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Implementing an Android Tool for Visually Impaired Students of E-Learning

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ABSTRACT
This article aims to describe the process of learning and development of an educational tool designed for mobile devices (smartphones) with Android technology. In summary, the application was developed based on the virtual learning environment Moodle and aims to develop a learning environment that supports the visually impaired students of e-learning, allowing them to ask questions, discuss and share ideas through forums and use chat rooms in real time. The fundamental purpose of this application is to cooperate with scientific knowledge in the sense that this is a representation of technological advance on the accessibility tools in distance education mode and provide comfort, flexibility and accessibility for the visually impaired students, realizing that education should always be inclusive.
Keywords: Accessibility, Assistive Technology, Educational Activities, E-learning, Interactive Tool, Mobile Devices.

I. INTRODUCTION

According to Article 1 of Decree No. 2494 which regulates Article 80 of the Law of Guidelines and Bases of National Education (Brazil, 1996): "E-learning is a way of teaching that enables self-learning, with the systematic mediation of organized didactic resources, presented in different media information, used alone or combined, and broadcast by various media".

E-learning can be set briefly as an educational modality in which students and teachers are separated physically or temporally and therefore it is necessary the use of information and communication technologies. Exercises and interaction between students and teachers are given through Virtual Learning Environments (VLEs). This interaction may be synchronous, real-time using chat and web conferencing, or asynchronous like forums and quizzes.

The first Brazil's EL experiences appeared in the early 1940s. The courses were prepared from printed materials and sent through correspondence, but these have failed to stimulate government and social responsiveness in the country for the new teaching method. In the 1960s, distance education acquired new media such as radio, television, video recorder and computer, in addition to the printed material.

With the advent of these new technologies and more recently the internet, distance education enabled the expansion of education in remote places and offered the opportunity of professional development for those students who could not attend regular classroom sessions. Nowadays it is

Impossible to think about education without considering the strong presence of the Internet in the students' lives. According to the 2010 census of the Brazilian Institute of Geography and Statistics (IBGE), a third of the population has access to the internet, and according to data from the Ministry of Education (MEC), the courses of distance education in Brazil express a high growth rate of about 50% per year (ABED, 2011) while the regular education has a stabilizing trend, growing only 3.5% per year (Botelho, 2011).

Faced with the evident growth of distance education courses, several studies and surveys were developed to improve the methods of interaction between teacher and student in this modality. These researches have forwarded the distance education to a great evolution, especially because the teacher becomes a developer who contributes for the student's education and shows paths that can be followed to maximize learning (Saraiva, 1996).

Consequently, the prospect of the models of teaching was transformed and now the student acts as an autonomous subject during their cognitive development process. In other words, the teacher ceases to be centralized and the student begins to seek the knowledge through collaboration with the teacher and other students using technological tools. In this sense, distance education is characterized by the establishment of a communication in which teachers and students are physically separated, but are connected through a digital medium. Today, the most part of virtual learning environment offers tools focused exclusively on technologies for the Internet (Musa & Oliveira, 2000). The major focus

of distance education is to bring the knowledge for areas of difficult access to education (Belloni, 1999) and the sad reality found in many places that have the greatest need for distance education is the difficulty of use and internet access.

In front of this obstacle, a new modality of education was developed, called Mobile Learning (M-Learning). The M-learning is a mobile learning that enables the execution of distance education environments through mobile devices such as palmtops, PDAs (Personal Digital Assistants), tablets and especially cell phones (Attewell, 2005). The student can access materials to study and interact with teachers and colleagues from anywhere using text messaging (SMS), photos, files, multimedia, e-mails and among others, even with the simplest model of a present day cell phone (Mohamed, 2009).

According to the National Telecommunications Agency (ANATEL) and the Brazilian Institute of Geography and Statistics (IGBE), currently there are 192 million Brazilians (IBGE, 2015) and 224 million mobile phones (ANATEL, 2015). In other words, there are more mobile phones in Brazil than Brazilians. And this is not necessarily reflected only in the metropolitan areas, given that, according to ANATEL, 5,564 municipalities in Brazil are served by mobile operators, representing 99.99% of the entire national territory (IBGE, 2015).

The future of distance education is very promising and it is also valid to point out that the today's world is very competitive to enter into labor market and requires a well-prepared professional who can achieve the requirements that the market demands. In this context of competition for a place in the market, it is important to note that according to the 2010 Census, of the 44 million Brazilians disabled who are of working age, 53.8% are unemployed or outside the labor market. This is due to the fact that there is a significant difference on the level of education between people with physical disabilities and the general population, because, according to the 2010 Census, 61.1% of the population aged 15 and over with disabilities have no education or has only incomplete primary. This percentage drops to 38.2% for people without physical disabilities.

It is apparent that we are living in a difficult scenario to provide education uniformly for everyone and that's why distance education, which already represents a breakthrough in educational accessibility offering education for the population that does not fit in the traditional education system, can also actively participate as an agent of the current conditions of education for those who are physically disabled.

Based on the above considerations, this project aims to conduct research in the area of technologies (specifically distance) for education mediated by mobile devices (especially mobile phones) in order to propose and model an interactive tool to aid the teaching-learning seeking to help the students in their interaction with distance learning courses. It is also a goal in this project to achieve the integration of this tool with the virtual learning environment currently used in the Directorate of Distance Education (dead) IFPE thus enabling students of e-Learning more ways of interaction and communication to optimize their learning process. Finally, the project also aims to assist the visually disabled students of distance education mode (to comprehend that education should always be inclusive and regardless of disabilities, which is paramount in the development of tools to aid these students and that can be applied in the realities of this important and growing mode of education within the IFPE.

II. RELATED WORK

In Brazil, the Law of Guidelines and Bases of National Education (Brazil, 1996), encourages, in Article 80, the development and broadcast of e-learning programs. The growing concern for an inclusive society, where the rights of minorities should be increasingly assured, is a reality in national and international scene.

People with visual impairments, but not only them, need access to technological tools that enable their educational and professional growth development. It is through the development of assistive technology, a concept used to identify resources and services that provide and expand functional abilities of people with disabilities, users of these technologies can increasingly be involved in activities that include the use of products, services and information.

Brazil has been following the development of Assistive Technology more slowly, compared to other countries, including other Latin American countries. However, there was an awakening to the issue in the last decade, but it is still far short of what some authors point out as desirable. Unfortunately, there are few offers of this category of applications in Portuguese, but some examples can be found.

III. MOODLE VOX SYSTEM

In the following subsections is shown the system as a whole and its main features.

3.1 General Explanation Of Moodle Vox Environment

The MoodleVox is an application specially designed for educational activities. Its purpose is to

provide a virtual environment where students and teachers participate in collaborative learning through the exchange of messages in chats and discussions in forums.

The tool has no visual interface, all interactions are by means of voice commands. It was developed for the system a speech recognition library containing all valid interaction commands that can be used while the application is running. The conversation between the MoodleVox system and the user is fulfilled through intelligent voice provided by Google and the logic of the MoodleVox interaction menu was based on organizational principles of Moodle. The relationship between teacher and student in MoodleVox tool environment.

The transmitter (the teacher) makes available to the receivers (students) an educational message. This message can be synchronous, through oral conversation in the chat, and you can send / receive the message instantly or can be asynchronous through topics in the forums of disciplines. Feedback from receivers complete the communication loop, so that, accordingly, the receiver turns into transmitter and vice versa. The synchronous interaction allows a greater degree of interaction. Already asynchronous interaction creates time independence as well as space. The combination of these two modes of interaction ensures flexibility of content to be transmitted to users of the system and minimizes the difficulties of the visually impaired to access the educational content and to communicate with colleagues and teachers.

3.2 Defining System Features

The requirements of survey activity fundamentally contributed to the software to be built correctly. In other words, it was necessary for those involved in the project know exactly what was expected of the application. The versioning, change control and monitoring of the progress of tasks were carried out through periodic in-person meetings and the use of GitHub's web hosting service.

3.3 Moodle Vox Interaction Menu

Through diagrams presented in the next topics, it can be viewed the interactive activities offered by MoodleVox. From the Menu application root, the user must decide whether to proceed with the Messages menu or the Disciplines menu, as shown in Figure 1.
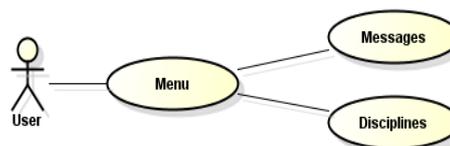

Figure 1. Diagram of MoodleVox's main flow

3.4 Moodle Vox Interaction Menu – Message Module

From the Messages menu, the system provides the writing option and the reading option for the user to choose which operation to proceed, as shown graphically in the diagram in Figure 2.
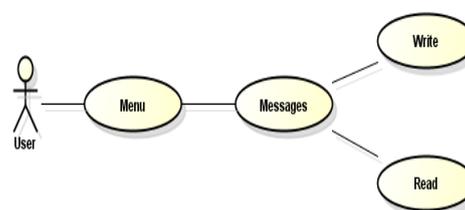

Figure 2. Message menu **-** Main Flow

If the 'Write' option was requested, the system prompts the user to enter the name of the contact to whom wishes to send a message. From the name supplied by the user, the system searches in their database. If no matching contact was found, an error message in the search is uttered by the system and the user can return to the search. Otherwise, with success in the search, the system returns a list of sought contacts based on the name that the user aforementioned. The user must choose one contact from all the contacts listed to send the message. Then, the system prompts the user to write the text of the message and send to the desired receiver.

If the 'Read' option is requested, the system informs if the user has new messages. If there are no messages, the application informs the user the status of the empty inbox. Having new messages, the application informs the emitter contact of the message and asks if the user wants to open it. If the answer is positive, the system reads the message's content to the user and asks if the user wishes to answer it. If so, the user can record the text of your message and then the system will send it. If the user responds negatively when it is prompted to open the message or whether to reply to the message, the system automatically returns to the 'Read' menu. As shown in Figure 3 and Figure 4.
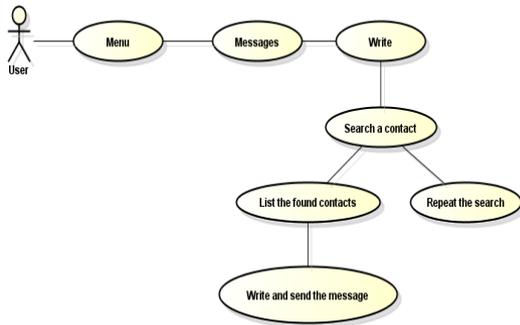
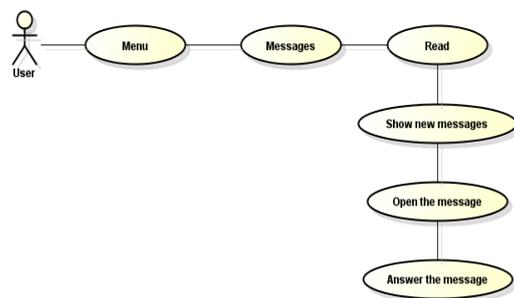Figure 3. Message menu: Diagram of interaction - Write Module

Figure 4. Message menu: Diagram of interaction - Reading Module

For both of interaction options, either in writing menu or reading menu, at any time during the execution of the operation, the user can return to the previous menu or return to the root menu. The user can also ask the system to repeat what was said in the current menu.

3.5 Moodle Vox Interaction Menu – Disciplines Module

In the Disciplines module the user have the option to choose which disciplines they want to access, and following this are the Weeks module and the Forum module of the chosen discipline, the first being the module to access the avaible classes, files and links and the other the module to access the existing forums about that discipline or to create one which are laid down in the Figure 5.
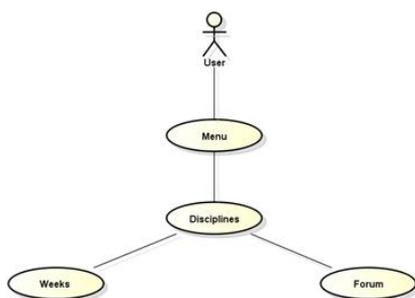

Figure 5. Disciplines menu - Main flow

Upon entering in the Weeks module the user have the option to choose the Resources module and them three alternatives of content: The Week's Text that is a simple resume of this week classes, the Files module which contains all files provided by the teachers and the Links module that contains useful links provided by teachers.

Also, entering in the Weeks module the user have the option to choose the Resources module and them three alternatives of content: The Week's Text that is a simple resume of this week classes, the Files module which contains all files provided by the teachers and the Links module that contains usefull links provided by teachers

Lastly, entering the Forum Module will give the user the option to participate on forums or create one, to participate the user can post on the already create forum and read the postages made by other users

IV. CONCLUSION

E-learning is the decentralization of teacher's figure and the development of a more autonomous and independent learning, thereby building more active, creative and independent citizens. Based on this, the technology investment in education provides optimistic prospects for the future of e-learning. The number of teachers and researchers that are participating in the technological advancement for the benefit of education is developing rapidly, giving rise to new trends in the learning process, especially on mobile devices, because due to the wide spread of mobile technologies there is a greater tendency to computers be replaced by increasingly smaller devices that permit the mobility, which in this case are mobile devices.

The research developed in question cooperates with scientific knowledge in the sense that this is a representation of technological advances relating to the accessibility tools in distance education mode. In addition, the project also represents an evolution in social issues, as it seeks to disseminate education for persons who are visually impaired, using techniques and e-learning tools through mobile devices, cell phone in that case, contributing thus, the learning of students and interaction in e-learning mode and assumes the role of a viable alternative to eliminate the barriers of access of the visually impaired to Higher Education.

Scientific researches consist of investigations, observations and experiments. Scientific researches try to use these tools to help us to understand the world, satisfying the curiosity and it also help with inventions that bring us comfort. It is hoped through the tool presented in this article a contribution in the construction of a new educational

paradigm, both in the quality of education, as the amount of who will receive it.

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