

The Digital TV as another solution to educate in isolated areas in the Amazon State, Brazil

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ABSTRACT

Several studies show that the distance education is a viable way to offer education to places that have difficulties in access to quality education. In the Amazon State, Brazil, some projects have gained notoriety for their emphasis on providing effective education at various high school and higher education levels in remote cities. We aim at providing mainstream inclusion to people who live in hard-to-reach cities. The aim of this project described in this paper is to investigate alternatives to use an e-learning management system within an interactive digital TV scenario. We plan to use the TIDIA-AE platform, which allows synchronous and asynchronous collaborative distance learning supported, integrated with the interactive digital TV platform under development in Brazil. As a result, we are providing a proof-of-concept prototype tool to be used by institutions in their educational activities. One of the tasks is the customization of the TIDIA-AE software platform taking into account some requirements for its use in a region as the Amazon, which presents very limited good quality network access. Our proposal takes advantage from the quality of image that TV provides and investigates the advantages of interactive digital TV. The work includes: investigation of the requirements, proposal and evaluation of alternatives, development of the proof-of-concept prototype and experimentation within potential scenarios. The work will be summarized in a report discussing the feasibility of using TIDIA-AE and Interactive Digital TV as integrated platforms to support the distance education in the Amazon state. The project is work in progress, and we plan to submit it to the pilot classroom group for tests in mid-2010.

Categories and Subject Descriptors

D.3.3 [Programming Languages]: Language Constructs and Features – *abstract data types, polymorphism, control structures*. This is just an example, please use the correct category and subject descriptors for your submission. The ACM Computing Classification Scheme: <http://www.acm.org/class/1998/>

General Terms

Your general terms must be any of the following 16 designated terms: Algorithms, Management, Measurement, Documentation, Performance, Design, Economics, Reliability, Experimentation, Security, Human Factors, Standardization, Languages, Theory, Legal Aspects, and Verification.

Keywords

Distance Learning, Interactive Digital TV.

1. INTRODUCTION

There are numerous difficulties in achieving quality education in the Amazon State, Brazil. Correa [4] listed difficulties such as lack of sanitation, treated water, health facilities, and electricity (in some remote regions, electricity can only be accessed by batteries or oil generators). He also observed that access to school in this region may be only up to the 4th grade school level.

Since 2004, innumerable projects have been developed in order to expand the education available in the countryside, including distance-learning based projects. One important example is the project introduced by the State Secretary of Education (SEDUC), which has recently introduced distance learning for high school using new technologies. The project, employing digital TV technology via IP, allows a thorough integration of a TV studio infrastructure and live online classes which include participation via chat, e-mails as well as videoconferencing. Platforms such as the one deployed by SEDUC are expensive and hard to customize. For instance, accessing students' data with respect to their interaction with the system is not provided and hard to implement.

Open source state-of-the-art distance-learning based projects based on traditional Internet are difficult to be deployed given the low reach of Internet in the State as a whole. As a result, low quality interaction is achieved by having some type of broadcast (e.g. Terrestrial TV, very common in Brazil) used in combination with feedback via telephone or even fax.

Investigating the current scenario deployed in the Amazon State, we observed the problem of the low level interaction allowed by the available infrastructure. For instance, there is a necessity for alternative ways to expedite the handling of all submitted questions from the participants, so that all questions can be answered in a timely fashion. It is important to highlight that, as observed by Landim and Ribeiro [9], the delay in providing feedback to students in distance learning environments influence student motivation and drop out.

In the remaining of this paper, we detail our work in progress in which we investigate the opportunity of integrating a state-of-the-art open source Internet-based infrastructure, the TIDIA-AE (*Tecnologia da Informação no Desenvolvimento da Internet Avançada – Aprendizado Eletrônico* – Information Technology in the Advanced Internet Development- e-Learning) platform [17], with the novel terrestrial-based interactive digital TV (iDTV) adopted in Brazil, based on the Ginga-NCL middleware [11].

2. RELATED WORKS

The literature advocates the use of learning objects in the context of interactive TV in a way that combines education and entertainment [10]. Some iDTV distance education applications, mainly interactive games and quizzes are described by dos Santos et al. [7]. An outstanding argument in this work is the provision of educational interactive documents as value added complement to the TV program; similar observations are pointed out by Soares and Souza Filho [16]. The research reported by Im et al. [8] presents a system for transparent conversion of web-based learning objects into iDTV applications, but without considering divergences in usability between Web and DTV. A feasible way to fight these disadvantages is presented by Lopez et al. [10], which includes the content authoring process, implying better control on the format of the learning objects. Common to all those related works is the focus on the MHP middleware, employed in the European DTV system, which makes them not immediately portable to the International System for Digital Television (ISDTV) that is the Brazilian Digital TV standard to terrestrial mode.

Cesar [3] comments the TV as social role and said the importance to develop thinking in the user that will consume that content. The research of [2] [12] shows that in Brazil the same path to transform learning objects from web platforms for digital TV is the way to the automatic generation of content for TV, and [12] test a prototype but using only local interactive. This project propose using the return channel but with restriction like a dial-up internet.

These presented papers shows that DTV for learning purposes is an area expanding and demand surveys. Transforming educational content from platforms LMS (Learning Management System) is a viable alternative to generation of DTV learning objects. This requires learn to use the new media, considering interaction and interface adaptations. Our project proposes to use the DTV as another tool interaction between students and teachers in distance education, using the Brazilian standards middleware – Ginga. Developing user-centered design and concerned with the usability of the system. With aim to provide tools to increase the education in isolated areas like Amazon state.

3. THE PROJECT

The main objective of the project is to investigate and implement a distance learning solutions applicable to the Amazon State using interactive digital TV.

An open platform was used as a base for in class education and distance learning, the TIDIA-AE [6,7]. We are designing and experiencing new modules so that they can allow the integrated use of the digital TV with an open source Internet-based platform: some modules are currently under development by other research groups University of São Paulo, Brazil.

The Digital TV module will be designed with more emphasis as a tool for the kind of teaching we envision for the State. The fact is that many cities in the remote areas of the state face difficulties in terms of Internet connectivity, which does not allow the use of Internet-based audio and video communication. However, we understand that the quality of educational process depends on continuous and bidirectional communication and, without Internet connectivity, the distance-learning approach reverts to the old model of independent study via mail in which the student becomes autonomous and isolated, and tends to drops out.

Our work is divided in six stages as follows:

1. Survey data about distance learning in the state
2. Elect one distance-learning ongoing effort as case study
3. Investigate the use of the TIDIA platform environment elected for the case study
4. Investigate alternatives of integrating the SBTVD and TIDIA platforms (requirements engineering)
5. Design and implement of a proof-of-concept prototype, in cooperation with the TIDIA and SBTVD teams
6. Experimentation with potential users.

3.1 Survey data about distance learning

We have concluded Stage 1: the main projects that have been surveyed:

- A) Undergraduate and graduate courses offered in the remote areas were developed by the University of the State of the Amazon (UEA). Conventional TV was used for broadcast and students' questions were answered via phone, fax and e-mail. Started in 2002, it is ongoing. It has several courses and the first attend every city in the Amazon state.
- B) High school distance learning, offered by SEDUC using IPTV technology. The hardware and software infrastructure allows efficient tools for communication, control and follow-up. This program was implemented in 2007 and the first group will graduate late 2009.
- C) Vocational technical level course in Tourism and Environment are offered by the Federal Institute of the State of the Amazon (IFAM). These courses will be offered in cities such as Barreirinha, Eirunepé, Manaus, Tabatinga and Tefé, starting in the first semester of 2010. These course will offer using only Web and the Learning Management System used is the Moodle.

After this survey we observe that the TV has important hole in distance education in Amazon. With this technology is possible attend every cities in the state. It has too the IPTV project that provide the class with great image and audio quality. Using this technology it can be possible the students interact in real time using chat and videoconference to ask the teacher who stay in studio in Manaus – Amazon capital.

It was also observed that the Internet can be used with a teaching tool but not exclusively, because it does not has a good quality and it is unstable, less than 524kbs in some cities in state, making the connection impossible at times due to technical problems.

3.2 Elect one distance learning project

The IFAM Project using only Web to provide content class. After the survey was observed that the internet has serious problems in state. Because this, the IFAM can be offer its courses to all cities of Amazon due the technique problems that can be impossible the students follow the lessons offered.

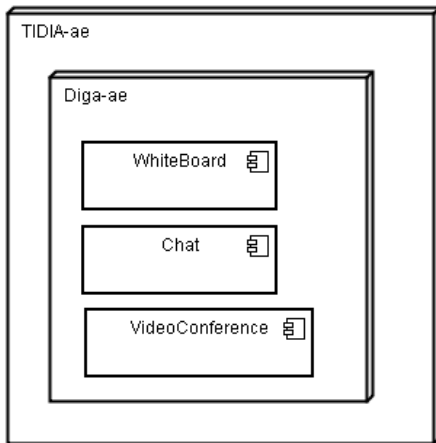
In Stage 2, The IFAM Project was chosen due to its flexible characteristics and for being a project that gives the necessary inputs for the research development.

3.3 TIDIA-AE

The TIDIA-AE (*Tecnologia da Informação no Desenvolvimento da Internet Avançada – Aprendizado Eletrônico* – Information Technology in the Advanced Internet Development- e-Learning) is a LMS developed by the São Paulo Universities. It is an

Additionally the classes can be accessed by the students that have internet at home or in lan houses, just accessing the Tidia-ae website.

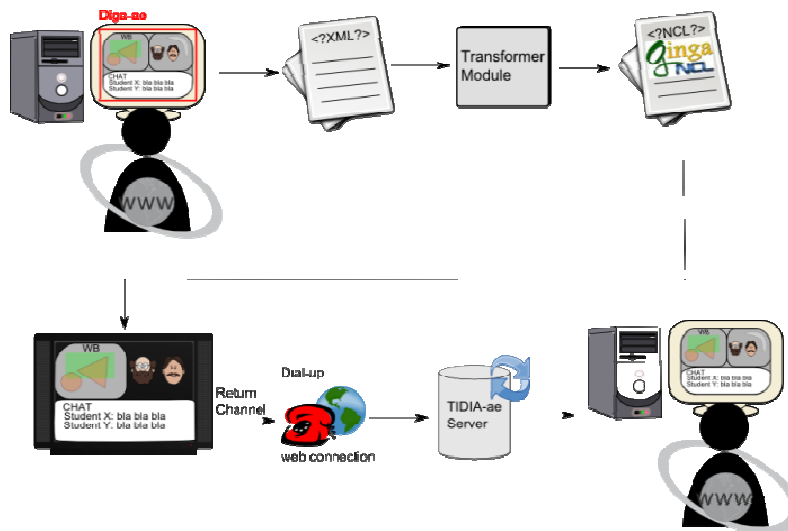
In Stage 4:



Picture 2: The Diga-ae tool of TIDIA-AE

The Picture 2 show that the LMS Tidia-ae can have a different tools combination and in this project we choose the Diga-ae tool that is the group of tools like whiteboard, chat and videoconference where all these tools are synchrony and collaborative.

The Picture 3 shows the information flow from the student access using your computer at home until view the class using the DTV and return data, using the return channel. The use of this technology would be the teachers scoring one day to take the doubts expressed by students. At the appointed time they would access the Diga-ae using the Internet and would record the class collaboratively using video conferencing, chat and whiteboard. This session could be subsequently accessed by students accessing the Tidia-ae platform or watching this on DTV. In this second case is necessary an adaptation and conversion of media from the



Picture 3: The information flow in proposed system

web. This conversion consists in obtain media descriptions in XML documents, these documents are subsequently converted to the NCL format after passing through a module that will be entrusted with this task. This module was developed using Java technology. The NCL document is generated in accordance with the specifications of the Brazilian Digital TV middleware - Ginga, more specifically the Ginga-NCL. After this step the document may be filed in the DTV, at the class scheduled. The interaction in the classroom might be using the chat that could be accessed using the remote control or keypad. Because are many students and only one device interaction, the tutor would be the person responsible for input data. This person is responsible for intermediate students and teachers, facilitating the conversation between them. These data generated in the classroom would be sent to the server's Tidia-ae through an internet connection dial-up. On the server that the data would be consolidated and updated. When a student uses the Internet to access the system, he can view the questions generated in class televised through the chat logs.

Our work on Stage 5 should implement the functions describe in this scenario and as result in proof-of-concept prototypes of those new authoring tools.

3.5 TESTS

Concerned about the acceptance and functionality of the prototype generated will be developed usability tests to validate the implementation.

Initially be implemented heuristic [13] to validate the usability of the system. These are made with professionals who can be the domain experts, i.e. distance learning or usability and interaction experts. This initial test will be developed with aim to find critical issues before applying to the potential users. Once implemented the corrections of the main problems encountered in the heuristic test will run a test with potential users, in a pilot class with students of IFAM course.

After these tests we expect know if the prototype has a good acceptance and it can be used with success in distance learning projects.

4. FUTURE WORKS AND CONCLUSION

We intend to finalize the implementation of the architecture proposed in this paper, and test with the real student in a pilot classroom. The real tests are important to evaluate the usability of the class using the DTV and known the problems create in automatic adaption of a LMS to a Digital TV.

By exploiting state-of-the-art efforts in terms of Internet-based learning management systems and interactive TV, at the end of this project we aim to have experimented with a proof-of-concept prototype tool to support distance-learning that takes into account the unique characteristics of the Amazon State in terms of needs and available infrastructure. We expect our work will have impact in several education-related problems in the State of Amazon in Brazil.

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