



## ITV-Learning: a Prototype for Construction of Learning Objects for Interactive Digital Television

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### 1. Introduction

In recent years TV broadcasting system has gone through a time of transition in which analogue TV has been gradually replaced by interactive digital TV (IDTV). Such replacement notwithstanding, IDTV has some analogue TV features in itself besides the same resources of a personal computer [1]. For the Brazilian government, education is the primary area for the development of IDTV software.

The change from analogue TV to IDTV does not consist only of improving the quality of picture and sound, but also of enabling greater flexibility by enhancing the system functions through applications for health services (t-health) banking (t-banking), government services (t-government), educational services (t-learning), etc [3].

IDTV will be Brazilians' main source of information, since TV is one of the most popular means of communication in Brazil. According to [2], over 94% of families own at least one TV set, which corresponds to 80 million TV sets throughout the country.

In the educational field, television-learning (t-learning) enables interactive educational services on TV in a possible association with electronic learning (e-learning) but with quite specific characteristics.

T-learning is thus an alternative to diffuse knowledge on a grand scale, namely everyone that has access to a TV set. This is possible due to the design of hypermedia applications through space-time synchronization among digital media.

For successfully applying t-learning to the educational context new resources and tools have to be developed, allowing instructors to take advantage of the development of such materials.

Learning Objects (LO) are resources of educational computing aiming at making the construction of interactive specific knowledge easier. LO development is not a simple or quick process, since it requires assembling a multidisciplinary team with a projects manager/coordinator, a pedagogic team, a specialist in the field of LO knowledge, computer systems analysts, computer programmers, an audio crew, designers etc. Keeping such a top – notch team of experts demands a high investment with no guarantee of satisfying the teaching needs.

We proposed an authoring tool for developing learning objects for IDTV that will enable an instructor to act as the developer of interactive digital materials, abstracting programming knowledge to build such LO.

### 2. ITV-Learning tool

The ITV-Learning tool (ITV-L) is designed to provide the means of constructing hypermedia applications with space – time synchronization for IDTV. The proposed tool is presently a prototype in the Java programming language.

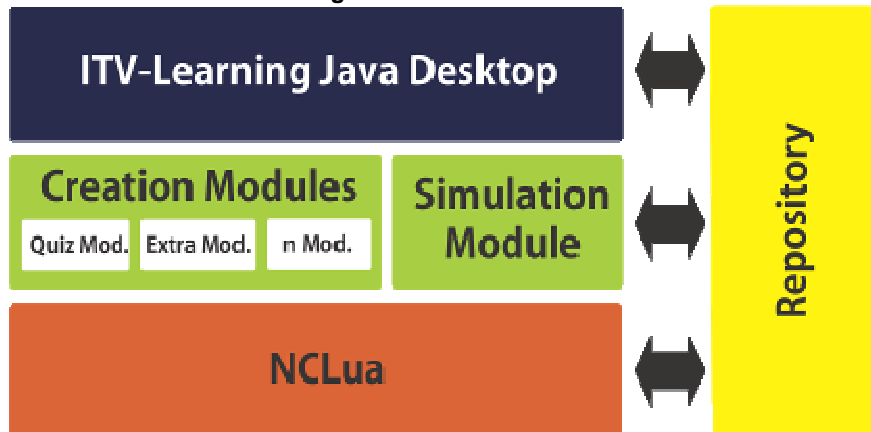
#### 2.1 Scenario

The ITV-L is used by the instructors on their personal computer to generate interactive application (LO) for interactive digital TV. Once the application is produced the instructor uses it in the classroom on a TV set and on a receiver with middleware Ginga NCL.

#### 2.2 ITV-L architecture

The architecture of the ITV-L is based on layers. In Figure 1 we present the components of the proposed architecture: (i) creation modules, (ii) simulation module, (iii) ITV-Learning Java Desktop, (iv) Repository module and (v) NCLua module.

Fig. 1. ITV-L Architecture



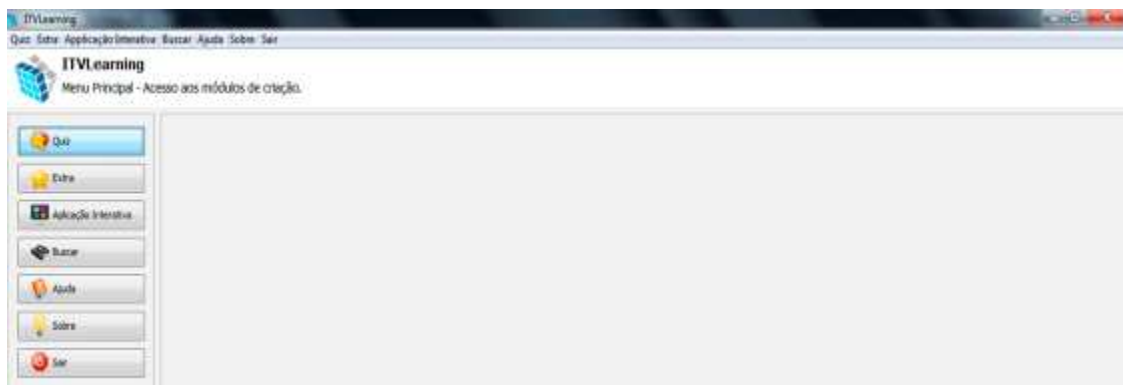
The **ITV-Learning Java Desktop** application is installed in the user's local machine and allows users to create LO. It executes the following modules: Quiz, Extra and Simulation. They are responsible for the creation and simulation of hypermedia applications by teachers.

- Extra module: creates complementary content such as audio, image, or video associated with the main video. After the application is produced the content can be accessed by remote control through an interactive call.
- Quiz module: produces a small quiz, shown at the end of the presentation of the LO main video, indicating the mistakes and the correct decisions.
- Simulation module: creates an environment that simulates the interactive application designed by the instructor by means of a tool. The user is expected to install a VMware image from a virtual machine with middleware Ginga-NCL to his/her computer. This image is called Ginga-NCL Virtual STB – Set-Top Box that emulates a set-top box for the Brazilian System of Digital Television
- The repository recovers and manages LO that have already been created.
- The NCLua module makes up the application based on information provided by the creation modules, automatically generating content that would otherwise be produced by a computer programmer or designer.

### 2.3 ITV-L prototype

The ITV-Learning desktop application executes the creation modules through the buttons representing their respective modules (Figure 2).

Fig. 2. Desktop Module Main Window



### 2.4 Creation process

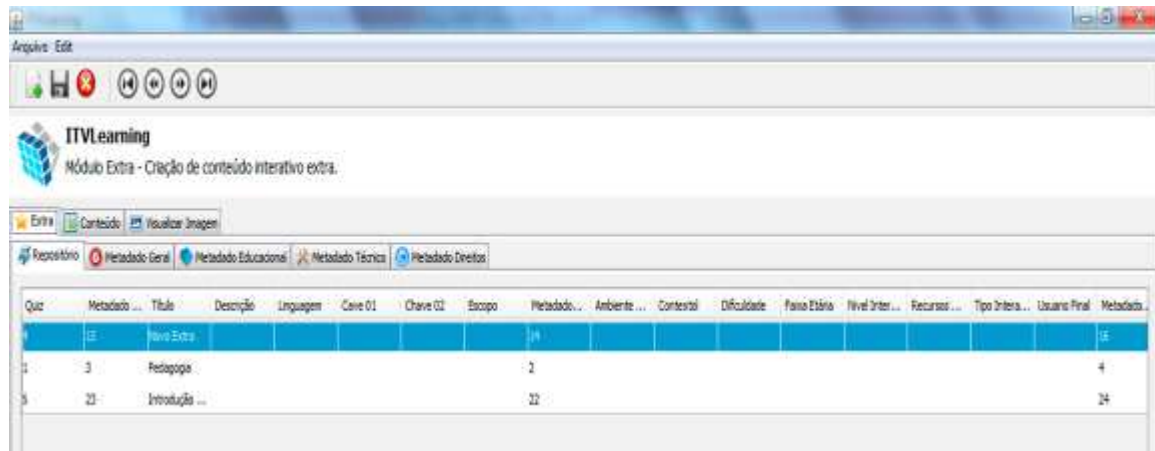
This section shows how an instructor can create a LO. The instructor has to take the following steps: create an extra LO and its content; add a quiz; and generate and simulate the interactive application.

#### Step 1: extra module

On clicking the “Extra” button on the desktop module (Figure 2) the window of the content module will open (Figure 3)



**Fig. 3.** Window of the Extra Module

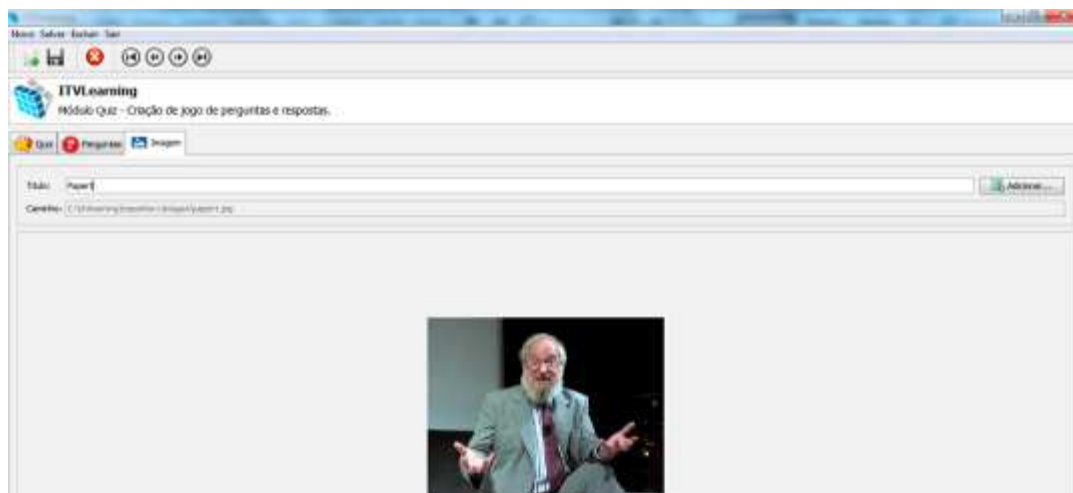


The extra LO is subdivided in “content” and “interactivity”, the first containing text, audio or video applied to the content of the main LO; the latter consisting of the so called interactive call of the extra content, where the instructor can define when a word/sentence will be used to show the user of the interactive application that there is complementary information (Extra) connected with the main video.

**Step 2: quiz module**

On clicking the button “Quiz” on the desktop module (Figure 2) the window of the Quiz module will open (Figure 4). At the end of the Quiz, statistics of the student’s performance are shown. However, a quiz has multiple-choice questions with images that can be associated with these ones. These questions present alternatives with clues.

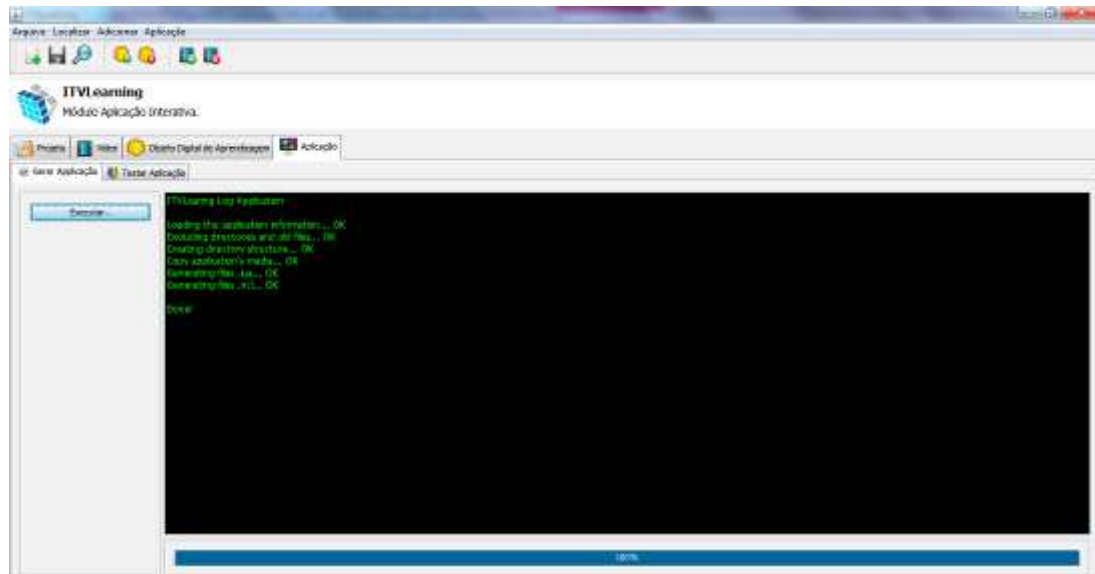
**Fig. 4.** Window of the Quiz Module



**Step 3: NCLua module**

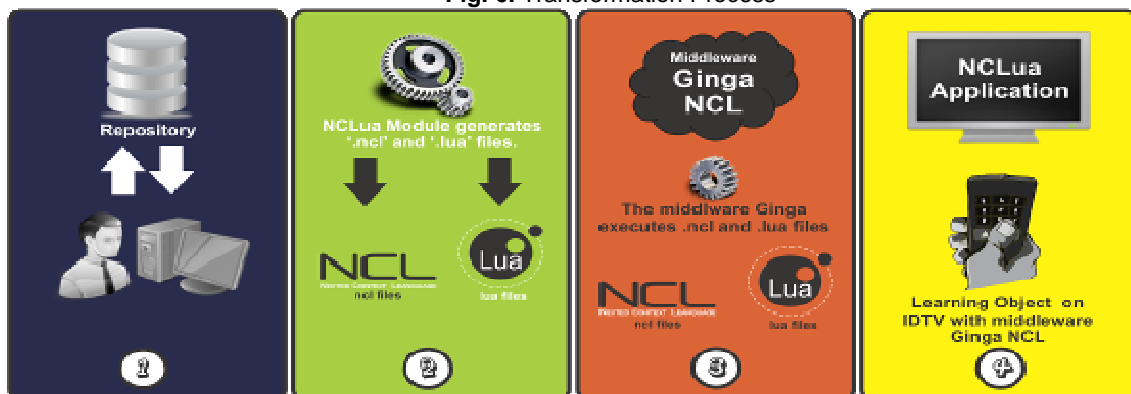
On clicking the “Interactive Application” button on the desktop module (Figure 2) the NCLua window is shown (Figure 5)

Fig. 5. Window of the NCLua Module



To generate the application a search is done in the repository by means of the “Identification/Title” parameter typed by the instructor. A LO will be recovered from the repository and transformed into an application for IDTV. The transformation process (Figure 6) happens when the tool of the NCLua module provides with the information recovered from the repository (1), automatically producing documents with the extensions “.ncl” and “.lua” (2). These documents are executed through the middleware Ginga NCL (3). LO are recovered by Set Top Box and showed as an IDTV application (4).

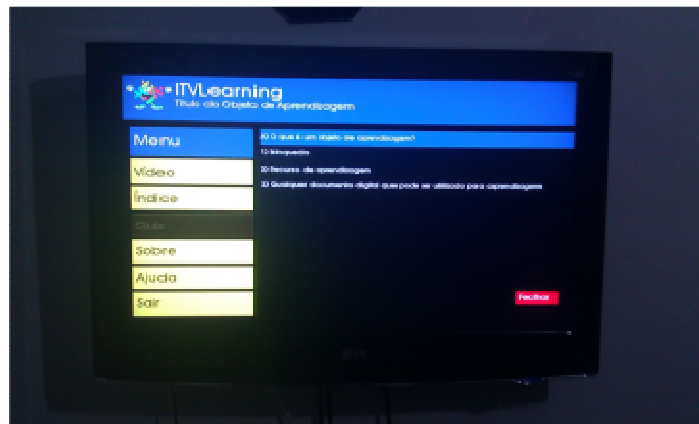
Fig. 6. Transformation Process



After the mentioned steps are taken we get an interactive application for IDTV (Figure 7). The application has a menu with the following options: video, index, quiz, about, help and close. It is executed by the IDTV remote control or by a mobile device (phone, joystick, etc.)



Fig. 7. LO generated by the ITV-L



### 3. Conclusion

The technological growth characteristic of the Society of Knowledge has called for the development of a new teaching profile in which gathering information is not fitting any more, but rather producing information and focusing on solutions that will satisfy the specific needs of the teaching process and reduce the use of costly systems. Using TV as a teaching tool can realize the potential of the teaching process and help teachers achieve their goals not only in our country but in other nations with a low level of education.

T-learning technology enables interactive educational services on television. It comes as a promising alternative to diffuse knowledge on a grand scale, that is, to everyone that has access to a TV set. To successfully apply T-learning in the educational context new resources and tools have to be developed.

We propose an authoring tool, called ITV-Learning, for the construction of learning objects for IDTV that will enable instructors to get knowledge of programming and LO construction. This tool gives instructors a greater autonomy in the construction of learning objects of IDTV.

### 4. Acknowledgments

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### References

- [1] Celes, C. S. F. S. and Souza, C. T. 2007 "Estilos Arquiteturais de Software na Construção de Objetos de Aprendizagem para a TV Digital Interativa", <http://www.br-ie.org/pub/index.php/sbie/article/viewFile/578/564>, June
- [2] Farias, M. C. Q.; Carvalho, M. M.; Alencar, M. S., "Digital Television Broadcasting in Brazil," *Multimedia, IEEE*, vol.15, no.2, pp.64-70, April-June 2008
- [3] Soares, L. F. G.; Barbosa, S. D. J. (2009) Programando em NCL 3.0 Desenvolvimento de aplicações para o middleware Ginga TV Digital e Web 1ª ed.