Learning CAD by LMS and Cloud Computing Implementation

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Summary - The paper presents experience from the blended course “Computer programs” at Faculty of Civil Engineering in Rijeka. This course teaches students about CAD (Computer Aided Design) in general and how to design in AutoCAD in particular. Since 2006, lectures and course exercises have been carried out as face-to-face classes and lessons presented on LMS Moodle. By completing the individual exercises, students are expected to adopt and develop their technical drawing proficiency. Students are also involved in group activities requiring integration of their acquired technical skills, organizational skills and presentation skills.

Furthermore, intention of group activities improvement by means of latest technologies implementation is presented: by applying the cloud-computing and real-time collaboration tool students can recognise the significant potential of those applications and utilise them in the future.

I. INTRODUCTION

Numerous discussions concerning e-learning implementation have recently resulted in following general objections: lack of institutional and administrative support, lack of student preparedness for online learning, lack of technological competence on part of the professors, shortage of time, need for technical support, and academic integrity concerns [1]. At the same time, new generations of students expect introduction of new technologies into process of learning. Because of those expectations the question “Why to establish e-learning?” becomes “How to establish e-learning?”. Therefore, usage of e-learning tools in various scopes and different blended teaching models has frequently been noticed at university courses through last few years.

However, new technologies and their great potential are combined with new challenges and dilemmas, for example the option that the often observed resource deficiency in computer labs (storage space, content availability and accessibility) can be eliminated by cloud computing technology.

II. THE COURSE ORGANISATION

The course “Computer Programs” has been presenting the students the Computer Aided Design – CAD for the period of last several years. The course currently includes 2 classes of face-to-face lectures during the first month and a 90-minute lab exercises per week during the summer semester (Picture 1). In the workshop part of the course students are directed to LMS Moodle for demonstration of content and computer exercises instructions. Students are introduced to: basic concepts of computer graphics, difference between bitmap and vector graphics and AutoCAD design.

The course is not mandatory and due to organisational causes the number of students allowed to enrol is limited to 60 and divided into two groups. Every year, students’ interest exceeds the number of available workplaces.

Since 2006 a total of 629 students have enrolled the course: 372 university students and 257 students of vocational studies.

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Within our course, LMS is utilised as a:

- repository of work tasks and manuals throughout individual exercises in the computer lab,
- completed assignment files’ storage site for both individual and team exercises,
- dedicated and always accessible web-portal offering learning materials, news and various course related topics,
- place of communication for students and teachers,
- on-line testing platform: the final exam consists of an on-line test and two assignments that students submit on LMS for grading; the exam is held in the computer lab
- marks and results database – a student can check his/her ranking and progress at any time.

A. Students’ team work

Students are involved in group activities requiring the integration of their acquired technical skills, organisational skills and presentation skills. Their assignment is composed of two tasks:

1. creation of a web page with the included animation they made during lab exercises dedicated to editing of bitmap images;
2. creation of a 2D drawing with AutoCAD, where they present what they learned about vector graphics.

Members of each team choose a student who will present their team and who will bear the role of a “team leader”. The team leader then describes the responsibility and involvement of all team members after they have successfully presented their completed project.

In the first task team creates web page using a wiki tool from the LMS system. Through the development of a task they learn how to integrate their knowledge of bit-maps, animation, web design and teamwork tools.

The teamwork tools are perceived as extra motivators for students. Although the students’ group assignment can be observed as a whole from the outside, individual assessment of the contribution to the shared project could be made much more transparent with teamwork tools.

Cloud computing is a new technology that can fulfil our expectations regarding the second students’ assignment.

III. CAD AND CLOUD COMPUTING

In its broadest usage, the term cloud computing refers to the delivery of scalable IT resources over the Internet, as opposed to hosting and operating those resources locally [5]. Those resources can include applications and services, as well as the infrastructure on which they operate. In traditional enterprise computing, IT departments forecast demand for applications and capacity and invest time and money to develop those resources in-house or purchase them from others and operate them in-house. With cloud computing, institutions procure IT services from remote providers; for example, today different university constituents access these resources over the Internet. [5] Some of the computing clouds were developed especially for academic community – i.e. Microsoft live@edu project.

AutoCAD WS, a.k.a. “Project Butterfly” appears to be an interesting possibility for us.

![AutoCAD desktop and AutoCAD WS comparison](picture2.jpg)
A. Project Butterfly and AutoCAD WS

AutoCAD WS is a Web-based CAD editor with built-in collaboration features. Because it is on the Web, it is accessible from anywhere, using any computer - provided there is an Internet connection. The drawings and other files are also stored on the Internet. [6] During its development phase it was known under the name “Project Butterfly”. It was developed by Autodesk Israel between January 19th and September 29th 2010. The idea of the project has been well explained on their blog site [7]: With AutoCAD WS it is possible to edit the design within a web browser. At any time the design can be downloaded locally and editing resumed, or it may remain in the cloud, to be shared with distant colleagues without the need for sending of files.

Project Butterfly’s Web client application is based upon Adobe Flash and Flex technology. Autodesk is hosting Project Butterfly’s Web servers on the Amazon Elastic Compute Cloud (EC2) service. The Amazon Simple Storage Service (S3) stores application and user data. Project Butterfly also uses AutoCAD RealDWG technology to read and write DWG files.

At the end of the project the software was named AutoCAD WS.

Its most important features are:

- Editing and storing drawings online
- Sharing
- Accessibility from anywhere
- All participants can edit and review
- Timeline and change tracking
- Email notifications [8]

Besides browser version, AutoCAD WS Mobile can be used on popular devices: iPad, iPhone and iPod Touch, with Android version underway.

A. AutoCAD WS possibilities and limitations

In comparison with AutoCAD proper (Picture 2), AutoCAD WS comes with (expected) narrowed functionality and the most important differences are: there is no support for 3D, no advanced commands related to drawing blocks and dimensions. Some settings related to underlain images are not available in WS, but there is a new feature regarding geospatial context: underneath a drawing’s geometry a Google Maps data can be easily placed and adjusted, making a task of using WS even more interactive.

B. Work plan for students

Requirement to collaborate with AutoCAD WS is a functional Autodesk login account. Before uploading to AutoCAD WS, a drawing – even an empty one – has to be created with desktop version of AutoCAD. To engage in real-time collaboration, there are no special settings or proceedings: registered participants have only to log-in at the same time and open the same drawing.

The team leaders are expected to publish initial drawings and share them with other team members. A shared drawing will be accessible only to a team that owns it, based on personal invitations sent to them by the drawing owner – in our case, the team leader.

After those preparatory steps, each team decides how to divide tasks among themselves and how to communicate: via built-in messaging system or with review notes attached to their drawing. During a real-time collaboration session, the participants can even use chat option to make the drawing more efficient and interesting.

The task would be completed through series of drawing sessions. The sessions can be organised partly as a real-time collaboration during the regular weekly lab exercises. The students can organize the rest of the work freely, as individual or real-time collaboration.

Because the drawing itself is stored in the cloud, there will be no need of tracking changes and versions manually. The Timeline is a visual representation of the history of any drawing uploaded to AutoCAD WS, and allows the collaborators to view previous versions or track any changes made on a drawing. From the teacher point of view, this feature is extremely useful because it allows connecting actions made on the project with corresponding team members.

C. Security and auditing

Cloud computing introduces significant concerns about privacy, security, data integrity, intellectual property management, audit trails and other issues. [5] Therefore it is our intention to store students’ individual assignments as before – on in-house file server (via network drives – every student has one) and on our LMS (after assignment’s submission). Monitoring and assessment of contributions to a shared project for each student are further simplified with features built into AutoCAD WS.

IV. Conclusion

Mobile and wireless technologies have influenced development of new content sharing platforms. To enable a teaching process with new possibilities, more and more blended learning models have been developed through the last several years. The presented course has been undergoing improvements with LMS since 2006. The students have accepted LMS well [2], [3], [4] and pointed out the following advantages: accessibility of teaching material, communication with teaching staff, outlook of grades.

With completion of individual exercises students are expected to adopt and develop their technical drawing proficiency. Also, students are involved in group activities requiring the integration of their acquired technical skills, organizational skills and presentation skills. Intentions of group activities improvement by means of latest technologies implementation is presented: with usage of cloud-computing and real-time collaboration tool, students can recognise the significant potential of those applications and utilise them in the future.
REFERENCES


