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ABSTRACT

To explore faculty needs for expanded visual instructional materials and to help provide for those needs, the Educational Technologies Division at Virginia Tech, in cooperation with the College of Engineering, is in the process of developing a multipurpose multimedia engineering visual database. The database is designed to assist faculty members in bringing visual examples to the classroom and to provide materials for student projects, student review, and recruitment efforts. Some concerns that have surfaced in the development process are reviewed. These include: (1) faculty members' reluctance to use new visual technology, (2) faculty members' reluctance to share materials, (3) problems with copyright permissions, (4) the rapidity of technological change, (5) issues of technical compatibility, (6) costs of cross-platform design, (7) the usefulness of prototypes, and (8) the necessity of allowing time for the expected developments. So far, the project has produced a prototype videotape with indexes, and plans for new materials are expanding. Two figures illustrate the project's development. (Contains 7 references.) (SLD)

Digitizing Images for Curriculum 21

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Introduction

Research indicates that students involved with interactive, visually-based materials outperform (Mayton, 1991), make significantly larger gains in achievement (Abrams & Streit, 1986), learn faster, have better retention (Bunderson, et al., 1981), and report significantly more positive attitudes toward learning (Cushall, 1987). As educators we believe that the effective use of multimedia stimulates the active involvement of the learner, provides opportunities for close-hand observation, and offers a safe environment for risk taking, experimentation, exploration, and problem solving. Despite these claims, we are told that technological innovations such as the videodisc and the compact disc are still having little impact on improving education (Bork, 1991). Disappointingly, we learn that ". . . the typical professor still adheres to the classroom in the same way it was set up at the turn of the century." (Cavalier, 1992, p. 32).

The National Science Foundation (NSF), in an effort to bring about major changes in education, has established the NSF Engineering Education Coalition Program. Five university consortia, namely ECSEL, FOUNDATION, GATEWAY, SUCCEED, and SYNTHESIS, are engaged in a multimillion dollar, five-year plan to design and implement new approaches to teaching. Goals include the implementation of new communication and information technologies to enhance the effectiveness and efficiency of the learning process. A primary focus of activity involves using interactive multimedia in the classroom.

Engineering Visual Database Project

At Virginia Tech a number of faculty have displayed interest in developing multimedia programs. However, a major obstacle in this development appears to be the lack of visual materials that are appropriate, readily accessible, and easily adapted. To explore faculty needs for expanded visual instructional materials, and to help provide for those needs, the Educational Technologies Division, in cooperation with the College of Engineering, is in the process of developing a multi-purpose multimedia engineering visual database. The database is designed not only to assist faculty members in bringing visual examples to the classroom, but also to provide materials for student group projects, student review, and recruitment efforts.

Phase One has included a survey of the engineering faculty at the schools in the SUCCEED consortium and an attempt at collecting quality images for inclusion on a videodisc. Each image received has been digitized, entered into both HyperCard and ToolBook stacks, and provided with a barcode for easy access and maximum flexibility.

Our original thought was that individual faculty and departments would have large collections of slides and other visuals available to be loaned to the project, digitized, and returned. The major task, then, would be to select images of the highest quality and the greatest usefulness. We soon learned, however, that there are a number of hurdles to be overcome in developing a visual database. We share some of these concerns in the hope that our experience may be of help to other developers.

Generalizations

1. Many faculty limit their use of visuals to blackboard sketches.

Change can be difficult and slow, particularly in the university setting. Many classrooms are equipped only with blackboard and chalk. Some schools have advanced to providing an overhead projector for each classroom, but only a few university learning environments currently enjoy the luxury of carefully designed, complete installations of modern technological tools. Departments are often reluctant to allocate scarce resources to new equipment and software which may rapidly become obsolete. *As a multimedia developer, you need to do a lot of convincing.*

2. Some faculty are hesitant to share their materials.

Faculty in general have limited time, limited resources, and are increasingly faced with challenges of larger classes, departmental responsibilities, and research obligations. Reward systems seldom recognize instructional development efforts. Even though many faculty would like to make their materials available to others, they do not have the time or incentive to write complete descriptions and provide other necessary information. *Do what you can to make life easier for the faculty, always emphasizing the potential benefits of cooperation.*

3. Copyright permission can be a problem.

Faculty often make 35 mm slides from photographs in textbooks and other publications. While this may be acceptable for face-to-face instruction, such materials cannot be used in media for wide distribution. Unorganized collections of visuals frequently are not documented as to source. Most manufacturers of videodiscs require indemnification from any claims of copyright infringement. *Be sure to get signed copyright releases for all materials used.*

4. Technological change is occurring rapidly.

Educational technology is advancing at a rate where it is difficult to keep up with the latest in digital compression algorithms, new authoring tools, and platform compatibility. A year and a half ago, when this grant proposal was first written, we were not ready to produce a CD-ROM in-house. Now we have that capability. Also, this fall each entering engineering freshman was required to purchase a computer with a built-in CD-ROM drive. Many headaches might have been avoided if we had restricted our proposal to the development of a CD-ROM. *Start small, then expand as resources permit.*

5. Compatibility is essential.

Given the rapid changes in technology, it is doubtful that eight institutions, or even the various departments within one institution, will have the same hardware and software. We found that our Educational Technologies division was using System 7.0.1, while our Video Broadcast Service was using System 6.5. Our Photo Lab was using Bernoulli storage disks, while we were using optical disks. Our Multimedia Lab was using 128 M optical disks, while we were using 650 M optical disks. Video was provided from contributing faculty on VHS, SVHS, and Hi-8--our Video Broadcast Service wanted to use only Betacam. *"If you want to surf at the leading edge, you must be prepared for constant changes and concomitant expense. You can't have it both ways."* (Vaughn, 1993).

6. Designing for cross-platform use is both difficult and expensive.

In attempting to make our product as useful as possible, we developed both HyperCard and ToolBook versions. Finding student personnel who are comfortable and proficient in both environments is not a simple matter. Even little things like naming files can produce problems. We began with descriptive file names for HyperCard. Then we realized we should have used eight character DOS naming conventions for easy conversion to ToolBook. We used PICT files for HyperCard thumbnails but had to convert to PCS and BMP files for ToolBook. *It's not much fun to rename hundreds of files.*

7. Prototypes are helpful.

As technology advances there is much to be learned. Processes that may have been successful in one situation will not necessarily produce the same results in another. Particularly when working with very large databases it is important to use formative evaluation, to test the product as you move along. *It is much more efficient to work out the details of transferring five barcodes than 500.*

8. If anything can go wrong, it will.

We endured the Blizzard of '93, which closed the campus for only the second time in the history of our university. We survived a hurricane-like storm that destroyed 100-year old trees and knocked out electrical power. Our Photo Lab moved their facilities to the other side of campus during the period when most of the slides were being digitized. The video equipment went down when the air conditioning failed and the temperature rose to 98 degrees in the editing suite. Text designed for 35 mm slides did not fit the safe title area of the video screen. Grandfathers died, the flu bug attacked, and student personnel graduated. *Be sure to build in plenty of lead time for the unexpected and unanticipated.*

Results

Despite our frustrations, we succeeded in meeting the terms of our contract--we produced a prototype videodisc, with over 700 images and 28 minutes of motion, as well as a HyperCard (see Figure 1) and ToolBook index, and a printed index with barcodes (see Figure 2).

We are currently in an extensive evaluation phase. Plans are to continue the project, to create new visual materials, and to press a CD-ROM. Our hope is that engineering faculty will begin to use these materials and discover that the visuals are useful in revising their courses for the 21st century. As other projects within the Coalition progress, we hope to be able to work with individual faculty in locating the images they need and implementing designs for Curriculum 21.

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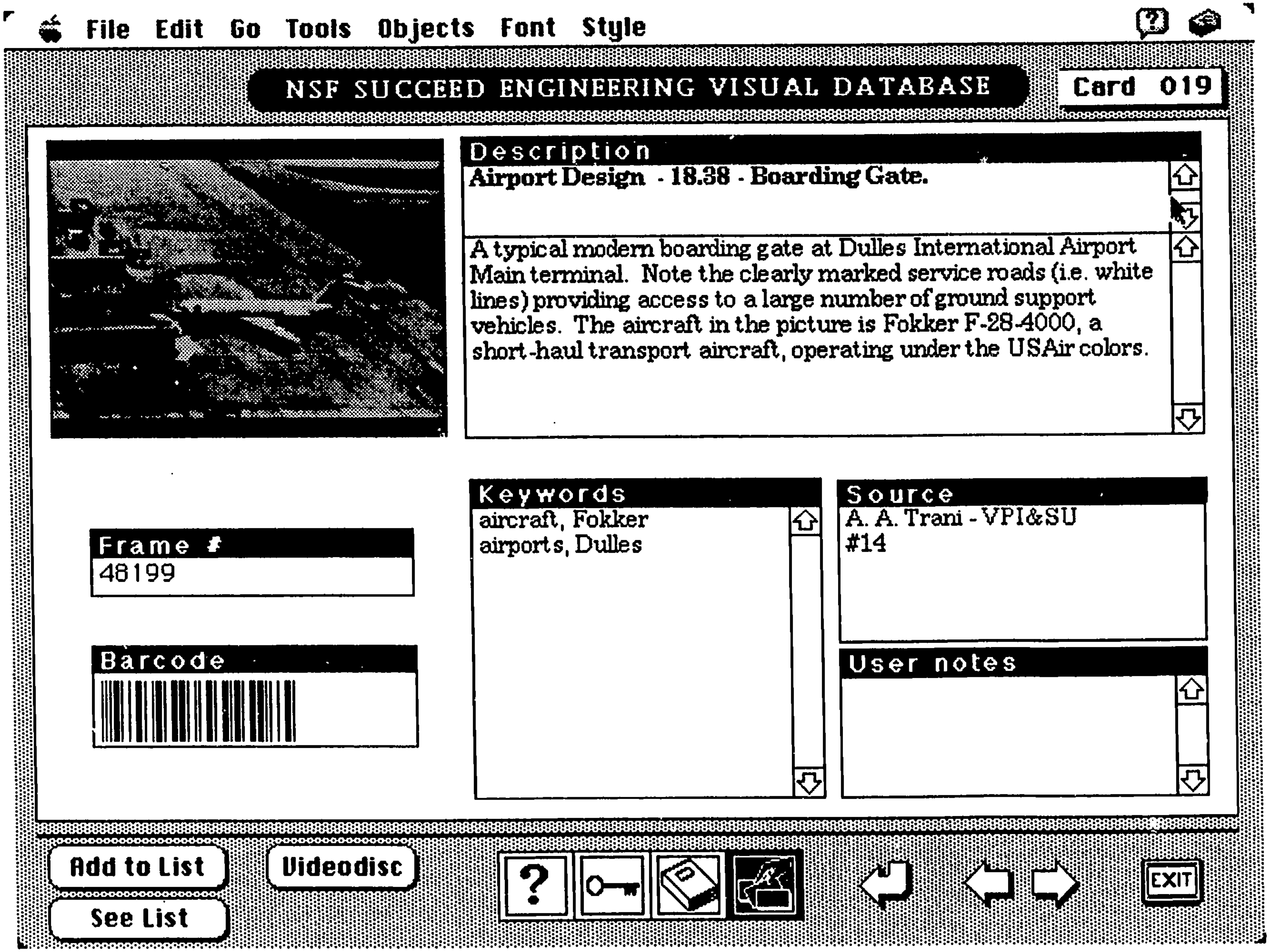

Figure 1. Sample Card from HyperCard Stack.

NSF SUCCEED - Engineering Visual Database Index

48181 - Aerospace Engineering.

48182 - Airport Design - 01.38 - High Speed Turnoffs.

48183 - Airport Design - 02.38 - Perspective View.

48184 - Airport Design - 03.38 - Turnoff Geometry.

48185 - Airport Design - 04.38 - High Speed Taxiways.

48186 - Airport Design - 05.38 - Cargo Facility.

48187 - Airport Design - 06.38 - Parking Facilities.

48188 - Airport Design - 07.38 - Charlotte, NC.

48189 - Airport Design - 08.38 - Terminals.

48190 - Airport Design - 09.38 - Raleigh-Durham.

48191 - Airport Design - 10.38 - Hangar Space.

48192 - Airport Design - 11.38 - Modeling.

48193 - Airport Design - 12.38 - Turning Maneuvers.

48194 - Airport Design - 13.38 - Mobile Conveyance.

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Figure 2. Sample from Printed Barcode Index.