An Internet and Windows based Approach to Distance Learning

Shahriar Emami, Ph.D.
Senior Staff Engineer,
Motorola Inc.,
Plantation, Fl 33322

Fazil Najafi, Ph.D.
Associate Professor,
University of Florida,
Dept. of Civil Eng.,
Gainesville, Fl 32611

Abstract- A number of distance learning approaches have been proposed and practiced over the last decade. A good example of them is FEEDS video delivery system by the state of Florida University system. With the advent of Internet and Web, educators and students have shown interest in Internet based approaches. Many flavors have been presented over the past few years.

Here, we would like to present and describe a Windows-based approach that takes advantage of Internet, multi-media (audio and video playback capability of computers) and computing environments. Microsoft Windows (98 or NT) help files allows one to create a document with access to other applications. We propose a course development method using Windows help files. A course is divided into a number of lessons. Each lesson is placed in a Web site and is made available to the students in a timely manner. Each lesson is basically a Microsoft Windows help file enhanced with audio and video clips, graphics and computing capabilities. For important concepts of each lesson a video clip taped by the instructor is included in the lesson. The audio visual nature of video clip is believed to enhance the teaching and make it more personal. Then the concept is repeated in textual form. Audio clips are utilized to present the summary of a section and the conclusions. When an equation is presented, it is linked to a computing environment (such as MATLAB or Mathcad). A default file is made available with typical values for each parameter of the equation. Students can calculate and graph parameters of interest. They can also make changes to parameter and see the results in a numeric or graphic form. At the end of each lesson there is a quiz. Students are quizzed on a number of key points within the lesson. If their score is below a threshold, they will be told to review the section. A different quiz is made available to the students this time. A number of Internet references are given in the form of hot links. Finally, an email link is placed at the end of each lecture, so the students can send their questions to the instructor. The most common questions are repeated and answered in the beginning of the next lesson.

Audio visual nature of our proposed course development approach makes it personal and effective. Additionally, the computing capability of it makes the approach hands on. We believe this method of delivery, which utilizes the multi-media, graphics and computing capabilities of Internet and computers, can provide high quality education for students around the globe.

I. Introduction

Science and engineering have advanced remarkably over the past forty years. With the fast pace of change in some areas of engineering, it is crucial to keep the working engineers up-to-date. Virtually all universities, both public and private, already offer distance education courses. Students at nine U.S. Colleges, including the University of Maryland, the New York Institute of Technology, and the University of Phoenix, can obtain full degrees without setting foot on campus [1]. Unfortunately, it is not always possible to bring them from around the country to the classroom on a regular basis. However, it is to the employers and employee's benefit to keep the engineering force up-to-date on the advances in their

respective areas of expertise. From employers perspective, they benefit from having knowledgeable engineers. These engineers would be able to apply their learnings to reduce the production cost, save development time and come up with new products and services. From employee's perspective, an up-to-date engineer is more likely to be rewarded and is far less likely to be unemployed.

In this work, we propose a method for delivering engineering education in the form of a regular college course or a short informative course. Section II reviews distance learning concept and presents a historic perspective. A suggested course structure and lesson formats are given in Sections III and IV. The distinguishing features of our approach is described in Section V. Sections VI contains the summary and conclusions.

II. Distance Learning

By definition, distance learning is the discipline that deals with delivery of education and surrounding issues. The value of continuing education is realized by corporations as well as practicing engineers more and more everyday. In many corporations, continuing education is provided in many forms such as regular graduate engineering courses, short courses and tutorials, in response to this level of enthusiasm.

One of the older forms of distance learning was correspondence learning. In this method, some universities mailed the materials to students on a regular basis. This arrangement was somewhat successful for business, psychology and a few other disciplines. However, engineering was not typically offered this way. All and all, this approach to distance education had little success (at least in offering engineering education) and often times was not taken seriously.

The electronic age ushered a number of alternative distance learning programs. The most fruitful form was delivery of the graduate-engineering curriculum through watching videotapes. This approach was adopted by a number of colleges and was refined to make the program as convenient as possible for the practicing engineers. FEEDS offered by the State of Florida University System was a very successful example [2].

With the introduction and popularity of personal computers, computer based education was invented as a new education delivery medium. Later, multi-media approach became a reality, as computers became faster and more powerful. The next advance was the networking. Once the computers were connected, many information resources became available to the so-called Internet users. World Wide Web (WWW) browsers, which made the networking seamless to users and increased the usage and popularity of the Internet, was invented in 1993.

The invention of WWW started a new area in distance education. Live audio and video was sent from classrooms to students in front of computers. However, audio quality was not very good and contained a number of gaps as a result of network congestion. Video was slow scan and in absence of a packet black or gray patches appeared in the picture. This method has improved to some extent and is still used for certain cases.

What we would like to propose is an approach that delivers materials to the students or practicing engineers around the world through the use of Internet. Practicing engineers or students can study a lesson whenever they get the chance to in the convenience of their homes or work places. State of art multi-media, Internet, graphics and animation capabilities are integrated in an environments to make the learning as enjoyable and efficient as possible. A detailed description of the approach is presented in the next Sections.

III. Course Structure

We envision the following arrangement for a graduate level engineering course. However, the structure can be modified to fit it into a short course or a tutorial. A course is partitioned into forty semester like lessons. Similar to a one-hour classroom lecture, each lesson takes about an hour to go through. The lessons are

placed in a web site, which is specified in the course syllabus. Each student is given a user name and password to access the lessons. Folders are provided for students to put their homework assignments in them. Three times a week a new lesson is placed in the web site (for instance on Monday, Wednesday and Friday).

IV. Presentation Format and the Tools

A typical lesson starts with a list of questions from the students and the answers provided by the instructor. Then, the new lesson starts. Critical concepts are emphasized by providing video clips. Instructor may just state the concept or use the blackboard and chalk to explain a concept. Using an animation sequence is another option. Audio clips are utilized to summarize the lesson and state the conclusions. Then the student should take a quiz. If his/her score is below a threshold, he/she is advised to take the quiz again. This time a different test is given to the student. The threshold can be adjusted by the instructor to custom tailor the course to different audience A list of references is provided at the end of each lesson. Some references are textbooks and journal articles. The rest are web sites with material related to the lesson.

We would like to use an application that can support calls to different tools (such as audio-visual, computational, graphics, animation, email and access to www web sites). PC environment using MS Windows is ideal for our proposed environment for two reasons. First, a great number of different applications from different venders are available and second of all these tools unlike UNIX tools are affordable. We chose to utilize Microsoft help files, which allows one to make calls to other existing tools.

A number of different applications for listening or viewing audio and video files with different formats are available nowadays. This is in addition to the tools provided by MS Windows (NT or 98). Compression is typically applied to audio and video clips to make them smaller in size. Compression as well as format exchange capability is typically provided in these tools.

Many computational tools for PC are available in the market. They also provide graphing and animation functionalities as well. MATHLAB, Mathcad and Mathematica are just a few examples of computational and graphical tools.

V. The Features of the Proposed Environment

Our proposed environment is unique in the sense of utilizing all the available multi-media, software and Internet capability to make learning an interesting and enjoyable experience. In this Section, we describe all the features of the proposed environment.

- Video clips: Video clips are used to emphasize the critical points of each lecture. These clips are taped apriori and they show the instructor explaining the key concepts. Some times an animated piece is used, instead.

- Audio: Audio clips are used to give a summary and conclusions for each lesson. Instructor's voice is used to create a rapport between the teacher and the student.

- Computational Capability: When formulas and equations are given, they are tied to a computational tool. Parameter data files with default values are provided. Student can vary the parameters in the parameter file to see the new computed value.

- Graphical Capability: Two and three dimensional graphics and animation power are provided by calling appropriate tools. Similar to the previous component, the graphs and animations can be changed by making changes to the their respective parameter files.

- Email: The link in the document allows the students to send email to the instructor.

- WWW Link: A list of Web links is provided in the reference section of a lesson by the instructor. Student can go to the provided links to see a different point of view or a demonstration of a related topic.

VI. Summary and Conclusions

Distance education has gained momentum over the last decade because of its clear benefits to the corporations as well as the practicing engineers. A number of different delivery systems have been proposed and tried in the past. Video-based engineering delivery was the most successful approach of the last decade. With the invention and popularity of Web browsers and the Internet, a number of Web-based approaches have appeared in the literature.

We proposed an environment that integrates multimedia, computational and Internet tools to create a powerful medium for distance learning. Personal computers and Microsoft Windows were found to be the appropriate platform and operating system for this medium, respectively. The course structure was described in detail and the presentation format was explained in sufficient details.

There are a number of features that make this approach attractive. Since this is a Web-based environment, it can be accessed all over the globe. This medium also provides flexibility since the lectures can be viewed when the student or practicing engineer has the time. The lessons can be viewed as many times as one desires. Hands on and interactive nature of the environment allows the student to experiment and learn. Hi tech nature of it makes the tool attractive to use.

References

[1] Gross, Thomas. K. (1999), " Distance Education the UK Way," *ASEE Prism*, Vol. 9, No. 3, Washington, D.C., p.28.

[2] University of Florida (1998), " Florida Engineering Education Delivery System (FEEDS)", University of Florida, Gainesville, Florida.

[3] Najafi, Fazil and Maalouf, W.M. (1999), "Multimedia and Electronic Means to Enhance Teaching Effectiveness and Delivery to On-Campus and Off-Campus Students, *1999 ASEE Southeastern Section Conference.*