IMPLEMENTATION OF NCL APPLICATION TO THE TEACHING PRODUCTION TECHNOLOGIES OF SUGAR AND ALCOHOL

Rodrigo Cândido Borges[1], Danila Fernandes Mendonça[2], Humberto M. Barros Filho[3]

Abstract *— Brazil is at the top of world production of sugar and alcohol. Faced with such a case is increasing demand in this area by qualified and able to perform technical activities in these industry line professionals. Seen the difficulties in understanding the varied processes of sugar and alcohol production, this project presents the implementation of an application for teaching technologies involved in this production base. This program works as an educational object shows in the products and byproducts derived from cane sugar, being developed at NCL programming language. NCL declarative applications enable encapsulate in your source code a range of services, bringing the final hypermedia consequent robustness.*

Index Terms — Alcohol, NCL, Sugar, Teaching.

INTRODUCTION

The biofuels production chain is notably one of those that have greater development potential in Brazil. This fact is evidenced when we consider the characteristics of the sector and the discussions concerning the use of oil as a clean fuel. Information provided by UNICA (Union of Sugar Cane Industry) show an evolution of the production of sugar and alcohol since the mid-70s. Particularly the creation of the National Alcohol Program, made possible the diversification of the products produced from sugar cane and the beginning of the car manufacturing running on ethanol, cleaner and more economical [12].

After the release of bi fuel technology cars, once again was opened an industry expansion perspective, based on the search of energy use from renewable energy and environmentally friendly sources, as contrasted with the utilization of oil, which has high costs, risks of shortages and high level of aggression against nature.

In addition, there is great expectation about the increasing demand for ethanol on a world scale in view of the growing concern over the need of actions that feeds the development, without however, bring risks to the sustainability of the planet.

The conjunction of these factors has set Brazil as the world's largest producer of sugarcane and potential leader in the field of anhydrous and hydrous ethanol production technologies, transforming the Brazilian sugarcane industry as one of the most competitive in the world. Due to this fact, the plants have adopted new production standards, resulting in export growth.

Although the relative euphoria by the industry growth, points to the need for further discussion on the social, economic and environmental issues involved in large-scale expansion of cane sugar. It is impossible to deny that such a process is already underway, as well as is not worth ignore the fact that the sector's development has placed on plants the necessity of dealing with new and more modern production standards in the pursuit of higher production volume, improved profitability, but also for their pressures of organized sectors of society, in search of a more connected production to sustainable development standards required by today's world, in terms of environmental responsibility. The workforce optimization in the sugar cane production sector is demanded by industries that hope to rely on professionals with a multidisciplinary and polyvalent formation.

Given emergence of the sugar and alcohol production process and the necessity of industry qualifications, this paper presents the development of an educational app, implemented in NCL [8], which expect expose the process of sugar and alcohol production, a detailed showcase of products and by-products of sugar cane. The focus of the application is to be an educational object in qualification courses, technical and senior courses in sugar and ethanol formation [7]. The choice of NCL, is given by its portability in television sets, the means of communication most accessed in Brazil. The application can be loaded on demand in computer networks, or even reside in television receptors offering an interactive and collaborative educational background formation.

DTV IN BRAZIL

The transition from analogue to digital TV has made television ceased to be just a screen to show a synchronized image with audio. The advent of DTV provided to the television environment a robust communication base,

[1]Rodrigo Cândido Borges, Department of Informatics - Federal Institute of Education, Science and Technology of Goiás - Campus Inhumas. Av. Universitária s/n, Vale das Goiabeiras. 75440-000. Inhumas, GO, Brazil. rodrigo.borges@ifg.edu.br
[2]Danila Fernandes Mendonça, Department of Chemistry - Federal Institute of Education, Science and Technology of Goiás - Campus Inhumas. Av. Universitária s/n, Vale das Goiabeiras. 75440-000. Inhumas, GO, Brazil. fmdanila@gmail.com
[3]Humberto M. Barros Filho, PRONATEC - Federal Institute of Education, Science and Technology of Goiás - Campus Inhumas. Av. Universitária s/n, Vale das Goiabeiras. 75440-000. Inhumas, GO, Brazil. neogouk@gmail.com

DOI 10.14684/ICECE.9.2015.48-51
© 2015 COPEC

providing services such as internet access, mobility, interaction between receptor and transmitter and t-commerce.

The Brazilian DTV System (SBTVD) [9] originated from a compound development committee, according to Decree 4901 of 2003 by the Republic President, by an Advisory Committee and a Management Group supported by entities such as the Research and Development Center in Telecommunications (CPqD) [3].

This committee was established to be responsible for the studies that define the standard to be used in Brazil. Completed these studies, conducted together with universities and television stations, the Brazilian TV system was presented on November 13, 2005 by the Ministry of Communications.

After formalizing the system and the concluding the studies, we opted for the standard adaptation DTV developed in Japan, ISDB-T [4], leading then to the Japanese-Brazilian Digital TV System (ISDB-TB) [9]. From joints, researchers promoted updates on Japanese TV system, among them the use of more modern digital compression of audio and video standards, and the adoption of a middleware developed in Brazil, Ginga [6].

Updates credited by the ISDB-TB allow the television scenario a broadcast quality that allows the reception of DTV signals mobile and portable devices. There is also the possibility of development of procedural and declarative applications, providing dynamism to the program developers. Figure 1 portrays the ISDB-TB architecture.

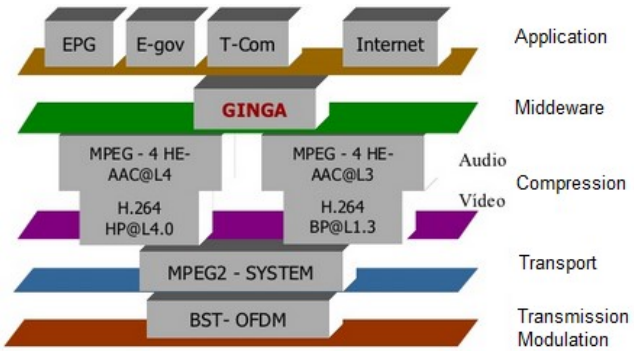

FIGURE. 1
LAYER REPRESENTATION OF THE ISDB-TB

Other important features of Japanese-Brazilian standard are mobility and interactivity. Mobility makes it possible for spectators to visualize content in various mobile devices by which you can watch digital TV, like cell phones and USB receivers for computers. In relation to the interactivity, there are many possibilities and lines of development that enables, including NCL application of an educational character proposed here.

Aiming to display the foundation for understanding the management and execution of interactive television programs, the next section will present the middleware Ginga, adopted by Japanese-Brazilian Digital TV System.

THE MIDDLEWARE GINGA

Middleware are software layers that aim to abstract to the application developers, hardware complexities, facilitating the use of environments rich in information technology. The middleware layer concentrates services such as identification, authentication, authorization, directories, digital certificates and other security tools. In the context of the Brazilian DTV, Ginga middleware is responsible for adding such services, culminating in rich software allocated to the receivers, and TV signal converters.

According to ABNT NBR 15606-4: 2010 [1], the middleware is responsible for the communication component between the user and the operating system of an embedded device such as the Set-Top Box (STB). Such software platform is installed on digital converters and TVs, mediating communication between operating systems and applications.

Ginga [6] was developed by the Catholic University of Rio de Janeiro (PUC-Rio) and the Federal University of Paraíba (UFPB), for use in the SBTVD. It has two main functions: the first is to make the operating system independent of the applications used by the hardware platform. The other is to offer a better support to the development of applications through the functions of libraries.

This middleware has in its architecture three interlinked subsystems: Ginga-CC, Ginga-NCL [10] and Ginga-J [11], which enables the development of applications following two different programming paradigms, declarative and imperative.

Ginga-NCL was developed in order to process the declarative applications NCL. NCL is a Lua scripting language which constitute the declarative environment ISDB-TB. Ginga-J was developed for the processing of mandatory applications made in Java, with specifically targeting facilities to the DTV environment.

The Common-Core Ginga (Ginga-CC) provides support to declarative environments, Ginga-NCL, and imperative, Ginga-J. In addition, the Ginga-CC also provides the blueprint management for the specified model for SBTVD / ISDB-TB and the management of access to the return channel, module responsible for controlling access to the network layer. Figure 2 shows the Ginga middleware structure, containing its subsystems and services offered.

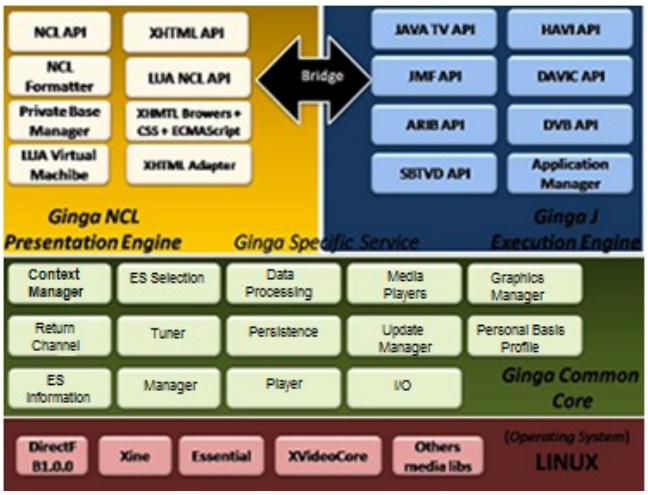

FIGURE. 2
LAYER REPRESENTATION OF THE GINGA [6]

Considering characteristics such as population reach of TV, the possibility of receiving signals on mobile devices, and the rich capacity for interaction, we chose to work for the development of this application in NCL, particularly aiming to provide educational content about sugarcane production of software in platforms and heterogeneous hardware. The next section is about the implementation of the application.

IMPLEMENTATION OF APPLICATION NCL

For application deployment, a survey of the technical information that includes the sugarcane environment, the management in the fields to the storage process of the final product was first made.

In the development of the application we used the NCL declarative language [8]. As IDE (Integrated Development Environment) it was used Eclipse [5], with the Composer Eclipse Plugin [2]. For execution and testing we used the Set-top Box Virtual Ginga-NCL version 0.12.4 [6] installed on a virtual machine VMWare Player version 7.0.0 [13].

Composer is a graphical and intuitive tool for creating hypermedia documents with digital interactivity, different from Eclipse, which is a programming environment that allows editing the source code. The Set-top Box Virtual Ginga-NCL is an emulator that under a virtual machine simulates the DTV environment for the purpose of loading, reading and application execution.

FIGURE. 3
NCL APPLICATION IMPLEMENTED

FIGURE. 4
MENUS SAMPLE AND APPLICATION DIAGRAMS

Figures 3 and 4 illustrate the execution of the application NCL directed to the teaching of sugarcane production technologies. The application uses diagrams, graphics and texts that can be displayed on the screen synchronized with the main video. Such media can be accessed through the interactive menu, which features several options for access to hypermedia.

Unlike other forms of audio and video display, DTV allows direct interaction between users and content, reaching a range of viewers habituated to the use of remote controls, and in some cases, not familiar with the use of computers. While viewing videos, languages such as NCL allow synchronization between applications and access to content through a click, without necessarily pausing the program shown.

THE EVALUATING OF NCL APPLICATION

For software evaluation, were installed emulators Set-top Box Ginga-NCL Virtual on desktop computers, each containing an Intel Core i5-4590S 3.0 GHz processor with 6MB Cache, 4GB RAM DDR3L 1,600 MHz, HD 500GB SATA3 5400RPM HDD and Network Card Realtek RTL8151GD.

Following questionnaires were applied to forty regular and registered students of the Course Subsequent Technician Sugar and Alcohol (distance learning modality) of the Federal Institute of Goiás, Brazil.

In the questionnaires, were guided issues that led each user to interpret the program so to review requisites related to its usability. The questions were formulated by addressing: the easy-to-use, layout and efficiency.

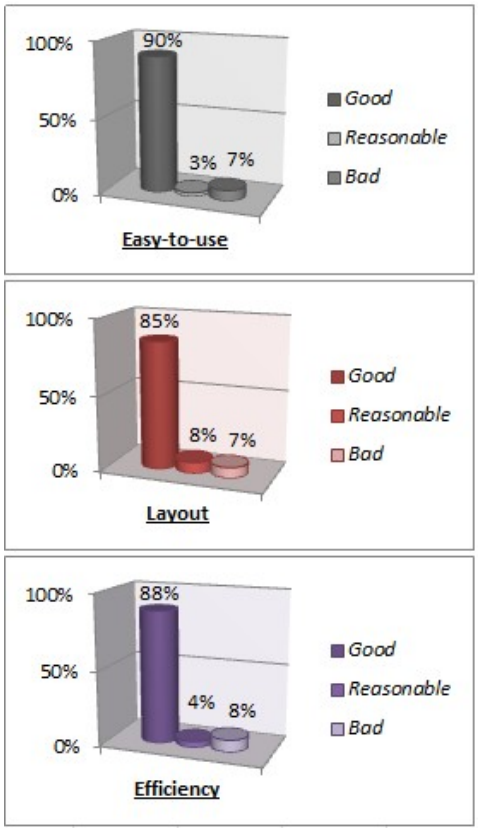

FIGURE. 5
EVALUATION AND RESULTS

In the context of NCL application efficiency, 88% considered good, reasonable 4% and 8% bad. Figure 5 shows other results of the evaluations.

CONCLUSION

The product enables application and provides video lessons with content relating to methods and the production of sugar and alcohol, and enables sync images, text, and other media, promoting interactivity between student/viewer and content. While the student/viewer watches a video for a given theme, it has access to graphics, schematic designs, text, and other visual tools that are shown by the application synchronously or asynchronously, and may or may not be defined by the user.

Interactive applications have the power to make its users an active receiver, in other words, the student / viewer is induced to take part in show, either by viewing a picture, by sending questions and answering questionnaires, all through the TV or home computers. With these technologies you can create a new model of learning where the student is even more included in the proposed theme.

The project described here offers in its implementation emerging information technologies that will contribute as interactive learning objects, providing an innovative proposal of collaboration between schools, industry and community. With the maturing of the educational culture, the methodologies of audiovisual education will be consolidated as an interdisciplinary way of training knowledge, a parallel tool to regular classes.

REFERENCES

[1] ABNT, Associação Brasileira de Normas Técnicas. "ABNT NBR 15606-4:2010 Versão Corrigida:2012". Available at: http://www.abntcatalogo.com.br/norma.aspx?ID=148472 (Accessed: December 2014).

[2] COMPOSER, "Composer Eclipse Plugin". Available at: http://composer.dubture.com/ (Accessed: December 2014).

[3] CPQD, Centro de Pesquisa e Desenvolvimento em Telecomunicações. "SBTVD". Available at: http://www.cpqd.com.br/tags/sbtvd/ (Accessed: December 2014).

[4] DIBEG, ISDB-T "Integrated Services Digital Broadcasting - Terrestrial - Official Web Site". Available at: http://www.dibeg.org/ (Accessed: December 2014).

[5] ECLIPSE, Foundation. "Eclipse Projects". Available at: https://eclipse.org/ (Accessed: December 2014).

[6] GINGA, Org. "Official Site of Ginga Middleware". Available at: http://www.ginga.org.br/ (Accessed: December 2014).

[7] MEC, Catálogo Nacional de Cursos Técnicos. "Eixo Tecnológico Produção Industrial, Técnico em Açúcar e Álcool". Available at: http://pronatec.mec.gov.br/cnct/et_producao_industrial/t_acucar_alcool.php/ (Accessed: December 2014).

[8] NCL, Nested Context Language. "NCL - Nested Context Language, a Declarative Language for Hypermedia Authoring" Available at: http://www.ncl.org.br/ (Accessed: December 2014).

[9] SBTVD, Forum. "Fórum do Sistema Brasileiro de TV Digital Terrestre". Available at: http://forumsbtvd.org.br/ (Accessed: December 2014).

[10] SOARES, L.F.G.; MORENO, M. F.; DE SALLES SOARES NETO, C. "Ginga-NCL: Declarative middleware for multimedia IPTV services". *IEEE Communications Magazine*, Vol. 48, Issue 6, 2010, pp. 74-81.

[11] SOUZA FILHO, Guido L.; LEITE, Luiz Eduardo C.; BATISTA, Carlos Eduardo C. F. "Ginga-J: the procedural middleware for the Brazilian digital TV system". *Journal of the Brazilian Computer Society,* Vol. 12, No. 4, Print version ISSN 0104-6500, 2007.

[12] UNICA, Brasil. "União da Indústria da Cana-de-Açúcar". Available at: http://www.unica.com.br/ (Accessed: December 2014).

[13] VMWARE, Inc. "VMware Virtualization for Desktop & Server, Application, Public & Hybrid Clouds". Available at: http://composer.dubture.com/ (Accessed: December 2014).