E-LEARNING ON GEOGRAPHIC EDUCATION IN HIGHER EDUCATION

Chimos Konstantinos [1], Karvounidis Theodoros [1], Mpasios Michael [2], Tsiligiridis Theodoros [3]

1 INTRODUCTION

The rapid development of Internet has already deeply influenced the life styles of people and the methods of handling affairs in e-era. The information technology becomes closely linked with activities of daily livings. According to the report of Hellenic Network Information Center, the number of people who access the Internet in Greece has risen from 4,3 million in 2008 to 6,8 million on 2012.

This percentage reveals that people rely on Internet to get information and they can learn through surfing on the Internet. Digital education improved the communication between students and teachers. E-Learning is an innovative and convenient learning mode. Students can acquire learning courses of their choice through Internet.

In the current century where there is an apparent information explosion, e-learning is an education mode which put into practice worthily. More complex subjects and materials are introduced in higher education; therefore, to increase the flexibility of learning and to keep examination styles updated there are two essential aspects. Digital education can resolve both of these concerns

The paper focuses on Geographic information in higher education and implements e-Learning website which integrates Geographic information system (GIS) and other technologies to assist teaching. By using open software Course Management System (CMS), Moodle, the study expects to achieve the target of collaborative learning and the effect of e-Learning. GIS is an auxiliary tool which is able to store, process, applies, display the numerical Geographic information. It has been widespread applied. The study considers that students must understand the basic concept of GIS in depth before GIS applying. Therefore, the paper pays attention to instruct the basic concept of GIS and make use of the technologies to transform boring textbook into interesting learning materials. The triad of this research is the following.

First by implementing a website which supports e-learning activities (course giving material posting, communication handling) related to geographical information with SCORM standards.

Second by introducing a collaboration learning mode with virtual communities and leveraging the horizontal (among peers) and vertical (among instructors and students) interaction through the aforementioned website.

Finally to establish a learning path between students and instructors in a way that students are continuously aware of their progress.

TECHNOLOGICAL ISSUES

1.1 Streaming Video Over IP

Recent years have seen many advances in several fields, such as computing and data transmission technologies, compression technology, high bandwidth storage devices and high speed networks that have generated new results in multimedia information distribution technology and make it possible to provide real time multimedia services over the Internet. Videoconferencing is one of the most demanding and appealing applications in this context. Video data must be streamed and played out continuously. If the data stream is interrupted over a time interval, exceeding the buffering capacity of the receiver, the video play out process will enter a pause status. In e-learning applications these interruptions will annoy end-users, leading them ultimately to abandon the system. However, there are critical contexts in e-learning services, where low quality of service in video streaming may induce incorrect decisions and data interpretation, leading to unpredictable consequences. To minimize remote video streaming interruptions, new coding techniques are implemented that include streaming encoded video data throughout the network. The quality of the streamed data will behave much better on network links that are not congested or are optimized to provide a predictable level of service to the video. This is true Quality of Service (**QoS**), which measures how smoothly a transmission reaches from the local to the remote endpoint, and vice-versa.

In the above context the MPEG standards provide the most widely spread collection for compression and transmission of video data. This collection of standards includes MPEG1, MPEG2, MPEG3, MPEG4, MPEG7 and MPEG21. The compression methodology is considered asymmetric in that the encoder is more complex than the decoder. The encoder needs to be algorithmic or adaptive whereas the decoder is retarted/dumb and carries out fixed actions. This is considered advantageous in applications broadcasting, such as e-learning, where the number of expensive complex encoders is small but the number of simple inexpensive decoders is large. This approach of the ISO to standardization in MPEG is considered novel because it is not the encoder which is standardized; instead, the way in which a decoder shall interpret the bit stream is defined. A decoder which can successfully interpret the bit stream is said to be compliant. The advantage of standardizing the decoder is that over time encoding algorithms can improve, yet compliant decoders will continue to function with them. The MPEG standards give very little information regarding structure and operation of the encoder and implementers can supply encoders using proprietary algorithms. This gives scope for competition between different encoder designs, which means that better designs can evolve and users will have greater choice because different levels of cost and complexity can exist in a range of coders yet a compliant decoder will operate with them all.

Basically, MPEG video is composed by several Groups of Pictures (GoP) each containing sets of video frames, relying mostly on inter-frame compression. Each GoP starts with an intra-coded frame (a key frame) and includes all inter-coded frames of the sequence up to the next intra-coded frame The key frame interval may be variable depending on the bit-rate or the image quality required. The MPEG1 standard was originally designed for bit-rates of 1.5MBit/s, for stand-alone applications, with 352×240 resolutions. The basic coding algorithm combines motion-compensation, inter-frame prediction and intra-frame transform coding. Each frame is divided into 8 x 8 blocks, called macro-blocks, and for each one divided into 8 x 8 luminance sub-blocks, resulting in to 16 x 16 block motion compensation. The MPEG2 standard is an extension and higher bit-rate of MPEG1 video that supports a range of full motion interlaced video and audio coding application in different transmission rates with emphasis on scalability. With highlight scalability in MPEG2, it is possible to drop some parts of the video data stream and proceed with lower quality decoding, i.e. with scalability it is possible to reconstruct video frames from pieces of the total stream – spatial scalability. The total bit stream may be structured in layers, starting with a base layer and adding refinement layers to reduce quantization distortion or to improve resolution. This acts like several filters that progressively improve the video quality. This layer structure is possible when using scalable video coding techniques, namely the spatial and temporal scalability, the signal to noise (SNR) and the data partitioning.

MPEG-4 enables different software and hardware developers to create multimedia objects possessing to improve the quality of services and technologies, such as digital television, animation graphics, the World Wide Web and their extensions. This standard enables developers to better control their content and to fight more effectively against copyright violations. Data network providers can use MPEG-4 for data transparency. With the help of standard procedures, MPEG-4 data can be interpreted and transformed into other signal types compatible with any available network. The MPEG-4 format provides end users with a wide range of interaction with various animated objects. Standardized Digital Rights Management signaling, otherwise known in the MPEG community as Intellectual Property Management and Protection (IPMP).

1.2 Development of HDTV E-learning Content

While video is one the most powerful communication media, most distance-learning initiatives do not maximize its instructional impact. A cursory look at such initiatives finds that most use a combination of video of the instructor and synchronized presentations of PowerPoint slides. Dastbaz1 found that this approach is neither effective nor efficient. The ineffectiveness persists even when following recommendations such as those provided by Howell and Morrow2 for using PowerPoint in the classroom. The most effective use of instructional video involves showing animations and moving illustrations of the concepts presented, while the instructor conducts the lecture. For each instructional objective presented in a lecture, the design team must ask, "What is the most effective way to communicate this objective to the audience using video as a medium?" Seldom is the answer to this question "a PowerPoint slide" or "video of the instructor writing on the overhead projector."

MPEG2 and higher standards have become the most widely accepted standards for video transmission and storage in various video applications, such as the standard-definition TV and high-definition digital TV (HDTV) broadcast, Internet video-on-demand, interactive TV and video conferencing. On the other hand, broadband networking technologies such as cable modem and xDSL are bringing to homes and office buildings Internet connections with up to 20 Mbps or higher bandwidth at acceptable prices. More advanced technologies of even higher resource availability, such as Fast and Gigabit Ethernet, are providing capacity to afford multiple high-quality video streams simultaneously. At the same time, high-end personal computers are becoming more powerful with processors of speeds over 3GHz, large memory, and capacious storage devices. Finally, tremendous amounts of information resources have appeared on Internet servers (e.g., {yahoo, Google, etc}.com), which are becoming the most popular model of information sharing.

With all these exciting technologies, we can expect much better video distribution services offering higher visual quality, richer information content, greater interactivity, more flexibility and finer customization. Aiming at the same goal, two originally separate approaches, *PC plus Internet* and *TV cable network plus set-top box*, have been converged to provide a common set of services including pay-per-view, multichannel view via picture-in-picture (PiP), Web browsing, stock/weather/sports/news updating, e-mail accessing, and others. The first approach, PC plus Internet, provides easy interactivity, flexibility, and customization of various multimedia services. But this approach does not provide high quality HDTV display and processing due to limited screen size and lack of efficient software solutions that are capable of composing high bit rate MPEG2 video streams online (the TV networks have agreed to deliver all digital video content in MPEG2 format). On the other hand, the second approach, TV cable network plus set top box, provides high-quality video delivery through special hardware at the TV devices or set-top box. However, this does not support easy interactivity, flexibility, and customization of the displayed content since all the video processing is done in a closed world – from the TV station to the set-top box – using predefined operation modules and proprietary formats.

Creating effective distance-learning instruction carries with it the same requirements as creating high-quality instructional television shows such as those shown on the Public Broadcasting Service series NOVA or the Discovery Channel. This level of production is rarely seen in distance learning because of its high cost and lengthy production times. Television producers employ the help of editors, animators, scriptwriters and compositors to produce content. Instructional designers, on the other hand, are primarily taught to systematically structure instruction. They are typically skilled at conducting needs assessments, defining objectives, writing assessment items, and carrying out a plethora of other instructional design–related tasks in accordance with an instructional model. In television production, the audience is typically much larger than in a distance-learning scenario. The net effect is that television production can achieve a relatively low cost per unit, even if the total production cost is high. The cost of distance learning typically cannot be amortized to this extent.

Using instructional design practices and high-end computer graphics compositing, we can produce instructional content that is not only pedagogically effective but also maximizes the power of video. The cost of producing graphics-rich video can be reduced by using a structured production pipeline and strategically employing the latest technological advances. Based on today’s experiences, some recommendations may be provided:

- Use a process that minimizes the time required from the instructor. Instructors will be more willing to participate if they do not have to create media assets or spend time guiding the creation of those assets.
- Implement a process that ensures an instructionally effective script. In our case, this involved videotaping the instructor twice and having an instructional designer review the script.
- Use multi-layer video instead of 3D graphics whenever possible. This will reduce the production time.
- Select and use contemporary video and computer peripherals. Often current consumer versions of video gear can outperform and cost less than professional video gear produced a year or two ago.
- It is estimated that for each hour of finished video, storage of approximately 30 GB is required. This amount is transferred extremely slowly over a 100-megabit network. The problem can be alleviated by placing appropriate gigabit network cards into the production machines and assembling a network attached storage device composed of GB drives. Note that the combination

of the gigabit Ethernet solution and the network storage device is expected to reduce the idle time for animators.

Using these techniques, it is possible to generate distance-learning content that is instructionally effective and maximizes the effectiveness of the video.

2 AGRICULTURAL E-LEARNING RESOURCES ISSUES

In the scientific literature, one can find several arguments that technologies can never be neutral; they have specific affordances that might facilitate certain approaches and minimize others (Dron 2006; Feldstein & Masson 2006). Specifying the requirements of its particular usage will fulfill the expectations of the initial target.

Growing global demand for food, animal feed, bio-fuels and materials means that farmers are under increasing pressure to boost their productivity. Yet at the same time, they are required to lower the impacts of agriculture on the environment and adhere to ever-stricter food safety and animal welfare rules. ICTs have the potential to help farmers cut their environmental impacts in many ways. For example, with ICTs, fertilizers and pesticides can be applied by machines guided by a GPS (Global Positioning System) to avoid overlapping applications, while sensors in the field can provide information on the state of the crop so that chemicals are only applied to the parts of the field where they are needed. Similar systems can be used to control irrigation, helping farmers reduce the amount of water supplied to the crop. These systems allow for smarter environmental regulation with high protection of vulnerable areas.

On the animal welfare front, robotics and ICTs can also assist with livestock management; large amounts of data can be gathered by automatic feeding systems, milking robots, milk analysis and sensors mounted on animals. Meanwhile, product quality and safety are not forgotten; there is a lot of research into ‘laboratories on chips’. These small devices can be placed near food items to monitor their quality and safety parameters, and then transfer data automatically to a computer via wireless communication. Some agricultural ICTs are already being used on farms today, while others are still at a relatively early stage of development. However, these technologies are of little use on their own; it is pointless to place smart sensors in a field if there is no way for them to send their data to the farmer’s computer. In addition, the computer must be able to display the data in an understandable form so that the farmer can use the information to make decisions. For this reason, developing common standards to allow different devices to communicate with one another is a priority for this exciting area of research.

2.1 Background: E-learning Platforms

Speaking of e-learning is not a new phenomenon. Its use though is being continuously remodeled, as technology evolves and gives more options. E-learning, initially, gained popularity in higher education because of its flexibility. With the advent of social networks, the initial role of computers as means of pathetic display and storage of information has been transformed into a participatory one. A major reason for this is the modern way of life asks for the critical use of technologies that allow remote access to educational resources, to compensate for the difficulties of a physical presence in traditional educational institutions.

Educational institutions are challenged by great changes caused by multiple external factors such as the increasing difference among relative costs and benefits of the physical versus the virtual environment or the impressive shifts in the characteristics of students and the way they affect their curriculum (McGovern et al., 2005).

An e-Learning course may be delivered in various ways.

- ***a)*** *Interactive Course Content* consisting of homework assignments, lessons, quizzes, SCORM/AICC (Sharable Content Object Reference Model/ Aviation Industry Computer-Based Training Committee), vote banners and workshops.
- ***b)*** *Static Course Content* consisting of files and Folders, IMS (Instructional Management Systems) Content Packages, Web Pages, Links of URLs.
- ***c)*** *Social Course Content* including Chats, Forums, Glossaries, Wikis, Databases, Surveys.

Since the learning mode can be either trans missive or social or both, the required infrastructure requires to support both. In a general perspective a learning platform as such should consist of a Learning Management System (LMS) which provides a virtual learning environment (VLE) and the capability to the learners to build their personal learning environment (PLE).

The required e-learning platform should also facilitate the administrative part of the learning process. The use of a ***blog***, for instance, provides the means to post announcements, annotated links for readings or references, electronic course material and time schedules, networking and personal knowledge sharing. A blog of course can be also useful in the learning process.

A ***Wiki***, on the other hand, as an easy-to-use group-authoring tool, may also be needed for the collaborative creation of assignments.

Podcasting technology, which allows easy broadcasting of audio and audiovisual files, may be very useful since it enables the dissemination of learner-generated content to participants, which, in turn, acts as a catalyst and support for learning.

On the other hand the platform should be adequately responded to the needs of the synchronous learning. Thus it should facilitate real-time training of participants from different locations and web-meeting conferences with enriched interactive elements between people, preferably from a variety of terminal devices.

One suite has been recently developed consisted of two platforms: *Unibook* and *Uniboard* (Chimos, 2012)

- *Unibook*[1] is the result of the coupling between a Learning Management System (LMS), that is Moodle 2.0, and a Synchronous Distance Learning application, which is the Big Blue Button (bbb). The first component, based on the Moodle LME, has been customized to meet the requirement specifications of *Unibook* and communicates with Big Blue Button via a smart Application Programming Interface (API).
- *Uniboard* is exclusively the “teacher’s tool”. It communicates and cooperates with Unibook in real-time, from which it extracts information and presents it both graphically and in text form.

In an agricultural perspective the aforementioned vast amount of information can be effectively and efficiently shared in the direction of knowledge creation. Social learning in an e-learning perceptive, either synchronous or asynchronous between peers, engages them in a way that they learn from each other, communication, observance, co-creation and interaction between fellow students. This “give and take”, in turn may yield significant benefits in the development of knowledge creation.

On the other hand informal learning, supported by e-learning platforms may also yield significant benefits in an agricultural environment. Bearing in mind that informal learning occurs in a variety of places, such as at home and work, and through daily interactions and shared relationships among members of society, it is definitely the major learning mode in agricultural perspective. According to Cross (2007) “*a major component of informal learning is natural learning, the notion of treating people as organisms in nature*” Since an e-learning environment that fits the previously mentioned requirements is a place for networking, interaction and collaboration in a social media dialogue, informal learning is a mainstream learning process.

3 CONCLUSIONS

The study focuses on Geographic information in higher education and implements e-Learning website which integrates Geographic information system (GIS) and other technologies to assist teaching. The proposal consists of the following three aspects:

- Implementation of a Website to support e-learning activities related to geographical information with SCORM standards.
- Introduction of a collaboration learning mode with virtual communities and leveraging of the horizontal (among peers) and vertical (among instructors and students) interaction in this website.
- Finally, establishment of a learning path between students and instructors in a way that students are continuously aware of their progress.

[1] http://unibook.cs.unipi.gr/unibook/

The work concluded with an outline of background information of e-learning platforms.

Future work includes deployment of the aforementioned proposal in the field and assessment of the perceptions and satisfaction of the involved parties.

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