

Social Inclusion with mental remote control for digital TV

Felipe Fabio
Universidad Técnica Federico Santa María
Valparaíso, Chile
felipe.fabio@alumnos.usm.cl

Jonathan Reyes
Universidad Técnica Federico Santa María
Valparaíso, Chile
jonathan.reyes@alumnos.usm.cl

ABSTRACT

Digital television (DTV) is poised to a highly popular means of entertainment and information. However, physically disabled users may have serious problems to perform simple tasks like switching channels and controlling the viewing experience. This article describes an approach that replaces the conventional remote control a device that allows to interact with the TV by capturing brain signals and following head movements with a gyroscope. An already running prototype is also presented.

Keywords

Ginga-NCL, Emotiv, Interactibility, Disabilities

1. INTRODUCTION

The standard Integrated Services Digital Broadcasting Terrestrial (ISDB-Tb) is developed to give the society the opportunity to have television of quality and for free since there was a group of people who could access and pay for this service.

It also gives people with no enough the opportunity to learn important things. Besides, this makes possible the existence of a relationship with information about culture, health, economy, society,etc[1].

Just watching the social meaning that gives this technology[2] is that we Developer an idea in the same line,but perhaps attending to a minor group yet highly marginalized by the currently development of technology: this minor group is peope with physical disability (Rights Inclusion Social[3]). In general, technology is not designed for these people, for example the device used for operating the television device wirelessly from a short line-of-sight,commonly known as remote control unit (RCU) is becoming more complex,with an enormous amount of buttons for a disabled person. Consider we are talking about people with tetraplegia[9], is paralysis

caused by illness or injury to a human that results in the partial or total loss of use of all their limbs and and maintain only the head movement.

The purpose of our work is to develop an application NCLUA [7] [4] that allows the user to control Basic tv functions like switching channels, turning volume up and down, and getting in and out of certain menu,.To achieve this goal, we use Emotiv(<http://www.emotiv.com>), an innovative device developed by the company[6], which works based on brain signals captured by some sensors and also following the head movements by a gyroscope. Using this device a person with physical disability could be able to do basic tv functions in an autonomous way, making life easier. a gyroscope, with these characteristics could simulate these.

The following sections show the characteristics and how to use the device, besides its integration with application to digital television is structured in such a way that is a easily navigable device.

2. HEADSET EMOTIV

Since the beginning of the investigation we found this neuroheadset called EPOC, which we choose to achieve the development of our application and decided to incorporate this technology joining it with the digital television neuroheadset (figure1). EPOC is a device that detects electromagnetic impulses of our brain through Saline 14 sensors, which are interpreted through patterns that determine certain behaviors of people(Cognitive-Emotive-Expressive)[5].

In addition, the headset has a gyroscope, which lets you know when a person turns his head, and an important point is that it is a device wireless.

This headset can do some interesting things as in different aspects:

Expressive:

- Detecting facial expressions-time user real, this pattern has the advantage of being a universal signal,ie, this signal does not have to be trained by the user to be detected. For example, if anyone smiles, your avatar will too.

WebMedia'11: Proceedings of the 17th Brazilian Symposium on Multimedia and the Web. X Workshop on Tools and Applications.
October 3 -6, 2011, Florianópolis, SC, Brazil.
ISSN 2175-9650.
SBC - Brazilian Computer Society



Figure 1: Neuroheadset EPOC

Emotive:

- real-time monitor of emotional states, feeling, frustrations, etc..

Cognitive:

- Interpretation of user's conscious thoughts and intentions: to manipulate objects with a certain pattern of thought, this type of recognition requires a training for each user. For example: Movements, push, draw, etc are unique for each user.

Given these characteristics and capabilities, developing a remote control unit that achieves manipulating a TV mentally and in a simple way. It can be used by anyone, but emphasizing the usage of it by disabled people.

The basic functions of a conventional remote control unit simulating the headset are switching channels, associating the movements of the neck to left and right to channel switching made by the back and front side, respectively. Turning volume up and down is associated to up and down head movements respectively. These movements may control these functions in a very intuitive and simple way as shown in Figure 2.

Additionally, two other actions that allow to navigate the graphical user interface developed at NCL and Lua are included (discussed in section III). These actions are: making selections and access to menus and submenus which can be done by blinking 3 times rapidly, in less than 2 seconds. The second action is returning to the submenus, associated to the facial expression of smiling.

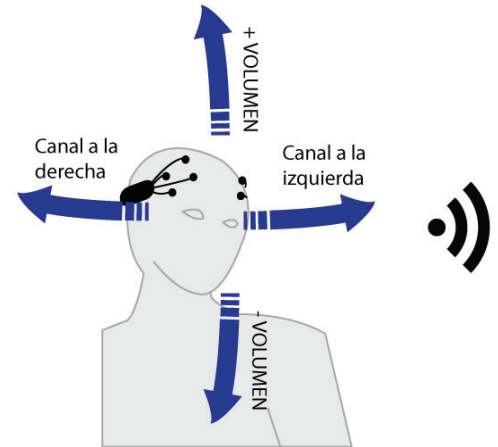


Figure 2: Headset operation

2.1 NCLua Application - Graphical User Interface

The application that aims to develop simulating a TV interface is controlled by the neuronal device.

For programming and testing of the simulated application a set top box with ginga embedded in a system environment Ubuntu 10.04 operating given that the specific rule works with a Linux core, then settled on this basis Ginga middleware (Ginga-NCL[8] basically) version developed by LIFIA natively and also the SDK license Emotiv System (figure 3). The libraries necessary to use the headset are not given in standard digital TV, but eventually could come embedded in a set top box (stb) particularly interested in the concept.

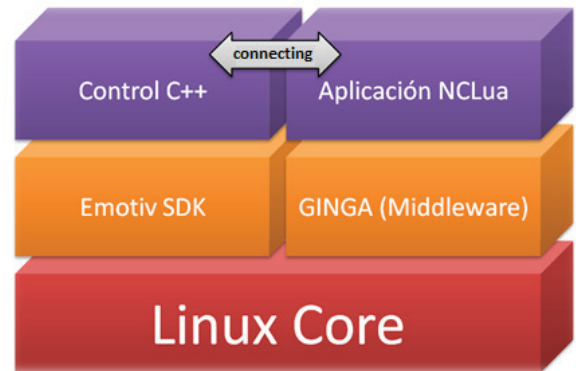


Figure 3: integration between NCLua App with Emotiv SDK.

Considering that the application must have a structure very similar in all menus to be easy to navigate using a few patterns. In the case of our application is considered a design in which all menus must be navigated with left and right head movements. In case of switching channels, this design includes and uses icons moving forward like a roulette wheel

or carousel, as you can see in Figure 4. Besides watching tv and listening to music, it offers other options like playing games and make setting time a very easy one.



Figure 4: (a) Initial state, (b) Change when moving the head to the right., (c) Same structure in internal menus.

A demonstration of the application being controlled by the neuroheadset EPOC can be seen in the video <http://alumnos.inf.utfsm.cl/~ffabio/videos/videoDemo.mp4>. An interview explaining the project it's shown in an earlier Spanish version, also. <http://alumnos.inf.utfsm.cl/~ffabio/videos/emcitec.mp4>.

3. CONCLUSIONS

In this article we show how the development of technologies and applications can go in helping people, providing the In this article it's shown how the development of technology and applications can help people, providing the inclusion of a minority of the population but still important too. This means a wireless device: neuroheadset, allows obtaining the patterns of facial movements and head movements through its gyroscope. This headset applied in a technological environment such as television gives digital inclusion, it can be integrated to manipulate and interact with something so common in society as it is television.

Standard type of digital television adopted in Chile and actually being developed in Brazil is an important contribution to the delivery of services to people, providing high quality video and sound, and information to people that don't have acces to internet.

It's the contribution of social inclusion that gives the rule, an important point to get a greater development and applications contributing to the globalization of technology without making selection among people, allowing everyone to have the same opportunities.

This piece of technology opens a door for new applications and new development in the field of social inclusion, not only in digital television but in many areas . It also raises the idea of developing more research on a topic not commonly worked on as it is physical disability and its connection to social inclusion for further improvement of the society

4. ACKNOWLEDGMENTS

We want to thank to the Department of Informatics, Universidad Tecnica Federico Santa Maria for their support in this project providing us with getting the neuroheadset.

Also, thanks to colleagues who contributed in the realization of this project such as Diego Yachan and Sebastian Diaz. Finally, thanks to Professor Hernan Astudillo for giving support in our work, gave us the chance to participate in specialized courses elated to the fieldand lead us to new jobs.

5. REFERENCES

- [1] Sociedade Brasileira de Engenharia de Televisão. *El Modelo brasileño de TV digital puede acelerar los negocios, la inclusión digital y la social en toda la región de América Latina*, volume 1. Revista da Set - Edición Especial para Latinoamérica, June 2009.
- [2] Francisco Utray Delgado. *Accesibilidad a la TDT en España para las personas con discapacidad sensorial*. Serrano, 140. 28006 Madrid.
- [3] Catherine Frazee. *Thumbs up! : inclusion, rights and equality as experienced by youth with disabilities*. 365 Bloor Street East, Suite 2000 Toronto, Ontario, Canada M4W 3L4, January 2003.
- [4] R. Lerasulimschy, L. H. de Figueiredo, and W. Celes. *Lua 5.1 Reference Manual*. ISBN 85-903798-3-3, 2006.
- [5] Robert Lievesley, Martin Wozencroft, and David Ewins. *The Emotiv EPOC neuroheadset: an inexpensive method of controlling assistive technologies using facial expressions and thoughts?*, volume 5. Pier Professional, June 2011.
- [6] Emotiv Epoc Neuroheadset. <http://www.emotiv.com/store/hardware/epoc-bci/epoc-neuroheadset/>.
- [7] Luiz Fernando Gomes Soares and Simone Diniz Junqueira Barbosa. *Programando em NCL 3.0*. August 2009.
- [8] Luiz Fernando Gomes Soares, Rogério Ferreira Rodrigues, and Marcio Ferreira Moreno. *Ginga-ncl: the declarative environment of the brazilian digital tv system*. March 2007.
- [9] Tetraplegia. <http://en.wikipedia.org/wiki/tetraplegia/>.