varphi_{low})$. This representation does not require the alignment of skeletons, being robust to noise or sudden changes. So, we can consider the angles over the time as separate signals and apply a smoothing filter[4]. Finally, it is necessary to compare the frames of each repetition with the frames of the specialist recorded exercise, with a given error for each angle. One of our current efforts is focused on setting a Gaussian distribution for each angle and time to complete the exercise, accumulating probabilities to estimate its correctness.

3 Preliminary results and Conclusion

An overview of the skeleton trajectory during the realization of the exercise is depicted in Fig. 1d. We have proposed a method to supervise a rehabilitation exercise based on Kinect tracking. This method is robust to noise and can be easily extended to other exercises. It can be implemented at a relative low cost.

Acknowledgments. This work has been supported by the Ministerio de Ciencia e Innovación and the European Union (via ERDF funds) TIN2011-25259 and the University of Jaén UJA2010/13/08 sponsored by Caja Rural de Jaén.

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

MonAMI: Mainstream on Ambient Intelligence. Technical Implementation

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Abstract. The MonAMI project was aimed to investigate the feasibility of the deployment of open platforms for AAL services provision and to test user acceptance and the usability of the services. The services were designed to give support in the areas of environmental control, security, and leisure. The participants included elderly persons with disabilities, care staff and informal carers. The concept of the open platform proved to be satisfactory for the provision of the services. The usability of the technology was viewed positively and the overall result indicates that this system has the potential to prolong independent living at home for elderly people with disabilities.

Keywords: AAL, ambient intelligence, e-inclusion, elderly, mainstream technology

1 Objectives

Previous European projects [1-2] have shown that technological augmentation of the living space can help to alleviate these problems by supporting daily living tasks and increasing quality of life, thus reducing the need for institutional and other care. So far, the results of these projects have often stayed in the laboratory or only been implemented on a small, local scale.

The objective of the MonAMI [3], 5 years long project funded by the European Commission with 14 European partners and a budget of 13 M€, project is to demonstrate that accessible, useful services for elderly and disabled persons living at home can be delivered in mainstream systems and platforms.

2 Methodology

The technology base for delivering the MonAMI services is the MonAMI platform developed from mainstream, open-source components with a touch screen computer as the central element. Other parts are a Universal Control Hub as the user interfaces server, wireless sensor networks and a remote service management function. The total is a platform flexible enough to deliver a wide range of different services and facilitate future development and addition of services in a cost-effective manner. The services developed by MonAMI have been grouped into five packages: AMiSURE for safety and security, AMiCASA for home control, AMiVUE for home status information, AMiPAL for time management and AMiPLAY for games.

The selected services were first tested in six Feasibility and Usability centres with user tests in lab-like conditions. The centres have different profiles and address different user groups. For example, the Slovak centre focused on analysing and enhancing the integration of inclusion services based on mainstream technologies in new EU Member States.

Once the services and applications were found to be feasible, usable and appropriate to user needs, a living-scale field trial was carried out at sites in Slovakia, Spain and Sweden. Many users tried the services in their homes and the impact and consequences have been analysed. The economic viability and long term sustainability of the services has been addressed in order to facilitate real mainstream implementation.

3 Results and significance

We consider that the proof of concept of deployment of the technological architecture of the system has been a success, mainly due to its modularity and interoperability, and its potential to lower costs of equipment by introducing mainstreaming technologies.

Awareness of the importance of the value chain, open platforms, interoperability, modularity and mainstreaming has been raised by a large extent.

Facility to change or add services has been a large advantage of current technological system. Anyhow, further development is needed to reach an off-the-shelf solution with more mainstreaming options.

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

MonAMI: Mainstream on Ambient Intelligence. Living Scaled Field Trial in Spain

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Abstract. The MonAMI Living Scaled Field Trial in Spain was performed to investigate the feasibility of the deployment of open platforms for AAL services provision and to test user acceptance and the usability of the MonAMI services. The services were designed to give support in the areas of environmental control, security, and leisure. The trial was carried out in a sheltered home. The participants included elderly persons with disabilities, care staff and informal carers. The concept of the open platform proved to be satisfactory for the provision of the services. Usage of the services varied among the users and was found to be associated with the individual's acceptance, attitudes and capabilities. The usability of the technology was viewed positively and the overall result indicates that this system has the potential to prolong independent living at home for elderly people with disabilities.

Keywords: AAL, ambient intelligence, e-inclusion, field trials, elderly

1 Objectives

Previous European projects [1-2] have shown that technological augmentation of the living space can help to alleviate these problems by supporting daily living tasks and increasing quality of life, thus reducing the need for institutional and other care. So far, the results of these projects have often stayed in the laboratory or only been implemented on a small, local scale.

The objective of the MonAMI project [3], 5 years long project funded by the European Commission with 14 European partners and a budget of 13 M€, is to demonstrate that accessible, useful services for elderly and disabled persons living at home can be delivered in mainstream systems and platforms.

This article describes the work carried out at the living scale field trial (LSFT) site in Zaragoza Spain to test the MonAMI services and technologies in a living environment.

2 Methodology

The LSFT in Zaragoza was carried out in a sheltered home owned and managed by the local government. This site was chosen to gain an insight in the deployment of AAL services in this scenario as well as to provide information concerning usability and acceptance of ICT support services for independent living.

There is an identified "independent living gap" that makes a difference in quality of life and social expenses in the transition of people from their own homes to shelter homes. MonAMi has set pilots in both sides of the gap: in the homes of elderly persons living independently in their own apartments/homes in Sweden and Slovakia and in shelter homes in Spain for elderly persons. As such, the LSFT in Spain intended to provide insight on the acceptance, usability of AAL services by people at the least autonomous side of the gap.

The selection of participants was user-centred. The participants in the trial were 15 elderly persons with disabilities (users) living in the Romareda residential home (sheltered home) in Zaragoza, their carers (2) and care staff (7, from 12 recruited).

Additional acceptance and usability tests were carried out with 18 persons living in the residence, to further check whether this kind of services are acceptable, usable and found useful for persons who require support to increase their autonomy.

3 Results and significance

We consider that the proof of concept of deployment of the system has been a success, searching and linking the elements of the provision chain ready to perform the experiment, integrating it in the environment of the shelter home, and proving and that the open platform is viable and potentially much very powerful in service provision, mainly due to its modularity and interoperability.

We have succeeded in raising awareness of the importance of the value chain, open platforms, interoperability, and modularity among the local stakeholders (government, organisations, industry) in Zaragoza. Having gained the interest and support of the stakeholders we are now making a number of national proposals to continue the work of MonAMI, to develop new services and to extend benefits to other groups (e.g. to demonstrate the extent independent living can be supported by ICT, to demonstrate the economic impact ICT services can have on the cost for support).

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Accessibility, Inclusion and Rehabilitation using Information Technologies
La Havana, Cuba. 13 - 15, December 2011. ISBN: 978-84-695-0590-8

Interaction for rehabilitation.

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Keywords. Serious games, Interaction for rehabilitation, Vision-based interfaces.

1 Objectives

In long-term rehabilitation processes, user demotivation is common due to the repetitive and intensive nature of the actions undertaken that become boring after hundreds of sessions. As a consequence, the user does not focus on the therapy program and it therefore loses its effectiveness. It is known that rehabilitation results are better when users are motivated [1]. In addition, when rehabilitation is aimed at maintaining capacities, users rarely increase their capacities. Demotivation can cause patient resignation. Moreover, if the user also has a cognitive disability, continued therapy is even more difficult.

In order to improve the motivation of ASPACE Baleares users (www.aspaceib.org), we present a vision-based video game for balance rehabilitation. The game offers a sense of play and challenge the user adaptable. As the game was developed using computer vision techniques, the user does not have to hold a device and is free to move. The game also stores information about the user so that specialists can observe and evaluate progress.

2 Methodology

Based on interviews with specialists from ASPACE center, a video game was designed to work on balance, using the principles of game design for rehabilitation described by Burke [2]. To ensure achieving the objectives set, it was decided to develop the game using the prototype development paradigm.

The user is located in an interaction space (see Fig 1) that consists of a projection screen, instrumented with a depth sensor and an RGB camera. The interaction is performed by tracking the user's hand. , Ffrom the hand position it has on each frame, it is determined whether interaction with different objects on the screen occurs. The algorithm used is Camshift [3], an iterative method that can track an object based on the colour as a main property.

This work is partially supported by the projects MAEC-AECID A/030033/10 and MAECAECID A2/037538/11 of the Spanish Government.

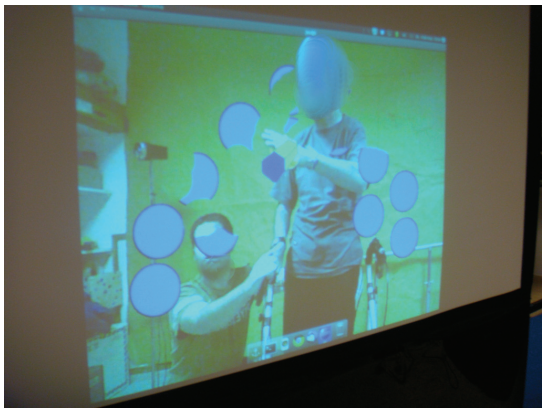

Fig.1 Patient using the interaction system.

3 Results

The experiments performed in this project are aimed at validating the usefulness of games as a motivating tool in therapy, as well as the work done by physiotherapeutic activity.

Everyone who participated in the project in previous years, had abandoned the therapy program. During the tests performed, none of the users expressed intentions of abandoning the treatment; this serves to validate the motivational aspect of the project.

In order to know the current status of the experiment, an intermediate assessment took place, after six months of therapy with the system. We used the Functional Reach test

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