

An Architectural Model for Design Multicultural Learning Objects

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Abstract.-Learning objects are considered as educational resources that can be employed in technology support learning. They are a digital pieces of knowledge to put together in order to form courses on line. Considering cultural aspects is possible to reuse them in different context for a large diversity of community of users. Nevertheless, the design and development of graphical user interface for this kind of objects become more complex since the multiples representations and the large diversity of resources. This work proposes the use of architectural models try to mitigate the design of user interfaces for multicultural learning objects.

Keywords.-Multicultural context, Learning Object, Model-View-Controller pattern, Architectural model, Usability and Design Patterns.

I. INTRODUCTION

Nowadays a large number of universities are producing their courses in terms of learning objects and saving these objects in their own repositories, these repositories in general support several local queries with different criteria thanks to the information in the metadata. Such repositories have the goal of opening access to a wide variety of materials to anyone around the globe [6].

Learning objects are considered as educational resources that can be employed in technology support learning. They are a digital pieces of knowledge to put together in order to form courses on line. A traditional learning object is composed of five components such as: theoretical knowledge, evaluation, related subjects, metadata and practical knowledge [3].

Whenever you create an academic content, you put a bit of yourself into the content. This part is often a representation of your own culture and even if you deliver that content in your classroom where you are intimately familiar with your students, there are parts of that content that are difficult for all of your students to understand that have nothing to do with the educational content

However, previous issues have been less pronounced than what occurs now when several mentors create content in different part of world. Internet allows us to find, create easily different good quality of academic contents and deliver them to a large number of societies. A learning object could be created in different locations and in different languages need to be re-built or localized in order to satisfy the requirements of each location

Monocultural perspectives hamper learning in a number of ways. Students are not exposed to or do not engage with different forms of knowledge or realities. Students are not encouraged to learn about or engage with a diverse group of people. As a consequence, there is no conception of alternative ways of thinking and acting, hindering imagination and criticism, with the potential to promote arrogance, insensitivity, providing a fertile ground for prejudice. Multiculturalism puts forward the existence of multiple (multi) cultures as opposed to one (mono) particular culture within an educational system and society at large. As a countermovement to the established educational system, it attacks a constructed reality that is often referred to as ethnocentrism or monoculturalism. This is essentially to change the conceptualization of culture, moving from unitary to pluralistic perspectives [2, 7].

Today, educational content can be easily distributed worldwide via the internet. While this is easy to do, it is apparent that in all of these materials there is both intentional educational content and unintentional cultural content. Some talk about bias in learning materials, but this tends to be pejorative. We prefer to say that culture is in whatever you create. A traditional learning object can be enrichment through the clearly identification of cultural factors such traditions, best practices and customs.

A Multicultural Learning Object (MLO) is defined here, as a learning object that could be used for different cultures and the learners could better understand in his/her own educational terms. In the literature of e-learning and human computer interaction some works have proposed for analysis and development of MLO: Agada has considered the multicultural education as an emerging paradigm [8], Oshlyansky et al. have précised the difference between cultural aspect from usability aspect for the graphical user interfaces at analysis stage [10], Gómez et al. have presented a development of mathematic courses in terms of MLO's [12].

Unfortunately, no there isn't enough contributions for designing multicultural learning object in the literature of e-learning [2, 12]. This work purposes an architectural model to design and develop multicultural learning objects in an effective manner. For this goal, section two gives an outline of problem; next section presents our proposal in terms of a conceptual model in order give some solutions. Final

section shows the design of a multicultural learning a case study in order to prove the current proposal.

II. OUTLINE PROBLEM

A multicultural learning object always pursue the idea of reusable interactive components, it is necessary a good quality of graphical user interfaces for different contexts, so a MLO could be delivered for an initial population but also to as many groups with another culture. In this sense the production of MLO's become complex, it is necessary several amounts of academic resources and a big multidisciplinary team with different competences. However this responsibility is left to the analytical and creative decisions of developers even if this task is not easy to carry out.

This work identifies the follow difficulties for the production multicultural learning objects:

1. Multicultural learning objects require high Interactivity, reusability and usability.
2. It is necessary identify some new criteria to evaluate the quality of multicultural learning objects
3. It is necessary different abstractions at design level to deal with the complexity for developing multicultural context.
4. It lacks mechanisms for graphical user interface easy to maintain different context of use.
5. Learning objects are truly portable and reusable across multiple platforms including mobile devices and portable game consoles.
6. The results given for a MLO require several abstraction levels for multiple representations.

Next sections describe some solutions to the aforementioned problems.

III. ARCHITECTURAL MODEL

Development of multicultural learning objects requires in particular a big effort in the specification of the graphical user interface in order to support a large diversity of users. According to Shneiderman [1], the user interface is the specification of the look and feel of an interactive application. The production of a multicultural learning object is similar of an interactive application where the user requirements and cultural context are represented in particular in the graphical user interface. The design of a graphical user interface includes the determination of which interactive components are displayed to the user and the functions that let to interact with these components in order to support user task.

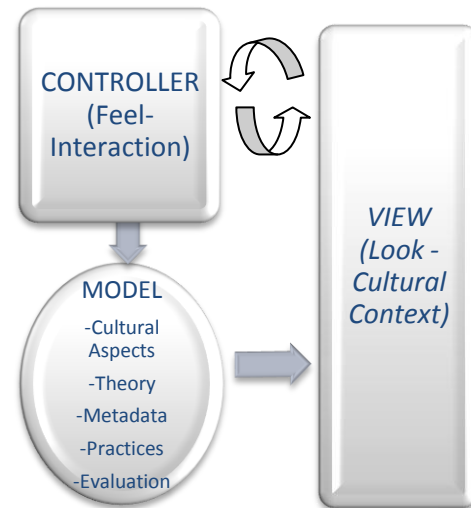


Figure 1. Multicultural Learning Object based on the MVC model.

In order to cover the interactive nature of a multicultural learning object, we propose an architectural model based on the architecture Model-View-Controller (MVC) [4,9] (see figure 1). The Model encapsulates the cultural content of a learning object, the Views could represents and display different cultures, traditions and customs according of information given by the Model. This is presented in functions of user interactions and requests send to the Controller module.

Note in figure 1, that module Model is composed of main components of a learning object: theoretical knowledge, metadata, activities and evaluation, all are specified with cultural aspects. A multicultural learning object could be composed of different views which they are ready to be required by several users of different cultures. The views could give different perspectives and presentations of the academic content in function of user task. With different Views the reusability could be possible without affecting the other properties such as portability and access. It is well know that users learn of different manner and in general it is proposed different learning styles. In addition, we consider here that cultural aspects (traditions, best practices and customs) could help to learn in a more familiar manner to the member of a society.

Actually, the view and controller conform respectively the look and feel of the graphical user interface of a multicultural learning object. Then, the graphical user interface could be separated from the academic content (Model) given different representations in functions of user requirements. With this separation, it is possible to have an effective maintenance and reuse of software components by different stakeholders, for example designers, developers, teachers and pedagogues.

Concerning to implementation of a multicultural learning objects, it could be easy to develop since several toolkits and object oriented language (such as a, C++, Visual Basic, Smalltalk, etc..) support the architectural model MVC. It would rather open standard and public domain software libraries and tools. For the software architecture we let us guide from the Model-View-Controller (MVC) paradigm [4] [9]. The requirement that the LO has to be displayed in a Web-browser, resulted in the decision to use JavaEnterprise technology and the graphical user interface could be composed with swing components. The metadata handling is done by means of XML based on SCORM format.

IV. CASE STUDY

Mexico is a recognized as a country with a rich culture and a large diversity of traditions, one of the reach traditions is the celebration of day of the dead. This case study shows the specification of a multicultural learning object of day of the dead in Mexico. For this purpose, we present the case study in two sub sections; the first one describes the architectural model at design level and the second sub-section at implementation level.

A. Design level

The celebration of day of the dead are echoed in cities and villages throughout Mexico. As each locality offers distinctive traditions and a unique flavor bound to fascinate the curious traveler, a visit to any Mexican cemetery would be a worthwhile addition to the itinerary of anyone touring the country this time of year [5].

A design of a multicultural learning of the day of the dead requires put clear that this tradition is marked throughout all Mexico by a plethora of intriguing customs that vary widely according to the ethnic roots of each region. Common to all, however, are colorful adornments and lively reunions at family burial plots, the preparation of special foods, offerings laid out for the departed on commemorative altars and religious rites. In general at elementary school, Mexican students require to study about their traditions, they could choice the multicultural learning object representing in the figure 2. Note that there are a set of views which represents different versions of celebrations of day of the dead in Mexico. User could learn about this celebration with the information given by the module Model, they regroup the cultural information and activities as well as some assessment resources.

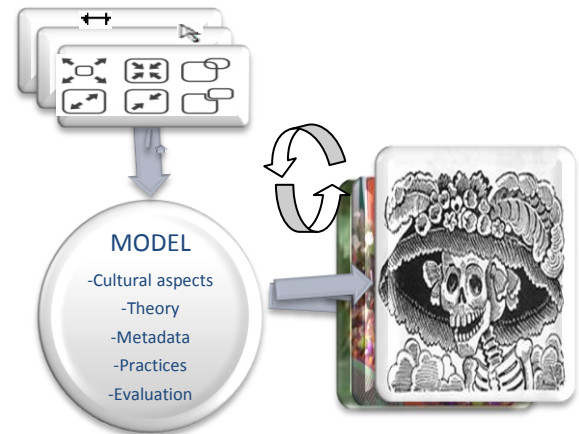


Figure 2. A first representation of learning object titled “ celebration of day of the dead in México.

This multicultural learning object could be useful for users interested in different forms of celebration of day of the dead in Mexico. A more explicitly architectural MVC model for this object is specified in the figure 3. Note that the module Controller could get the user actions coming from different input devices, and the set of view could describe the celebration of this tradition in function of different regions of Mexico, as follow:

1. *North of México region.*- Halloween is a tradition usually celebrated in Mexico in particular in the border states with the United States of America. Some typical Halloween activities include costumes and attending costume parties, ghost tours, , and watching horror films. bonfires, visiting haunted attractions telling ghost stories or other frightening tales.
2. *Center of México region.*- Most México guidebooks make special mention of day of the dead traditions celebrated in the center of Mexico, in particular in the Janitzio Island, families celebrate the day of dead with dishes, music and night candlelight vigils in the cemeteries.
3. *South of México region.*- Some altars with some pictures, dishes and meals appreciated in life by the dead, These altars in honnor to dead of familie with several dishes and flowers are installed in the houses at south of Mexico.
4. *Center-Occident of México region.*- The people of region centre occident remember this day with Mexican revolution style with several representations of skeleton. One of the skeleton is the Catrina representig a woman who was member the high society. Also the mexican revolution skeletons are considered to wear by the people during the day of dead in Center-Occident of Mexico.

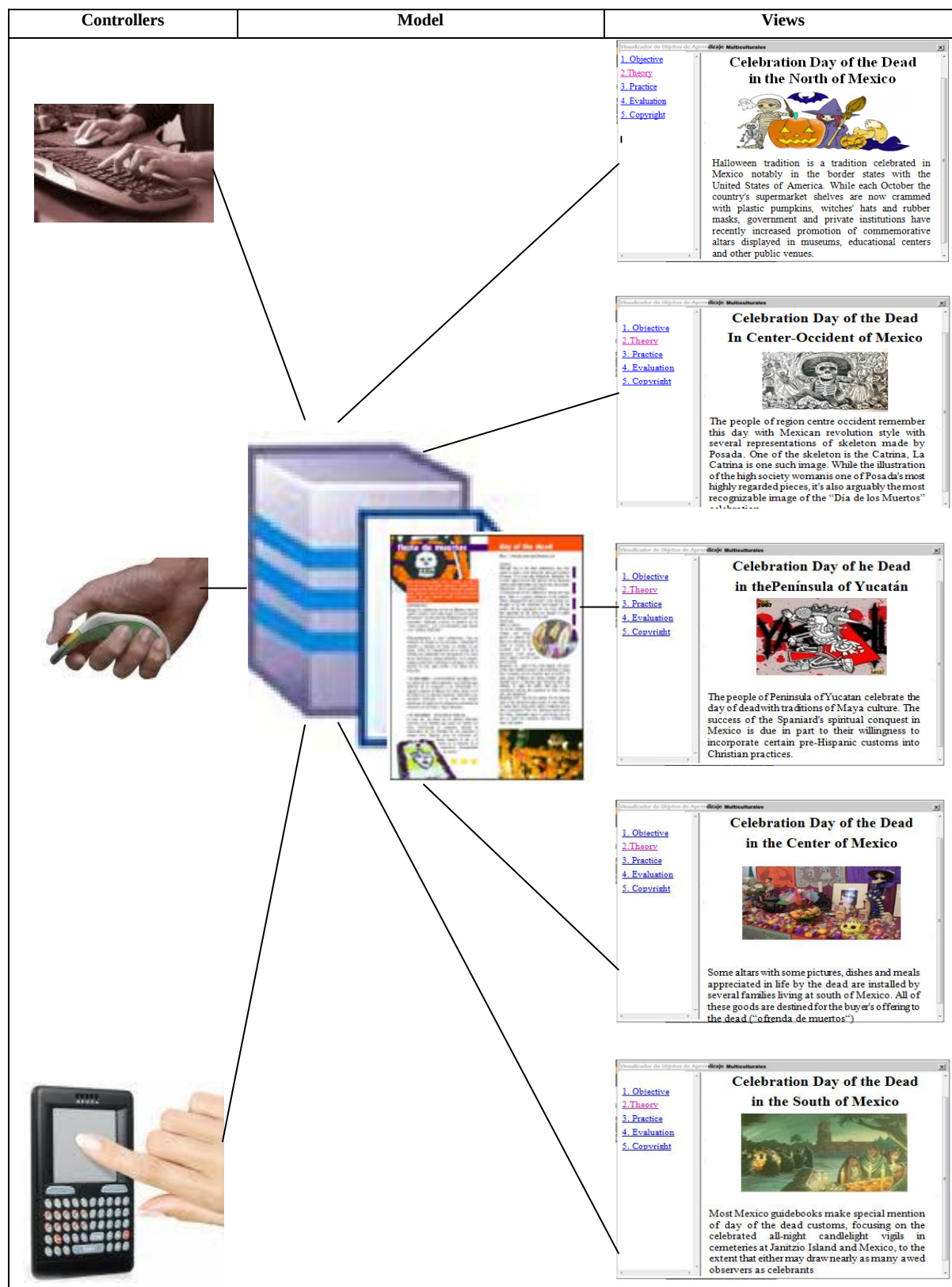


Figure 3. Architectural model of multicultural learning object titled “Celebration of day of the dead in México”.

5. *Península of Yucatán region.*- The people of Peninsula of Yucatan celebrate the day of dead with traditions of Maya culture incorporating certain pre-Hispanic customs into Christian practices

The multicultural learning objects proposed in this case study was possible, thanks to the information obtained with colleagues from different regions of Mexico.

B. Implementation level

Once our multicultural learning object is specified under MVC architecture, it is possible to implement it using the *Observer* design pattern of Gamma et al.[9], this is described in figure 4 as follow:

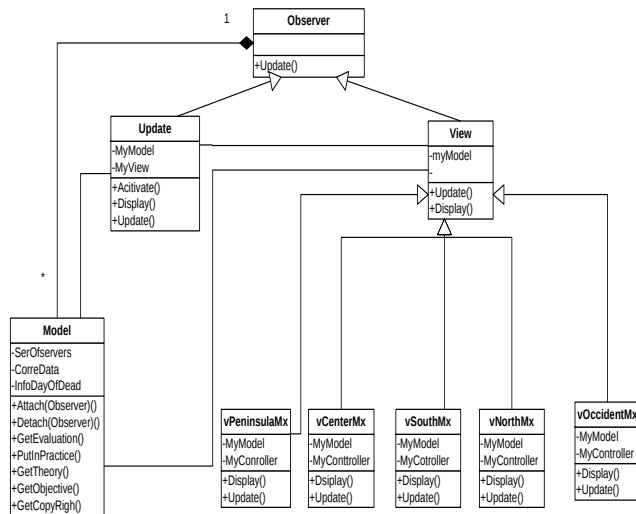


Figure 4. Class diagram of Multicultural learning Object about the Celebration day of the dead in México

Using the *observer* design patterns is possible to use a class view for every graphical representation of our multicultural learning object. The class Model encapsulates all information of the day of the dead in Mexico. In addition, it supports a set of function for learning object such as: *GetTheory()*, *PutInPractice()*, *GetObjective()*, *ApplyTest()* and *GetCopyright()*. These functions are enable and displayed by a set of interactive component of graphical user interfaces, then user actions could activate these functions and the results could be displayed in the different views.

V. CONCLUSIONS

The design of multicultural learning object for giving solution to software problems is considered as a complex task which is usually left as a programming activity. This work purposes an architectural model to design and develop multicultural learning objects in an effective manner. Considering cultural aspects is possible to reuse them in different context for a large diversity of community

of users. We propose an architectural model based on the design pattern MVC (Model-View-Controller). The model proposed here encapsulates the main content of a learning object in the module Model, the set of views could represents different cultures, traditions and customs according of information given by the models and the user interactions throughout the Controller model.

As conclusion, it is important to say, that the adaptability, the evaluation and the massive production of multicultural learning objects, they are some research topics to be considered like future work.

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