12th International Conference on
Multimedia in Physics Teaching and Learning,
13-15 September 2007, Wroclaw, Poland

Conference Proceedings

Sasa Divjak
University of Ljubljana, Slovenia

Slovenian Experience with Developent and Deployment of SCORM Compliant Courseware

Abstract: Slovenian Ministry of Education granted several projects focused in development of e-learning courseware for secondary and elementary education. All projects have to fulfill several selection criteria. One of this was that the developed material should be compliant with actual official curriculums of the particular subjects. The second was that it should be enriched with interactive and multimedia elements. The developed materials should also permit reusability and adaptability to particular learning environments and scenarios. Such courseware should be compliant with most popular learning management systems which are introduced in Slovenian schools. An obvious choice was to follow SCORM standard. Since this standard is in continuous development several problems related to the incompatibility of the available authoring tools and learning management systems with this standard arise. The paper explains the experience gained and shared during the mentioned projects.

Keywords: e-learning, SCORM, learning scenarios, LMS

1. INTRODUCTION

Slovenian Ministry of Education and Sport granted several projects focused in development of e-learning courseware which could be independent and compliant with the most popular Learning management Systems which are planned to be used in Slovenian Schools. The use of SCORM standard [2] was an obvious choice and also one of the prerequisites of the se projects. This means that the learning content should be packaged in so called SCORM contents packages, a special form of zip files. Other preconditions were that the e-learning pages should be enriched with multimedia and interactive elements. The use of SCORM should also lead to the reusability of the developed materials.

The basic principle of SCORM is to implement SCORM compliant material on a server running LMS (Learning management System). The user (usually a learner) accesses this server as a client. However it should also be taken into account that only some schools are already using servers with learning management systems. In order to avoid restriction to such advanced learning environment it was decided that the developed learning material should be also runnable as usual hypertext.

One of the granted projects is focused in teaching and learning of Computer and information technology according to the official curriculums in the secondary schools. The first phase of the project was dedicated to the analysis of these curriculums and to the definition of particular topics that should be covered. In particular the subject of Informatics for general gymnasiums and the subjects of Computer technology and Computer networks for technical gymnasiums were treated.

2. SCORM FUNDAMENTALS

SCORM, the Sharable Content Object Reference Model, is a technical specification that governs how online training (or "e-learning") is created and delivered to learners. It is a collection of standards and specifications for web-based e-learning. It defines communications between client side content and a host system called the run-time environment. The former is usually a function of a learning management system). SCORM also defines how learning content may be packaged into a transferable ZIP file.

Sharable Content Objects (known affectionately as SCOs) are small, reusable, building blocks of instruction. They are the interchangeable parts that people creating instruction can put together in different ways to create a lesson, a course, or even a curriculum. A SCO can be as small as an image, text, or audio used to support e-learning, a block of information such as a procedure or a concept, or a meaningful assembly of smaller objects like a lesson, a unit, or a course.

SCORM Navigation defines how learning and system initiated navigation events are triggered and processed, resulting in the identification of learning activity for delivery. Navigation is the process by which a learner and an LMS cooperate to identify navigation requests to realize a learning experience.

For a learner to access a course or any of its activities, it must issue a navigation request. The result of each navigation request is one of two things: an activity is delivered to the learner or the current activity is taken away. Only one activity can be experienced by the learner at a time.

How the LMS knows which activity to deliver in response to a navigation request is defined by the content package's activity tree and sequencing information. By default, a learner experiencing a content package will choose an activity from the tree to launch. Some typical navigation events are the following:

Start: request to identify the first activity of a tree, generated automatically by the LMS when the learning begins his learning.
Resume: request to resume a previously suspended attempt on an activity tree
Continue: request to go to the "next" learning activity available in the tree
Previous: request to return to the "previous" learning activity (in relation to the current activity) in the tree
Choose: request to "jump" directly to a specific learning activity in the tree
Abandon: request to immediately terminate the current activity
SCORM 2004 defines the sequencing information that describes how SCORM-conformant content may be sequenced to the learner through a set of learner or system-initiated navigation events. It provides the ability to prescribe the intended learning sequencing strategy.
SCORM is a standard still in development and currently many tools support its previous version, SCORM 1.2 and only some are compliant with the current SORM 2004 (also known as SCORM 1.3).

3. STRUCTURE OF THE COURSEWARE

One of the main questions was the granularity of the developed material and corresponding content packages. One possibility was to embed the entire subject in one single content

package. This could simplify the importing of the SCORM package into a given learning management system. But it also means decrease of the flexibility and reusability of such courseware. Therefore a second alternative was chosen. According to this each particular topic was considered as a package. The disadvantage of this approach is that the administrator has to import many packages in order to publish on the server the whole subject.
This disadvantage was bypassed with the introduction of composite content packages. This means integration of several content packages, all belonging to a particular subject, into a single- more complex package. From the internal point of view we should know that each content package is represented by a single zip file which contains a so called manifest file (imsmanifest.xml). This file describes how the content package is to be used by a LMS. Such files become sub-manifests of a larger package.

4. INTERACTIVITY OF EXAMPLES

The basic didactic units are represented as hypertext pages which contain pictures, animations and also interactive examples, mostly represented by flash animations and some enriched with applets. Following the experience with well known physlets [3] the interactivity of applets was achieved by public functions which permit the integration of interactive commands in hypertext. Some attention was paid to reusability of such applets in different didactic scenarios.

One example of such generalized applets is shown in the Figure 1. It demonstrates the model of a simple computer. The algorithm can be written as a pseudo code or in a simplified assembly language.

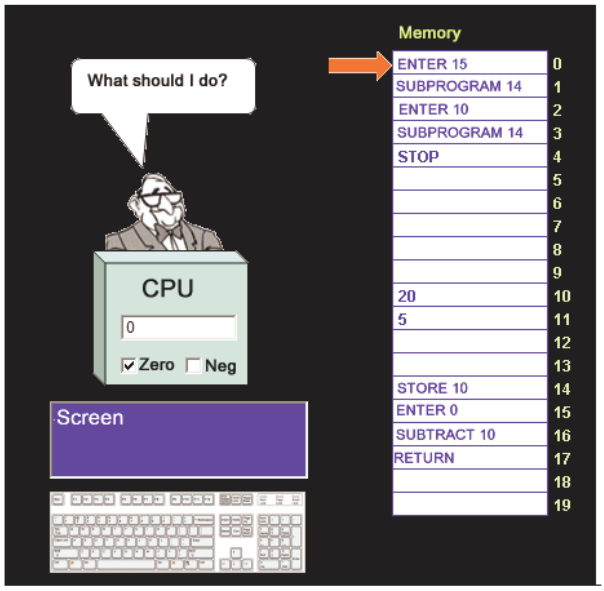

Figure 1: *Interactive example of a simplified computer, controllable by JavaScript functions*

Other scriptable applets are used for illustration of history timeline, comparison of analogue and digital data, demonstration of basic digital circuits etc.

One basic problem of such interactive demonstrations is that it is sometimes difficult to find the idea what can be animated with such approach. This is in contrast to the experience in

natural sciences, in particular in physics where the interactive simulations of natural phenomena are an obvious didactic alternative.

5. MORE PROBLEMS

One basic problem encountered during development and adaptation of the already available materials was the incompatibility of tools with selected standards. Some authoring tools are still supporting SCORM1.2 or their declared conformance with recent version 2004 is only declarative. Sometimes the deficiencies can be discovered only on some internet discussion forums. Even using conformance test tools provided by the official associations the behavior of the developed courseware is sometimes strange, unexpected. Therefore it was decided to use only the possibilities that represent a common denominator of used authoring tools and most popular learning management systems. Despite interesting possibilities of courseware sequencing defined in SCORM2004 it was decided not to use it and use only navigation possibilities.

6. CONCLUSIONS

During the project more than 800 hypertext pages were created or adapted. These pages were enriched with more than 1500 pictures and more than 200 flash or java animations or interactive elements. In development several problems were encountered. One was the lack of needed learning materials and most of them have to be rewritten. The second was that the official curriculums have many discrepancies. The third problem vas the lack of experience with SCORM standard and encountered nonconformities of used tools with it.

REFERENCES

[1] WEB page of the project http://colos1.fri.uni-lj.si/ERI
[2] Advanced distributed learning: http://www.adlnet.gov/
[3] Physlets home page: http://webphysics.davidson.edu/Applets/Applets.html