

eLEARNING, BRINGING PHOTOGRAMMETRY ONTO THE INTERNET AND INTEGRATING IT WITHIN ALREADY EXISTING COURSES.

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ABSTRACT:

The World Wide Web is changing the way we teach and the way we are able to convey and access information. Breaking down complex photogrammetric and image analysis concepts can often be difficult on a static page of a book and it is impossible for students to capture animations as they sit in a lecture. The Internet offers a stage on which animations can be built, viewed easily by many, and replayed as often as the user requires. On the other hand, most conventional institutions already have well established courses. Integrating eLearning technologies into these courses is important to increase accessibility but it is also important to many that the way a course is taught is not radically altered. The Institute of Photogrammetry and GeoInformation (IPI) from the University of Hannover is currently, as part of the eLearning Academic Network (ELAN) Niedersachsen Project, building web courses to fit into a number of their already existing courses.

IPI is developing three courses, keeping the lecture structure unchanged and implementing new technologies into the course material. The lectures remain in class and students are able to access course material and information from wherever they may be and whenever they wish to. The Web-based information is produced in English although the courses remain taught in German for the moment. By presenting the course information in English it increases the global awareness and language abilities of the students, and makes it an excellent resource for other students around the world to also come to and learn from.

Presented in this paper is the method by which IPI is constructing the information on the Internet, how it has been integrated into the courses, the technologies used and tested in the project and a look towards future work.

1. INTRODUCTION

eLearning is currently a buzzword. Jumping on the eLearning bandwagon however, does not actually mean taking control of the wagon and using it to go firstly, in the right direction, and secondly using it to achieve an end goal. The Institute of Photogrammetry and GeoInformation (IPI) from the University of Hannover is currently, through a number of eLearning projects, investigating how eLearning can be used and integrated within already existing and taught courses to aid both the students and the lecturers in making the learning experience more effective and enjoyable.

The biggest question is; what is the right direction to take an eLearning course? The correct direction or method for one student or institute is not necessarily the correct direction for another student or institute. Finding these direction options is just as important as the creation and design of the course.

IPI is adopting a technique whereby multiple sources of information are being created and developed. Alongside long standing traditional lectures, materials such as multimedia content, interactive references, webpages, new learning material and practicals are being developed. This method of combined learning, often referred to as blended learning, offers multiple possibilities for students to learn and this flexibility of learning fits many different learning techniques. IPI also hopes through the course to educate the students in eLearning techniques whereby it becomes more widely accepted and useable in other environments (Schiewe, 2003).

2. RELATED WORK

There has been a lot of related work written and carried out in the general area of eLearning and slowly more and more projects are being carried out in photogrammetric and remote sensing areas. A lot of the projects that already exist, however, are more orientated towards Geographic Information Systems and do not specifically tackle the problems which surround eLearning in photogrammetry and remote sensing. The related work can be essentially divided into two distinct areas: those which focus on practical production of educational material, of which a number of very good projects currently exist; eg. Weippert and Fritsch, 2002, and those which look in a more didactical way at the problems encountered by eLearning.

A lot of the related work looks at how eLearning can be developed in almost completely new courses where a lot of flexibility exists in course structure and content. Being fairly fixed in the course structure adds an extra challenge. However, Rößling *et al.* (2002) suggest certain elements are important to remember when constructing eLearning courses be they from scratch or using an already existing framework. They suggest that many online materials suffer from two common drawbacks: the lack of learner-centric designs and display disparities between authors. The first of these problems can be particularly acute, whereby the online learning path will often only exist in one of two extremes: statically fixed or nearly absent. Lecture slides are an example of statically fixed learning paths restricted to essentially only forwards and backwards navigation. Unstructured HTML pages offer the other extreme

of too much leeway where the user can easily become lost or taken away from the subject areas.

Both Ferreira *et al.* (2002) and Höhle (2000) have looked extensively into distance learning and how these courses are received and studied by their participants. Much of what applies to pure distance learning can be taken and applied to onsite combined learning courses. What is important when doing this and when developing any type of eLearning course, as Mühlhauser (2002) writes, is that the courses aren't just "shiny welcome screen facades" of uncompleted projects offering incomplete content or un-updated content, but that the material is used, updated and, most importantly of all, educates.

The technique of combined or blended learning is being used to develop IPI's courses. Singh and Reed (2001) propose a good definition for blended learning: "Blended learning focuses on optimizing achievement of learning objectives by applying the "right" learning technologies to match the "right" personal learning style to transfer the "right" skills to the "right" person at the "right" time." This definition focuses importantly on the learning objective and not the method of delivery. Singh and Reed also acknowledge the fact that many different personal learning styles need to be supported to reach a broad audience.

Although content is the main element of any course, good testing and practicals are also key components which should be present to supplement course content. Users can monitor their progress and lecturers are able to see how course material is being learnt and whether the pace of the course is correct for particular learners. König and Weser (2004) propose a new database system for supplying test questions to students based on their ability. Their ability is graded on a three-tiered level - low, moderate and high - from answers given in an initial test. The questions they are supplied with are then individually tailored to suit their ability. As this knowledge increases so does the difficulty of the questions.

3. BUILDING COURSES

The IPI courses being currently developed are in the area of image analysis, image orientation and close range photogrammetry and are being built into already existing lectures. This is important for many institutions that are either unable to make wholesale changes to existing courses or who wish to keep existing course structures fixed. The new learning techniques are being developed to fit into the current curriculum. This technique of combined learning methods or materials is most commonly known, as referred to above, as blended learning. To make the blended learning technique more powerful it is important to start looking at the media as options; classroom/ lecture hall training, web based training, "webinars" (web equivalent of seminars), CD/DVD materials, videos and simulations. What we are also trying to do however is not to forget the traditional and equally important materials such as books, documents and PowerPoint slides. "The best courses offer a combination of more complex media with one or more simpler media" (Bersin and Associates, 2003).

IPI is developing a number of different media levels; the lecture, interactive lecture notes, archived multimedia lectures (figure 1), course books, links to course material from other sources, script based material, online tests and interactive practicals. With all of these materials it would be possible to lay down the grounds for a distance learning course, however we

are seeking to maintain the close link between the student and lecturer.



Figure 1. Development of a good quality lecture archive with the possibility for subsequent web streaming.

By not pursuing distance learning but investing in interactive on-campus courses the quality of teaching coupled with the progress of the students can be closely monitored and feedback quickly received and implemented. This method also reduces some of the data and licensing problems encountered particularly in photogrammetric and remote sensing areas, where large and expensive data sets and software packages are required for practicals and examples.

A user friendly course design on multiple levels is being developed, whereby the material the learner is introduced to first is a graphical slide version of the course. This graphical slide version provides the learner with all of the key information without large volumes or paragraphs of text. The idea behind this is that many learners when faced with a page full of text will print the material out and the learning loses its interactivity. With more graphical based pages the learner still has the opportunity to print the material out but it is more user-friendly to read on the screen than large amounts of text. A number of icons have then been designed to lead the learner to more in depth information in a more text based description of the complex topics. The design of the course with the icons, text size, colours is being maintained throughout the courses so to give the learner a familiar setup in which to work.

4. BRINGING IT ALL TOGETHER

Once the forms of media were decided finding a suitable learning platform upon which to base the media was required. Together with a self built platform a number of different other options were considered and investigated including; IBM Lotus Notes®, CLIX® Campus, ILIAS, Blackboard™, WebCT and Hyperwave®. Although building a learning platform would ultimately lead to increased flexibility it was not a feasible option within the constraints of the project and so the Hyperwave® Learning Platform (figure 2) was chosen on the basis of two reasons. Firstly, the platform was supported and well established in one of the projects IPI is involved in. Secondly, the Hyperwave® Learning Platform offers what was felt to be the most user friendly structure, in both navigation and file structure, for students and lectures. The Hyperwave® Learning Platform offers the ability to handle multiple forms of

Figure 2. The Hyperwave® Learning Platform

media such as Portable Document Format (pdf), word documents (doc), HTML and streaming media in the form of Flash and movies such as AVIs or MPEGs. This means flexibility in how the learning content can be presented and who can write the learning content. Most of the students learn within the university, however the learn content is being developed to not be too bandwidth hungry. Some larger elements are unavoidable and where a good quality, digital, multimedia lecture archive is desired, and the material is not to end up being a “peep show” like view (Mühlhäuser, 2002), then a larger bandwidth is required. This is an area in which new media such as DVDs or CDs can be used,.

One element of the courses which was felt to be particularly important was the construction of a scientific dictionary from English to German. A large proportion of the students who will study the courses are German it was felt beneficial for the students to be introduced to the English scientific words and terms.

Another element which was felt to be important was the construction of course tests (figure 3) so the students are able to monitor their progress in the course and find the areas of their knowledge which require more work. This has been achieved through the uses of the Hot Potatoes™ software package from Half-Baked Software. The software is free for use by individuals or educational institutions which are non-profit making; on the condition that the material produced using the program is freely available to anyone via the WWW. This means currently that the tests sit outside of the Hyperwave® Learning Platform but will hopefully be incorporated in the near future. The software enables the course/test author to develop a number of questions and place them in a local database. The questions can then be selected randomly so that each user will receive different questions, or question sequences.

5. WORK IN PROGRESS

IPI still has work to do to produce the finished courses, however elements of the courses are finished, such as the interactive lecture slides and elements of a more detailed lecture script. Some of these elements are already being implemented in the courses and being used fairly intensively by the students in their preparation for their exams. The ability to slowly introduce elements enables us to see how they are received and make changes to their content and appearance. Had IPI decided to go away from the lecture based approach and only use electronic material then there would be very little chance to receive feedback and monitor progress and thus make the important changes. Our aim is to try and understand how future engineers or photogrammetrists learn; it may be very different to how an artist or a linguist learns and that in turn may be very different to how a geographer learns. The way in which the student learns is dependant on a number of variables, type of content being one of these. We are trying to establish some of the other variables and build our content upon this basis in an attempt to help the student learn.

There is not only still work to do on the development of the courses but also on the acceptance of eLearning by both students and lecturers alike. So long as eLearning remains on a “nice to have” and not a “need to have” basis then it will continue to be overlooked (Glowalla, 2004). Current techniques work but if we continue to develop things such as aircraft, which in principle already work, to fly further, be larger and more comfortable, why not develop learning techniques to accommodate different learning methods and styles and by so doing open up the learning experience to other learners.

The next phase is the further development of the existing three courses, applying the feedback received from the students who have used elements of the course this year. Together with the initial three courses a further three courses are to be developed

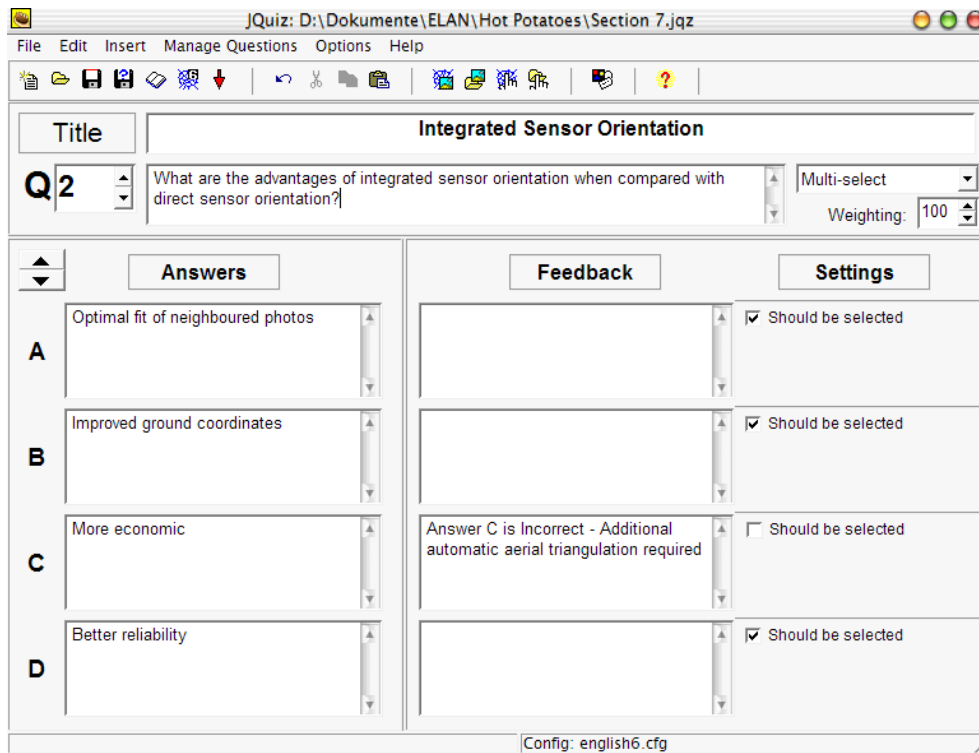


Figure 3. Course tests are being developed in the Hot Potatoes™ software package.

with the aim of incorporating the courses into a new masters study program in the future. The further development of the three courses will include the recording and construction of the digital multimedia lecture library.

6. CONCLUSION

The aims of IPI are to produce eLearning material that is long lasting, usable, up to date and educational. These goals are being realised firstly through the progressive implementation of new material into the existing courses, secondly by talking with and assessing student feedback to each part of the course and implementing changes where necessary, and thirdly through introducing the students to new study methods and therefore educating them and making them more sympathetic to the methods when encountered in the future. It is important to remember that eLearning is perhaps a larger tool for industry than for universities and schools and that, by learning the basic principles of using eLearning, students are more prepared when it is encountered later in life.

Education is an important issue that should not be overlooked in the quest for the perfectly designed site. Sometimes course developers should step back from an attitude of “should this button go here or here” or “shall I use red or blue” and actually analyse whether someone could learn from the material which is being created. A student will use the material only if they are able to learn from it, regardless of the site appearance. What is important is that the material is easily accessible, so the student does not need to install a large number of programs to use the material and go through a laborious setup procedure, and that the material is up to date and correct.

Through further development and implementation IPI hopes to provide more eLearning courses in the future - all the time learning from what it and others have done in the past.

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