TV-Libras: An Implementation Model for Deaf People communication mediated by Interactive Digital Television

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Abstract
This position paper intends to present a model of communication system mediated by Interactive Digital Television to provide a better set of facilities for Deaf or Hard of hearing People, with the purpose of minimizing digital and social exclusion. These facilities will use Libras (Brazilian Sign Language) using captions in lively gestured form.

Keywords
Digital Interactive Television, Deaf, Computer-Mediated Communication, Libras, Context-free Language, Regular Language.

ACM Classification Keywords
J.5. Sign Language for Deaf People (e.g., Libras);
J.5. Language translation;
I.2.11. Languages and structures;
E.4. Formal model of communication;
F.4.3. Formal languages.

Introduction

Brazilian federal government is interested in implementing a Brazilian Digital TV Standard [7] that, besides offering information and having cultural and entertainment purposes, must work for sociability, minimizing social and digital exclusion. In a way it is extremely important to put in question the useful features to attend the diversity of Brazilian people, including Deaf and Hard of hearing People.

Deaf people have serious difficulties in understanding written language because it was created by hearing people and its symbols represent oral language. This is why captions in written Portuguese, menus and online helps must be directed to assist the specificities of Brazilian deaf, using Libras in the gestual animated way.

Interactive Digital TV [7] having several technological advances, as the possibility to obtain a feedback channel, a better transmission signal, and others evolutions generate great motivation in writing this article to discuss about usability in this new paradigm that is iTV.

In this context the objective of this article is to present a purposed model for implementation of a system of communication through the iTV that will have the main focus hard of hearing persons that know Libras. This article presents the main incentives for using the signal language, afterwards to place in evidence the main concepts in technology for the return channel (or interactivity channel), after all the proposal for TV-Libras model. The objective is to present a model and to show some conclusions from this article and finally some works related to the TV-Libras.

THE SIGN LANGUAGE IMPORTANCE

Computer popularity and utilization in most areas of knowledge is increasing, growing especially in education. But most of the development projects are made without considering the great diversity of users and theirs difficulties, which limits the usability tools from deaf users. Besides that, educational softwares produced in Brazil are insufficient. According to the demographic census carried through IBGE [1] in 2002, about 14,5% of the Brazilian population presents some kind of deficiency and 3,38% of the Brazilians has hard of hearing problems in some level. For Deaf people, one of the hardest problems is to have difficulties in express themselves in their own written language, even if there is a great effort in making SignWriting [10] a standard language for the Deafs. That is when they need to use a third language (writing Portuguese oralized) to writing, what is hard to them, since the code made by non-deaf people is funded in phoneticism, graph is based in sounds, which makes learning very difficult.

This learning is extremely hard for people that born deaf or one that was deaf before alphabetization, writing from a language originated by speech becomes a nonsense symbol union without significance. Knowledge from speech language is required to get domain of the written language, what for deaf does not happen in a natural way. For this reason, they are

almost disabled to carry through written productions. About reading, they present reduced understanding after many years of scholarship. In this context, it is necessary to consider the importance of sign language for educational improvement of deaf people, then their first language, or their natural language. It is through signals that a deaf person can communicate, understanding easier the world and participating in the community where they live [8].

RETURN CHANNEL (OR INTERACTIVITY CHANNEL)

To have a minimum of Interactivity in television, a return channel, also called Interactivity channel, is necessary. It is through this channel that a reply from interactive viewer comes to television provides service [7].

The Return Channel will be responsible for the communication between the Viewer and the sender of TV or Interactive Service Provider (ISP) [2].

Return Channel is a necessary resource always when a deaf person wants to communicate with other one, for example, in a chat that uses SignWriting, in future researches this would be used to provide this communication.

MODEL PROPOSAL FOR TV-Libras SYSTEM

This model is based on an implementation of a service for Interactive Digital Television capable of converting captions and sound of the voice into text and the text in Libras.

This section presents the TV-Libras system architecture (see figure 1), and its translation functions. In that figure, we have the following components:

1. Voice Sound: Sound track captured and transformed in Portuguese captions;
2. Text Conversion: translated source text to Portuguese words structured that has a meaning in Libras, easier to deaf understanding (use formal regular language to specify Libras);
3. Conversion Text in Multimedia: a sequence of videos that corresponds to the presentation of the partial text in Libras, in lively gestured form; and
4. Sounds, symbols and multimedia dictionaries: a Portuguese sentences structures set and the respective structures in Libras.

A data flow that contains the voice sound which will be captured by a software component that will convert its content – the sound of the voice will be converted into a text summarized [3] or not (depending on parameters), then this text will be manipulated by another component of software, in this research xlet [5] is going to be the one that will make the transformation of the text in Libras, and finally the content of the Libras will be presented in television.

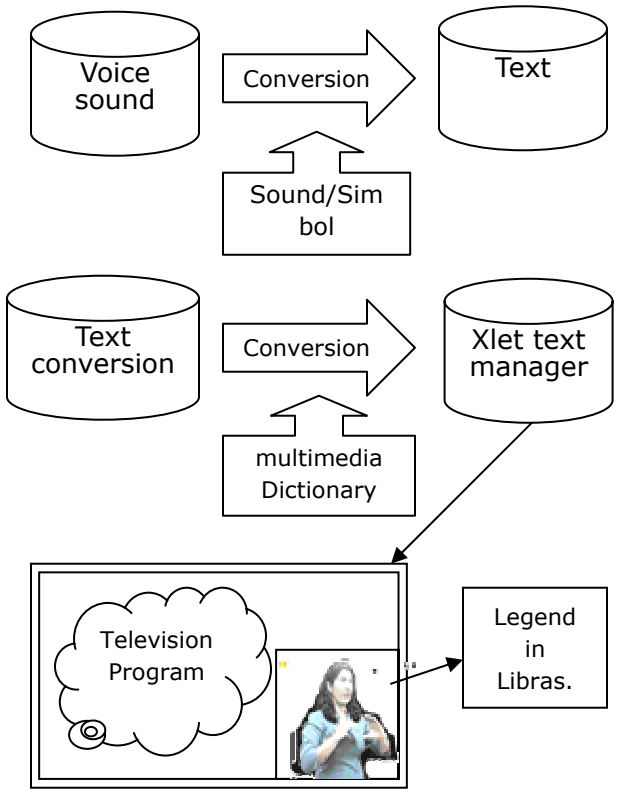

figure 1. TV-Libras Architecture.

One of the intentions of this work is to evaluate the utility of the theories of CMC (Computer-Mediated Communication) in the production of tools of communication for deaf communities using iTV facilities.

One offered feature would be a legends translator for deaf people, where a dictionary of approximately 8,000 videos will be recorded to represent each term in Libras and its respective text in Portuguese. The legend transmitted through digital signals would be translated and presented as a sequence of the videos previously stored in setup-box. Then the deaf person could have legends, menus and helps in his/her first language in the lively gestured form.

Another characteristic to be offered would be a chat using Libras, for deaf people and translated to Portuguese for hearing people. This chat would be mediated by the TV Broadcast Service (or ISP) and could modify the programming or modify the course of a telecast, in the case that the audience shows a preference for a guiding different from the programmed.

This kind of interaction between spectators and the generation of signal through chat are basic tools for e-learning environments using Interactive Digital TV and, in the case of deaf people, basic tools for learning of Libras and SignWriting for listeners who coexist directly with a deaf person.

The Libras legends in lively gestured form must be generated from the captions in Portuguese, even if technology for the direct translation of the recorded voice is improving, because the separation of diverse sounds that are in the sonorous track of the original programming would be difficult, and also the research of the main context. This generation will be used from automatic tools of Portuguese to Libras, but supervised by an interprete Portuguese x Libras, essential for a good comprehension for deaf people.

The Libras legends generator from Portuguese legends will be a software executed in ISP of the iTV that will be supervised by an interpret, and it will have functionalities to evaluate the text in accordance with a Context-Free Language, translating the text written into oralized language by a sequence of words in Portuguese more simplified following the grammar and understandable Portuguese for a deaf person. This sequence of words will be changed by a sequence of videos in Libras in lively gestured form.

CONCLUSION

Ours experiences have demonstrated that TV-Libras could have enormous potential as an instrument of digital and social inclusion- in short-term, this could enable the inclusion of deaf person and hard of hearing using this environment in Interactive Digital Television through the use of the functionalities of the Digital Television as support mechanism. This project intends to translate movies legends and speeches (voice sound) from Portuguese to Libras.

To achieve the main goals in technical-scientific fields a great improvement in the studied research is necessary however, not only in the field of the technologies (voice recognition, artificial intelligence, neural network) but also in the evaluations of the sociability that these tools can provide. Also, at the next project stage an adaptation of the Libras for a simplified version of language of signals through a sequence of videos will be required.

FaLibras-MT

RELATED WORKS

Some articles and projects related to this article are mentioned:

Torpedo Rybená

Torpedo Rybená is a service that allows you receiving and sending text messages in Libras. A deaf or hard of hearing person is able, by using the animation of images in the mobile phone, to communicate in Libras, and also to visualize the messages received in text [6].

ViaScribe

The IBM Accessibility Center Researches has created a software to assist in the education of deaf people that, from the writing in classroom of the voice of the professor, automatically and real time translates legends in the English – this software is called ViaScribe [4].

Sign WebMessage

A tool for asynchronous communication in web in which users can interact through the writing of the Portuguese Language or Libras.

This tool has as main goal to minimize communication difficulties of writing between deaf people and between deaf people and listeners, therefore it allows the interaction of users in a way that the lack of knowledge of one language is not a constraint for communication [8].

An environment for the authorship of automatic translators of texts from Portuguese to Libras in lively gestured form. This environment uses translation

memories to allow the translator to be specified to consider the domain of knowledge of the initial text [9].

Acknowledgements

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References

[1] Brazilian Institute of Geography and Statistics. http://www.ibge.org.br/.

[2] FORTES, Reinaldo Silva. Cossack System: A plataform for management of distributed hipermedia applications. 2004. 184f. Master thesis. Technological Institute of Aeronautics, São José dos Campos, SP, Brazil.

[3] Garcia, L. F. F. and Lima, J. V., " Web adaptation in Mobile Devices – An application of the summaryzation Conscientious of Context ", XI Brazilian Symposium of Multimídia and Web - WebMedia, Poços de Caldas, Brazil, 2005, pp. 9-24.

[4] IBM Accessibility Research Center ViaScribe software http://www-306.ibm.com/able/solution_offerings/ViaScribe.html.

[5] Java TV API – Sun Microsystems. http://java.sun.com/products/javatv/.

[6] Mobile phone service for deaf people with sign language http://www.rybena.org.br/.

[7] Montez, Carlos e Becker, Valdecir. Interactive Digital TV: Concepts, Challenges and Perspectives for the Brazil. 2º edition. ISBN 85-328-0328-8.

[8] Sign Writing site http://www.signwriting.org/.

[9] Souza, Vinícius Costa e Pinto, Sérgio Crespo C. da Silva. (2002a) "Sign WebMessage: An environment for communication saw web established in the writing Libras". In: XIV Brazilian symposium of Computer science in the Education – SBIE – NCE/UFRJ, Brazil 2003.

[10] Tavares Orivaldo de L., Coradine Luis C., Breda Wesley Lucas. (2005a) "Authorship of automatic translators of texts of the Portuguese for Libras, in the lively gestured form: A boarding with translation memory." In: XXV Congress of the Brazilian Society of Computation - Brazil - 2005.