Creating the Interactive Course "Solid Works 3D" using SCORM Options in MOODLE

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Abstract: The aim of the paper is to introduce the students from the ‘Computer Systems and Technologies’ degree course to the basic menus, instruments and operations of the 3D software product “Solid Works”. The developed course does not only offer a digital version of the learning material content, but also interactive presentation of every single lessons, exercise and module. The main steps in the creation of interactive multimedia course on the subject “Computer Graphics” are presented as well as its implementation in the platform for electronic and distance learning Moodle, using the SCORM opportunities to implement the interactive applications.

Key words: e-Learning, Interactive learning, SCORM, Moodle, Solid Works

INTRODUCTION

Creating interactive content is a great way to engage learners. Research has proven in time that the interactive learning improves comprehension, retention and on-the-job performance and cost less than physical simulations and other active learning approaches. The development and the wide spread dissemination of modern information technologies set new requirements for the Learning Management Systems (LMS). The development of LMS requires in parallel the development of standards and specifications as a tool for standardization of the used electronic learning resources. The e-Learning standards define a coherent content, by which the Learning management systems can work properly as also and the developers of its information themselves. The application of standards in the LMS ensures the good structural description of digital didactical content, of virtual courses and their participants, as well as the overall design of the systems [1].

There are numerous standards and specifications for e-learning and several developer organizations: ADL (Advanced Distributed Learning), AICC (Aviation Industry CBT Committee), IMS Global Learning Consortium, IEEE-LTSC, ISO / IEC JTC1-SC36 (Fig. 1)

![Fig. 1: Cycle of the standards](image)

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the development of ADL and as a tool it defines the structure of the training materials and the interface of the environment. SCORM is a collection of standards and specifications for web-based e-learning (Fig. 2).

![Fig. 2: SCORM – collection of standards](image)

The SCORM standard allows content authors to distribute their content to a variety of Learning Management Systems (LMS). The main benefits of using SCORM are:

- **Wide accessibility** - locate and access components from various remote locations and easy deliver them to many other locations;
- **Easily adaptable** - tailor your training to any individual or organizational needs;
- **Reducing the time and increasing the efficiency and productivity of electronic courses**;
- **Easy transfer of components created with other software tools without modification**;
- **Reusable components**.

A summarized model "client - user" using the standard SCORM is presented on the figure below (Fig. 3.):

![Fig. 3: Summarized “client-server” model using SCORM](image)

Core elements of the SCORM model are [2, 3, 4]:

- **SCO (Sharable Content Object)** – a Web document that in the course of its implementation interacts with the LMS in order to transmit and receive various data. It is the smallest piece of content that is both reusable and independent;
- **LMS (Learning Management System)** - a software application for the administration, documentation, tracking, reporting and delivery of electronic educational technology (also called e-learning) courses or training programs;
- **Learner’s Computer** – end user of the educational materials.
- **SCORM includes in itself also**: 

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**Fig. 2: SCORM – collection of standards**

**Fig. 3: Summarized “client-server” model using SCORM**
– Content Aggregation Model (CAM) - defines how to package content for exchange from system to system and also describes the components used in a learning experience, and how to describe those components to enable search and discovery;

– Run-time Environment (RTE) - defines a common data model and application program interface (API) for e-learning content. This combination of data model and API allow for standardized communications between client-side content and a system component (called “the run-time environment”), which is commonly provided by a Learning Management System (LMS);

– Sequencing and Navigation (SN) – describes how the content is delivered to learners through a set of system-initiated navigation events. The branching and the flow of that content may be described by a predefined set of activities [5].

The outlined features of SCORM make it particularly attractive for creating interactive multimedia applications for e-Learning.

The aim of the paper is to present the realisation and implementation of an interactive multimedia application, used for the needs of the students, who participate in the course “Computer Graphics”, studied at Technical University of Gabrovo.

LAYOUT

Flash is the professional standard for producing high-impact Web experiences. It enables authors to build attractive and effective Web interfaces and applications, beautiful graphics, and engaging narrative animations [5]. The software product “Adobe Flash” is used for the creation of the multimedia application “SolidWorks Tutorials”. It combines vector and raster graphics, thanks to built-in scripting language ActionScript it is possible the realization of interactivity [6]. Flash displays text, vector graphics and raster graphics to provide animations, video games and applications. It allows streaming of audio and video, and can capture mouse, keyboard, microphone and camera input. Adobe Flash Player enables end-users to view Flash content using web browsers [7].

When creating an online course the most important criteria to be met to ensure that the students receive the benefits they sign up for and they are satisfied with the presented material [8]. The application “SolidWorks Tutorials” includes the following content regarding all the topics studied in the Computer Graphics course. The following sections are included in the main menu: “Home”, “Intro”, “3D Modelling”, “Lessons” and “Downloads” (Fig. 4).

Fig. 4: Home screen of the “SolidWorks Tutorials” application
The interactive course is divided in 14 different sections. Each of these chapters includes the theory behind the topic, a relevant task, video example showing how the exercise can be performed (including voice explanation and subtitles) and a questionnaire in order to make the student aware of his/her knowledge of the current topic. Video brings a whole new dimension to teaching methods. Especially if the course content involves a level of practical skill, this can be demonstrated [8].

The topics of the presented lessons are as follows (Fig. 5):

- Introduction;
- File Management;
- Using the Interface;
- Design Intent;
- Sketching Basics;
- Basic Parts;
- Basic Functionality;
- Part Templates;
- Parts;
- Assemblies;
- Drawings;
- Linear Pattern;
- Circular Pattern;
- Revolve and Sweep Features.

Fig. 5: List with the presented lessons

The implementation of the interactive courses is performed in the environment for e-learning and distance learning Moodle, used in Technical University of Gabrovo. Moodle stands out at a tall height because of the sound educational philosophy, great community and the most importantly always eager to improve upon the mistakes based on the feedbacks by a lot of community members around the world [9]. Moodle is a course management system designed to help educators to create quality online courses and to administrate the outcomes. It offers a great range of possibilities and can be easily adapted to the particular subject. For the regarded purposes it is used the built-in system
module SCORM. Figure 6 shows a general view of SCORM package for self-study of “SolidWorks Tutorials” application.

![Fig. 6: General view of the SCORM package in MOODLE](image)

The presented interactive training module “SolidWorks Tutorials” is usable as a standalone application or integrated with existing SCORM-compliant Learning management systems. Trainees control the learning process and can move between the lessons regarding their level of knowledge and speed of mastering the coursework. The application is highly motivating and interesting and therefore higher results should be easily obtained.

**CONCLUSIONS AND FUTURE WORK**

It is presented in this report the development and implementation of interactive module for studying the basic features of software product Solid Works. The application is designed for users who have never dealt with the program for three-dimensional modeling SolidWorks, as well for those that have an experience with her. The interactive application is developed by individual lessons covering the interface, key features and tools for creating 2D and 3D models.

The course is implemented on Moodle platform and for that it becomes extremely easy to make it personal and flexible. The SCORM standard focuses on enabling the plug-and-play interoperability, accessibility and reusability of the learning content, with the objective of making sure that people have access to high-quality material, which is suited to their needs and can be delivered anywhere and anytime.

The future development of the course is the creation of modules for programs such as Adobe’s Photoshop, Premiere, and as Corel Draw. A further aspect of development of the course is to create conditions for passing a module of the course, by logical conditions within the Moodle platform.

**REFERENCES**

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The paper has been reviewed.