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ABSTRACT

Although visual databases exist for the study of art, architecture, geography, health care, and other areas, readily accessible sources of quality images are not available for engineering faculty interested in developing multimedia modules or for student projects. Presented here is a brief review of Phase I of the Engineering Visual Database project at Virginia Tech, funded by a grant from the National Science Foundation to the Southeastern University and College Coalition for Engineering Education, followed by a description of Phase II with indications of the progress made in the past year. The project proposed to create an engineering visual database, composed of existing slides, photographs, video clips, and computer simulations, which could be collected, indexed, and made available for the faculty within the eight-institution coalition. Phase I involved conducting surveys, and soliciting, collecting, sorting, digitizing, and entering visuals into HyperCard and ToolBook indexes. Over 700 still images and 28 minutes of motion clips were placed on a videodisc. A barcode index was printed, and materials were distributed to each of the eight schools for evaluation purposes. The proposals for Phase II include: (1) the evaluation and revision of the prototype videodisc produced in year one; (2) the creation of new video demonstrations, animations, graphics, and other images, produced on a CD-ROM and a revised videodisc; and (3) use of an Internet-based electronic delivery system to provide efficient access. (Contains five references.) (MAS)

Digitizing Images for Curriculum 21: Phase II

Alice D. Walker

Introduction

Some five years ago, at the 1989 Conference on Imperatives in Undergraduate Engineering Education, representatives from academe, industry, and government came together to consider the need for change in engineering education. An outgrowth of this conference was the establishment of two coalitions, sponsored by the National Science Foundation (NSF). In 1992, two more groups of schools were added, and in 1994, four additional coalitions were created. Today, 65 institutions of higher learning are involved in a multi-year, multimillion dollar effort to prepare engineering students to meet the demands of industry, emphasizing teamwork, creative problem solving, early design experience, and visually enhanced teaching materials.

Recently we reported (Walker, 1994) on Phase I of a project underway at Virginia Tech, funded by NSF under a grant to the Southeastern University and College Coalition for Engineering Education (SUCCEED), to produce an engineering visual database. Although visual databases exist for the study of art, architecture, geography, health care, and other areas, readily accessible sources of quality images are not available for engineering faculty interested in developing multimedia modules or for students working on individual or group projects.

Presented here is a brief review of Phase I of the Engineering Visual Database project, followed by a description of Phase II with indications of the progress made in the past year.

Engineering Visual Database -- Phase I

As part of a five-year plan to implement new approaches to the teaching of engineering, Virginia Tech is working with other universities in NSF-sponsored consortia to explore ways of improving the effectiveness and efficiency of teaching and learning. New developments in educational technology offer many opportunities to integrate visual material into the curriculum, thus providing a safe environment for close-hand observation, experimentation, exploration, and problem solving. Surveys indicate that while some innovators are creating attractive interactive software, many engineering faculty still rely almost entirely on the blackboard to illustrate classroom lectures. One explanation for the lack of extensive use of visuals is the difficulty in obtaining materials that are pertinent and easily adapted to individual needs.

We proposed, therefore, to create an engineering visual database, composed of existing slides, photographs, video clips, and computer simulations, which could be collected, indexed, and made available to all faculty within the eight-institution coalition. By sharing the resources of faculty from eight schools we hoped to develop a large database covering a broad area of engineering topics.

During the first year of the project, surveys were conducted, and visuals were solicited, collected, sorted, digitized, and entered into HyperCard and ToolBook indexes. Over 700 still images and 28 minutes of motion clips were placed on a videodisc. A barcode index was printed, and materials were distributed to each of the eight schools for evaluation purposes.

Engineering Visual Database--Phase II

The proposal for Phase II of the Engineering Visual Database project included three deliverables:

- the evaluation and revision of the prototype videodisc produced in Year One,

- the creation of new video demonstrations, animations, graphics, and other images, produced on a CD-ROM and a revised videodisc, and

- use of an Internet-based electronic delivery system to provide efficient access among SUCCEED campuses and community colleges.

Usually, research proposals are prepared months before implementation. In an area such as educational technology, where change is occurring daily, this can be particularly disadvantageous.

1. **Videodisc**. Evaluations received from Phase I indicated that although faculty were enthusiastic about receiving the videodisc, they did not put it to use. Many professors cited the unavailability of equipment as a major drawback. One faculty member responded, "I don't have a clue where there is a laser disk player to look at the laser disk, so I was not able to look at any of the movies."

An administrator replied, "Unfortunately we do not have VD players in the college. They have them in our LRC but it is a fight to get people to leave their desk."

In only one instance did we have a report from a totally satisfied user; a graduate teaching assistant (GTA) used the videodisc in a laboratory situation where the students could preview the exact steps of the testing procedures before being turned loose on expensive and somewhat hazardous equipment. The videodisc player was borrowed from Classroom AV Services on permanent loan for the semester, was installed along with a large screen monitor on a wheeled cart which could be kept in a secure cabinet over night, and was readily available for daily use. Students who missed a lab session could easily review the procedures on an individual basis. The GTA found the system very user friendly, and students reported that following the visual examples made the lab go more quickly and more efficiently.

2. **CD-ROM.** By the time Phase II had begun, many changes were taking place. Interest in videodisc technology waned as glowing accounts of the attributes of the CD-ROM appeared in the journals. Small, durable, convenient, and capable of storing large amounts of data, the compact disk emerged as the latest attraction. At our university, every entering engineering freshman is now required to purchase a computer with a built- in CD-ROM unit. The College of Engineering Multimedia Lab now has the capability to record compact disks. The cost of mastering disks has dropped. Thus, the decision was made to focus on the development of CD-ROMs.

Within a brief period of time the HyperCard database was put onto CD-ROMs and distributed to the eight schools in the Coalition. Response to this effort was much more gratifying. Comments included statements such as, "This is an extremely good teaching tool. Today's students are visually oriented--they learn better from visual materials because they grew up watching Big Bird."

Still, there were additional problems ahead. The original proposal promised cross-platform delivery capability. Asymetrix released Multimedia ToolBook in 1991, the first multimedia authoring tool for Microsoft Windows. A beta version of an update was obtained, but the programmers had difficulty working with it. A new version of ToolBook (Multimedia ToolBook 3.0) had been promised but was long delayed. When finally the software did arrive there were problems in converting the data. Meanwhile, the electronic mail was flooded with requests for the CD-ROM in PC format, while others asked when the UNIX version would be available.

Simultaneously, new images were being donated. Whereas 700 full screen images with no compression would fit nicely on a CD-ROM, 850 images would not. Should the database be split in order to maintain the quality of the uncompressed images or should the images be reformatted using JPEG? Would JPEG work with ToolBook? What other means of compression were available? In the long run, would it be necessary to burn a new CD-ROM every time new resources were discovered? How would the UNIX population be served?

3. **Internet.** As consideration was being given to these and other questions, a new area of technology gained recognition. Although the network had been around for some twenty years, use of the Internet suddenly blossomed with amazing popularity in educational circles. Faculty began using electronic mail routinely and were soon branching out into the wilderness of Archie and Gopher. Classrooms and offices were being wired for Ethernet. John December, from Rensselaer Polytechnic Institute, writes that the World Wide Web, ". . . viewed using a Mosaic client is the fastest growing form of information retrieval on the Internet." (December, 1994, p. 33).

NCSA Mosaic will run on Macintosh, PC, and Unix computers.

Clearly the opportunities were now available for millions of users worldwide to access our engineering visual database.

Cleborne Maddux, a professor at the University of Nevada, states, "I am convinced that telecommunications in general and the Internet in particular are *potentially* the most significant educational tools that have become available in my professional lifetime." (Maddux, 1994, p. 37).

Maddux hastens to add, however, that, ". . . far too many educators seem concerned only with making the Internet accessible to students, and far too few seem concerned with making sure that teachers and students can and will use it in educationally appropriate ways." (Maddux, 1994, p. 38).

The question for us now becomes, how can technology best be used to disseminate the database in an educationally appropriate way? Will it be sufficient to make these visual materials available to engineering faculty and students through the Internet, or is there more that must be done? How can we meet the challenge of enhancing engineering education?

Other researchers in the SUCCEED coalition have already established a SUCCEED home page. It will be a relatively easy matter to develop the HyperText Markup Language (HTML) documents needed to transpose the HyperCard data into Mosaic format. Once the materials are on line there should be no further concerns with cross-platform incompatibility--but will the visuals be used?

We have found that faculty, for the most part, need to see the product as it applies to their specific situation. They need to "buy in" by identifying a particular need that can be reasonably met. They need classrooms that are designed for the use of multimedia with equipment already in place. And they need guidance in effective ways to incorporate visuals in their teaching. In the years ahead much work remains to be done to bring about real change in engineering education.

Conclusion

NSF is now supporting eight engineering coalitions, representing 65 schools in a determined effort to revitalize engineering education. About one-third of the nation's engineering schools are currently revamping their programs to make them more practical and responsive to industry. In the words of Carl Zorowski, director of the SUCCEED coalition, ". . . if we are to succeed, we need commitment, team effort, trust, vision, hard work, patience, understanding, and a sense of humor." (Zorowski, 1994).

Those seem to be excellent characteristics for any educator to emulate, whatever the task.

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