NEW MODULAR APPROACH FOR KNOWLEDGE-TRANSFER IN MULTIMEDIA CARTOGRAPHY: THE E-LEARNING PROJECT CARTOUCHE

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Summary

CartouCHe (Cartography for Swiss Higher Education) is a new e-learning project and internet course, imparting knowledge about the multimedia and internet cartography to advanced students. For CartouCHe, existing courses at the three participating universities, ETH Zurich, University of Zurich and University of Applied Sciences Northwestern Switzerland, were redesigned to improve the quality of the learning materials. Built on modular content structures and techniques, the whole course offers high flexibility and extensibility. The deployed techniques easily allowed new teaching tools such as user-controlled animation-streams or interactive tutorials. The whole course is used in the blended learning mode within the curricula of the involved universities, whereas the blended learning aspect will be mainly applied for colloquia, discussions and exercises.

1 Motivation

In the last ten years, e-learning was hyped and pushed from nearly all academic institutions. Since one or two years, the hype is over and only the meaningful courses survived, others vanished into thin air. During this difficult phase, the new e-learning course "CartouCHe – Cartography for Swiss Higher Education" (Cartouche 2007) was developed. The reason for this decision was the fundamental change of the output media from analogous paper maps to two- and three-dimensional digital maps on mobile devices and for internet applications. This shift is one of the major current challenges in the field of geomatics and geography. Since only few textbooks and didactical tutorials for this field of interactive mapping exist, we are convinced that the teaching of these new media can be done best by using the media themselves.

2 CartouCHe – An Overview

CartouCHe (Cartography for Swiss Higher Education) is a new e-learning project and internet course, imparting knowledge about multimedia and internet cartography to advanced students. It is part of the Swiss Virtual Campus (SVC 2007). CartouCHe was initialised by the three leading universities in Switzerland dealing with multimedia cartography in research and education: Institute of Cartography at ETH Zurich (IOC 2007a), Department of Geography, section Geographic Information Systems, at University of Zurich (GISDOG 2007) and Institute of Geomatics Engineering at University of Applied Sciences Northwestern Switzerland (IOGE 2007). Each project partner developed a module, covering its own specialized field. The three modules deal with the following topics:

- Multimedia Cartography
- Location Based Services
- 3D Applications

The course language is English. The whole course (with all three modules) is equivalent to three ECTS credits. Each credit point is given after passing an exam at the participating universities.

The project started end of 2004 and was finished end of 2006. Currently, CartouCHe is in the maintenance phase until July 2008.

3 CartouCHe's Structure and Content

3.1 Content and Pedagogical Concept

As mentioned before, CartouCHe consists of three modules covering a broad range of themes. In contrast to the GITTA project (GITTA 2006), the focus of CartouCHe is no longer the design and implementation of static paper maps, but that of interactive, thus adaptable maps. Since an 1:1 transformation of book chapters to a web format is not a solution, the huge amount of content had to be generalized and prepared for the use in the internet. As a result of this process, the pedagogical concept ECLASS (Entry – Clarify – Look – Act – Self-Assess – Summary) of the GITTA project, originally adapted from Gerson (2000), was applied to the smallest structuring block of the modules (Figure 2).

Each of the three modules has a fix number of lessons depending on the size of the content to be presented. Figure 1 gives an overview of the themes of each module.

Multimedia Cartography	Location Based Services	3D Applications
1. Introduction to Multimedia Cartography 2. Computer Graphics 3. Internet Techniques and Web Formats 4. Planning Multimedia Projects 5. Data Storage and Structure 6. Cartographic Design for Screen Maps 7. Navigation - Concepts and Tools 8. Graphical User Interface - Layout and Design 9. Animation and Interactivity 10. Standardisation and Webservices	1. Foundations of LBS 2. Techniques for LBS Cartography 3. Designing Maps for LBS 4. Solutions for Small Screen Map Design 5. WebPark: LBS in Action	1. 3D Applications - Introduction & Motivation 2. 3D Space 3. User Interaction and Navigation 4. Basic Cartographic Modelling of 3D Space 5. 3D Visualisation Technologies - Overview 6. Advanced Cartogr. Modelling of 3D Space 7. Internet-based 3D Cartography 8. 3D Applications and Augmented Reality

Fig. 1: Content of the CartouCHe modules

The smallest building block is the unit. As a result of student's evaluations, a maximum of six units form one lesson, needing only a small amount of time for reading and exercises. The ECLASS concept is applied to the units (Figure 2). The estimated time per lesson is about 1 to 1.5 hours, while each unit requires approximately 10 to 15 minutes. The time includes reading, exercises and knowledge assessment tests.
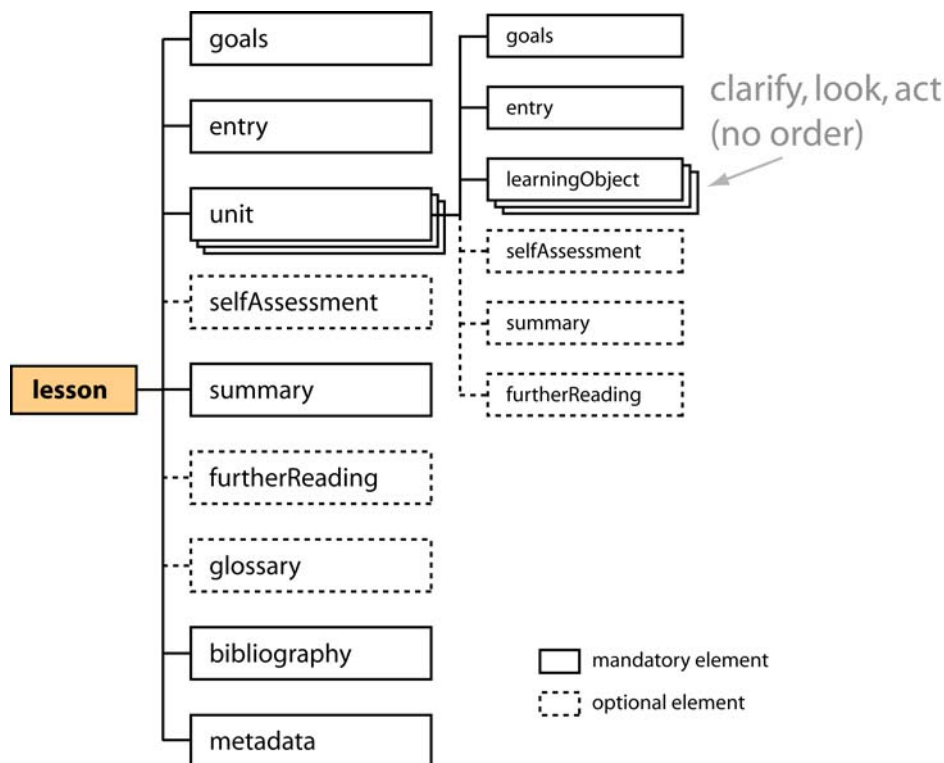

Fig. 2: ECLASS structure of the CartouCHe lessons and units, marked with eLML elements

3.2 Quality Assurance

In CartouCHe, the content was written by different authors at the three participating universities. Therefore, a multi-stage evaluation and reviewing process was developed to assure the quality of the written content. As a first step, experts in the discussed field, coming from the same institution, reviewed the lesson. A second evaluation took place for each lesson with all authors of the participating universities. In a third step, independent didactical experts of the ETH Zurich reviewed the content of the lessons. Additionally, the group leaders, global experts in the field of cartography, evaluated their lessons. As the last step, students and other user groups of different age reviewed the content. Figure 3 shows the five levels of the quality assurance process.
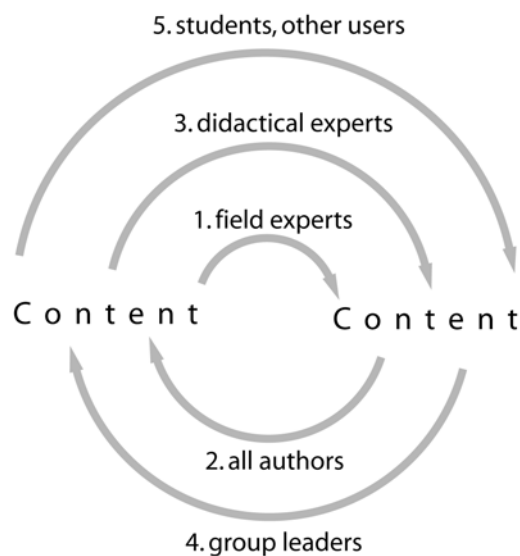

Fig. 3: CartouCHe quality assurance process

3.3 Use of New Media

A main reason for the e-learning course was the use of new media. Since passive consumption of learning contents is not up-to-date anymore, the new cartographic media allow now a true interaction between the map and the user: Queries can be transmitted via the user interface directly to the system, which then responds by means of an individually tailoured map. This map can be queried in detail using interactive techniques. In CartouCHe, animations, interactive maps, 3D applications, Web Map Services, movies as well as audio sources and text are used. These new media elements were integrated with standard multimedia web techniques such as Extensible Hypertext Markup Language (XHTML), Scalable Vector Graphics (SVG), Extensible 3D (X3D), Virtual Reality Modeling Language (VRML), ECMAScript, and proprietary multimedia techniques such

as Flash, Quicktime and WMV movies and mp3 files. Figure 4 shows an example of the integration of an X3D file.

Fig. 4: Embedded X3D file (right hand side) in the CartouCHe lesson

Nearly each unit in a CartouCHe lesson intensely uses the new media such as interactive examples, quizzes and visual aids, depending on the learning objective. Additionally, links to related topics, external sources and tutorials as well as explanations of terms as tooltip were integrated.

4 CartouCHe's Technique - Modularity and Flexibility with eLML

To increase the reusability of the course, CartouCHe was designed to be modular, flexible and extensible. From a didactical point of view, each unit and each interactive example should be usable separately in different courses. The ECLASS concept provides the possibility to do this.

To transform this modular concept to the web, the XML-based eLesson Markup Language (eLML) (ELML 2007) was used. The XML approach allows an easy updating and the extension of the description elements. The eLML content is defined as an XML Schema and allows a complete description of the lesson's content (Figure 2). It includes entries for the topic, an exact description of the learning objectives, view-only examples (look), interactive examples (act), the definition of terms (clarify), summaries and self-assessments. Even more, additional meta information can be integrated, reaching from a glossary, a bibliography, reading recommendations to installation hints, additional author and lesson information and copyright issues. With eLML, each part of the content (e.g. images or an unit) can be used by a direct link. This is ideal for teachers, if one just wants to explain a process with an example or explain a certain term by pointing out a small unit to read. Therefore, the student's as well as the teacher's acceptance for e-learning will be increased.
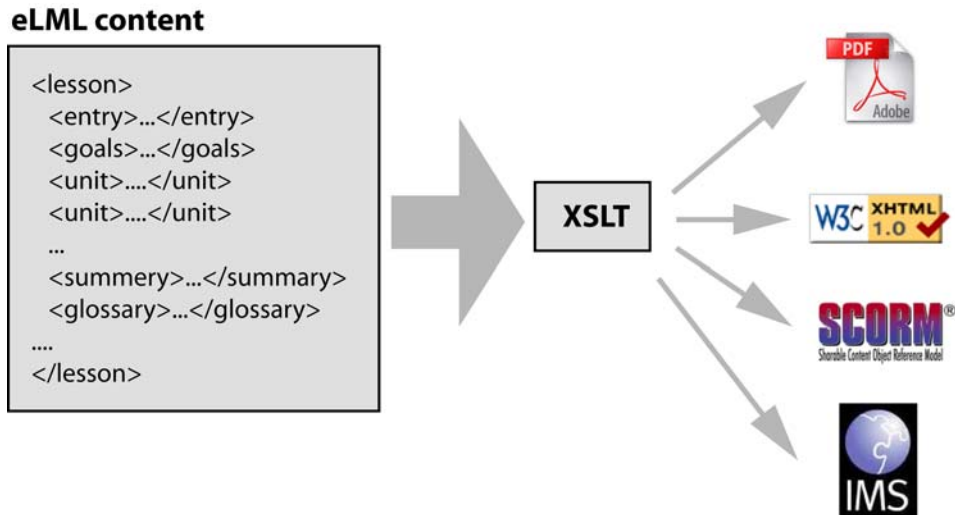
Fig. 5: Workflow for the application of eLML

A further advantage is eLML's strict separation of content and presentation which increases the reusability of the content. Multimedia elements and images are separated from text. They are stored in different directories. With XSL transformations, different output formats such as XHTML, PDF, and standard e-learning content packages (IMS, SCORM) can be created und integrated in various learning environments or used as stand-alone applications. Figure 5 shows the workflow for the application of eLML.

In general, the course can be used from all possible platforms (e.g. Windows, Linux, Mac) with all standard web browsers (e.g. Firefox, Opera, Safari, Internet Explorer). All necessary plugins for vector graphics, audio and video are available free of charge.

5 Integration in the Teaching Activities

Although CartouCHe can be used as stand-alone tutorial, the CartouCHe lessons are used in a blended learing mode within the curricula of the three participating universities. This is a result of various student evaluations at ETH Zurich, showing a clear tendency to keep the classical ex-cathedra teaching. But even as an additional learning tutorial, CartouCHe provides many advantages for students and teachers: The added value of the course for teachers is the easier preparation of their lectures by beeing freed from the time-consuming search for examples and literature. Furthermore, they can use the examples of CartouCHe in other courses, since they are accessable and reusable. While CartouCHe content is didactically proven, the so called "red line" gives teachers as well as students a guide and learning direction through new learning fields. For students, the course has the positive effect of allowing them to prepare the lecture, which may lead to a better interaction

between student and teacher during the lectures. The students will be given sufficient time for self-conducted learning at home. They also have access to the content day and night and can use the offered PDF script for preparing their exams. Additionally, they can explore the interactive and animated examples by their own, which leads to a better understanding and an easier recapitulation of the content.

At the Institute of Cartography (ETH Zurich), the module "Multimedia Cartography" is used in the course of the same name (IOC 2007b). The module was integrated as IMS Content Package in Moodle, an open source e-learning platform (Moodle 2007) and is intensively used by the students as well as the teachers (Figure 6). The Department of Geography (University of Zurich) uses the module "Location Based Services" in OLAT (OLAT 2007), the Institute of Geomatics Engineering (University of Applied Sciences Northwestern Switzerland) integrated the module "3D Applications" in WebCT Vista (WebCT 2007).
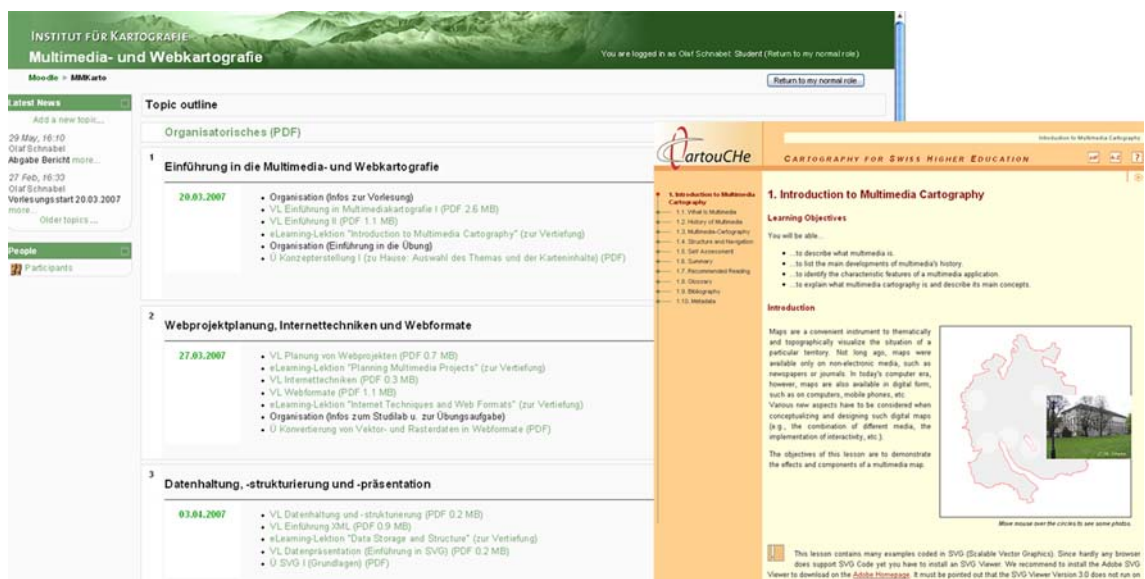

Fig. 6: Integration of CartouCHe in Moodle

6 Towards Open Content

It was also necessary to focus on the copyright issue. Since CartouCHe is used at different universities with different strategies, each CartouCHe partner is responsible for the copyrights of its own module. Currently, the modules are only usable for the project partners, but a further dissemination of the CartouCHe content is planned. The existing network of the GITTA consortium provides a good starting point. Within the GITTA project, an association was established to maintain the lessons. This new association is

open to every active member or sponsor interested in using, updating and/or promoting GITTA materials. The content of the lessons is available for free under the conditions of the "Creative Commons" licence.

In this context, a foundation of a similar association or the expansion of the tasks of the existing association by bundling the maintenance of CartouCHe and GITTA will be discussed intensively by the project partners. As one option, other universities or institutions could join the association whether to get access to the content (if it is not freely available) or to integrate it in their own environments and distribute it to their students. This approach is currently discussed in detail, since free content also requires permissions for the use of the external examples. This point can be easily clarified, since the cited external sources are collected at the end of each lesson in a bibliography list to see them at a glance. A second possibility is a separate but also free dissemination of the content, requiring only an authentification. This option is currently in use for the project "Dealing with Natural Hazards and Risks", NAHRIS (NAHRIS 2007).

7 Conclusion and Outlook

The new e-learning course CartouCHe complements the few textbooks and didactical tutorials for this field of interactive mapping with themes about up-to-date techniques and the use of new media. The whole course provides a good overview of multimedia and internet cartography, using the media themselves. With the help of the didactical concept ECLASS and the use of flexible and extensible techniques such as eLML, a highly modular e-learning course was developed and can now be used on demand as a stand-alone course or in a blended learning mode. Furthermore, the CartouCHe lessons were successfully integrated in various learning environments. Currently, they are intensely used in the curricula of all three project partner universities. In the future, a further dissemination of the content is planned, but not settled yet.

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