PROCEEDINGS

5TH SYMPOSIUM ON SMALL COMPUTERS IN THE ARTS

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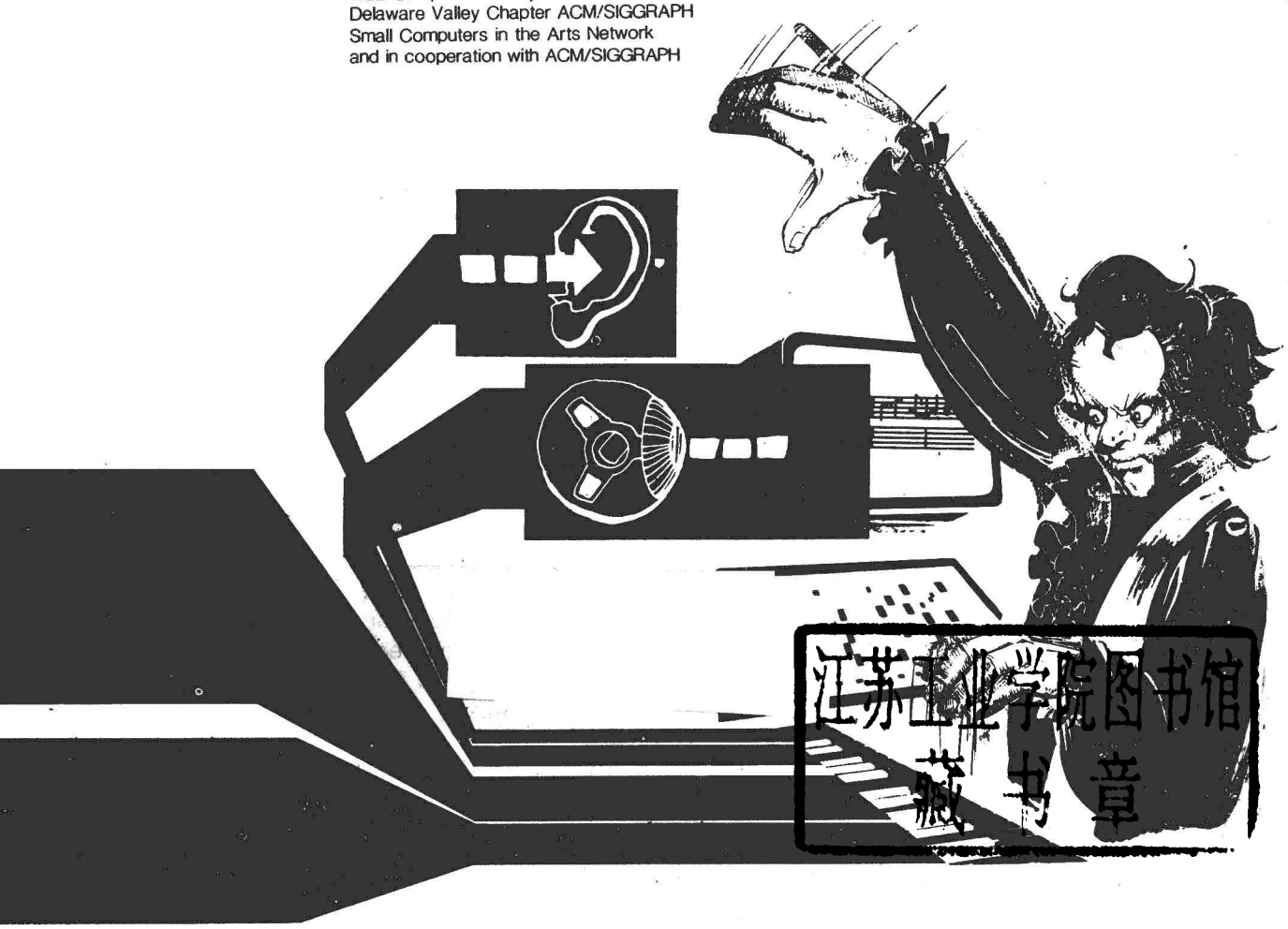

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And help from many other volunteers.

INTRODUCTION

We would like to introduce these Proceedings of the Fifth Annual Symposium on Small Computers in the Arts by relating just a bit of the history of the group that organizes it, the Small Computers in the Arts Network, Inc. This group is committed to the promotion of small in the arts through its newsletter, SCAN, concerts, the Symposium, and various informal meetings.

This current group emerged out of an earlier one, the Personal Computer Arts Group which held its first computer arts activity, a computer music concert, in 1978. The group hoped to provide a forum for creative people interested in using computers in the arts.

Art and music created with the aid of computer technology is more affordable than ever and the results become more "aesthetic" as every year goes by. As creative equipment and software tools become more mainstream, the commercial, fine arts, and music commmunities are bound to feel the positive impact. This Proceedings reflects the universal position of computers in the creative arts today.

Articles this year include trials and triumphs in the areas of aesthetic judgement, teaching, and evaluating artistic equipment as well as reports on project, products, conferences, networks, and expereiences.

The range of interests represented here and the degree to which they have been developoed by the authors shows us as organizers of the Symposium that a forum where computer artists can share knowledge with their colleagues is as worthy a project today, if not more so, than five years ago. We hope you are pleased with our selection of works.

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ARTISTS' ISSUES AT SIGGRAPH: AESTHETICS, ACCESS AND INTERFACES

Wendy S. Moldauer

There are several important issues facing artists working with computers. As the primary organization addressing the computer graphics community, SIGGRAPH has shown a high degree of responsiveness to the needs of artists. In 1985, courses and panels engaging a wide variety of speakers on the subjects of user interface issues and aesthetics were well attended. The next step is to involve the artistic community even more, by developing a new format for discussion and evaluation of these issues as they relate to the artist/user.

AESTHETICS

There seem to be a couple of theatres in which the aesthetics issue is being played out. The first is internal, a discussion between artists already familiar with the medium. The second involves dialog between computer graphics artists and the art community at large.

An indication of the gelling of aesthetics as a credible issue within the computer graphics community was the panel at SIGGRAPH '85, chaired by Mihai Nadin, of the Rhode Island School of Design with spirited discussion among Naidin and panelists Chuck Csuri, Frank Dietrich, Hiroshi Kawano and Tom Linehan. Those attending the panel were more than ready to participate--both of the microphones provided for questions sported long lines, and most of the questions offered generated more debate than could be covered in the time allotted to a panel.

1985 also saw a new format for the presentation of visual work. Along with the traditional art show and film and video evenings, a separate screening room was set up to provide an overview of works from a variety of areas.

The art show itself met with little criticism. It comprised several elements: a gallery-type space with two-dimensional work and sculpture; several installation areas for stereoscopic pieces, light sculptures and interactive environments; a Mackintosh environment for displaying many artists' work; and screening rooms for new high-resolution images and animation.

An innovation this year was the screening of film and video pieces old and new, which made up a survey of past, present and near-future developments in computer graphics. There was an impressive overview of work, creative and otherwise, divided into categories such as "Classics," "Education," "Art" and "Demo." Frankly, the telling segment was "Classics." It was impossible to deny the power of some very early work, such as that of John Whitney, Sr. and Peter Foldes. Other, more technical pieces also showed grace and humor, sometimes even truly inspired use of the computer, but even the "Art" segment was sometimes a bit stale.

As for the film and video presentation, there continues to be, though in smaller quantities, redundant "glitz" in the form of gratuitous streaks and flashes, swooping and diving cameras, all six million available colors co-displaying less than peacefully. Available resolution goes up exponentially every year, but it does not appear that artists are getting much more input regarding its effective use. Where is the gap? Why is the glitz being adopted so willingly by artists, when there are endless opportunities to explore unimagined possibilities? Is the "art" in computer graphics being guided mainly by technical wizards? Or, have the artists who gained access to commercial systems lost their device independence?

A type of chauvinism etches a great many discussions of computer art. It is characterized by heated debate over computing power, available resolution and colors, display and output technologies, software vs programming. Often this misses the point: does the piece work? The agony of creation is not enough. Facts of resolution, output device, unavailablity of desirable technology are, for the most part, irrelevant. The reaction of the art community as a whole has little to do with technological considerations. Unfortunately, the world at large has to make do with little more than a slow trickle of pieces from the computerized community, and often these are pieces in which there was very little input from artists.

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ACCESS

Is access an issue? Well, yes and no. A persistent individual who is willing to be flexible can usually find a computer to work with. The available tools, resolution and work environment may not be optimal, but there are systems out there. Adequate distribution is a far more persistent headache.

Still, there are many problems with this entrepreneural system of access. First of all, the artist must usually make do with whatever is available, without much hope of influencing the machine's actual usefulness. That is unfortúnate, because it perpetuates existing inadequacies. Also, when the interface is complex, it may require more time than is available to learn ones' way around it. The artist must be willing to negotiate blocks like awkward time schedules, inadequate training and support, learning more than s/he ever intended to about hardware, operating systems, the hazards of inelegant programming.

So what are art schools doing? Good computer graphics departments are still hard to find, and often even harder to get into. One option is to become part of a fledgling program, which often means a lot of pioneering and diplomacy, and a little time to make art.

Another consideration is that some programs combining art and computers, such as Ohio State's, involve the student in a great deal of programming and development, areas which do not appeal to all artists, while others, such as the undergraduate program at Rochester Institute of Technology, put emphasis on using existing turnkey systems--finding ways of getting around the limitations instead of trying to optimize them through redesign. These are clearly very different approaches to the role of the artist in development of his/her own computing environment. Though the situation is improving, it still seems that very few artists are making a direct impact on the computer graphics systems available to artists.

INTERFACE

For those who feel that the interface is not a central issue, it is especially important to talk to artists who have been turned off by their first encounter with a computer graphics system. Common frustrations are the inflexibility of the tools; the complexity of their use; a general unwieldiness which often requires incredible amounts of time in order to simply mimic traditional media. Another curse is the the incompatible nature of not only operations but also language--sometimes it seems that each system's designer decides to reinvent the languages of both computers and art.

In the discussion of aesthetics is some potential guidance in interface design. In working to develop long range visions of the potential of computers to enable, facilitate, perhaps even assist in the creative process, we will learn what is needed to bring the machine the rest of the way into the studio.

An exploration of aesthetics in computer graphics needs to be continuous, and interconnected with dialogue relating to all art forms. The Symposium is one of many suitable forums, perhaps better suited than most due to its flexibility. It is up to each individual involved in computer graphics to urge that his/her community begin to consider aesthetics along with technical wizardry.

Electronic Media Laboratory Proposal

by
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Abstract

This paper addresses issues relevant to coordinating a college-wide effort to provide access to media and technology in the areas of visual art, music and theatre. At the heart of this strategy is a design for an Electronic Media Laboratory consisting primarilly of a network of small computers. Using enhanced and off-the-shelf microcomputers is the first phase of a plan to achieve state-of-the art capabilities.

Introduction

This paper represents a strategy for facilitating the instruction of media and technology at the post secondary level. Such a project is taking place in the College of Visual and Performing Arts, Northern Illinois University. NIU already has a microcomputer facility of approximately 20 Apple II class machines based in the Department of Art, Visual Communication and Design area. The challenge presented to the author is to coordinate an effort to go beyond this dated technology. Moreover, to develop a college-wide facility open to all the Visual and Performing Arts faculty and students.

The term "media and technology" will be used in a visual context to mean imagery or objects that are produced using electronic technology. Very loosely this includes film. More appropriately it means; slide and movie projection systems, equipment to control slide and movie projection systems, analog and digital video, analog and digital video editing and projection equipment, computer graphics hardware and software, computer image editing and projection systems, and any combination or permutation of these. (Media and technology in the context of music, theatre or dance would be slightly different.) Hence the term Electronic Media has a broader connotation, it represents the application of media and technology to the Arts.

Electronic Media Laboratory (EML)

Recently, this author had the pleasure of working in a state-of-the-art environment called the Computer Graphics Research Group (CGRG) at The Ohio State University, Columbus, while on the faculty of the Department of Art Education. It is his opinion that state-of-the-art technology is centered around a UNIX operating system/ C programming environment and that this operating system/ programming environment is the model for advanced work in the computer arts. The CGRG effort is geared toward three dimensional computer graphics animation and their facilities reflect this effort[1]. Our intention is broader-based. This proposal represents the first phase of a two phase plan we are implementing to do advanced work in Electronic Media in the Arts. It represents a reasonable transition between where we presently are and the direction in which we intend to proceed.

Figure 1 schematically represents the Electronic Media Laboratory (EML) that we have begun to establish as a College facility in the College of Visual and Performing Arts, at Northern Illinois University. In the conceptual phase of the laboratory design there were three major considerations: 1) To achieve a level at or near state-of-the-art technology. 2) To maximize versatility. And, 3) To be as cost effective as possible. We believe our configuration succeeds in reflecting these considerations.

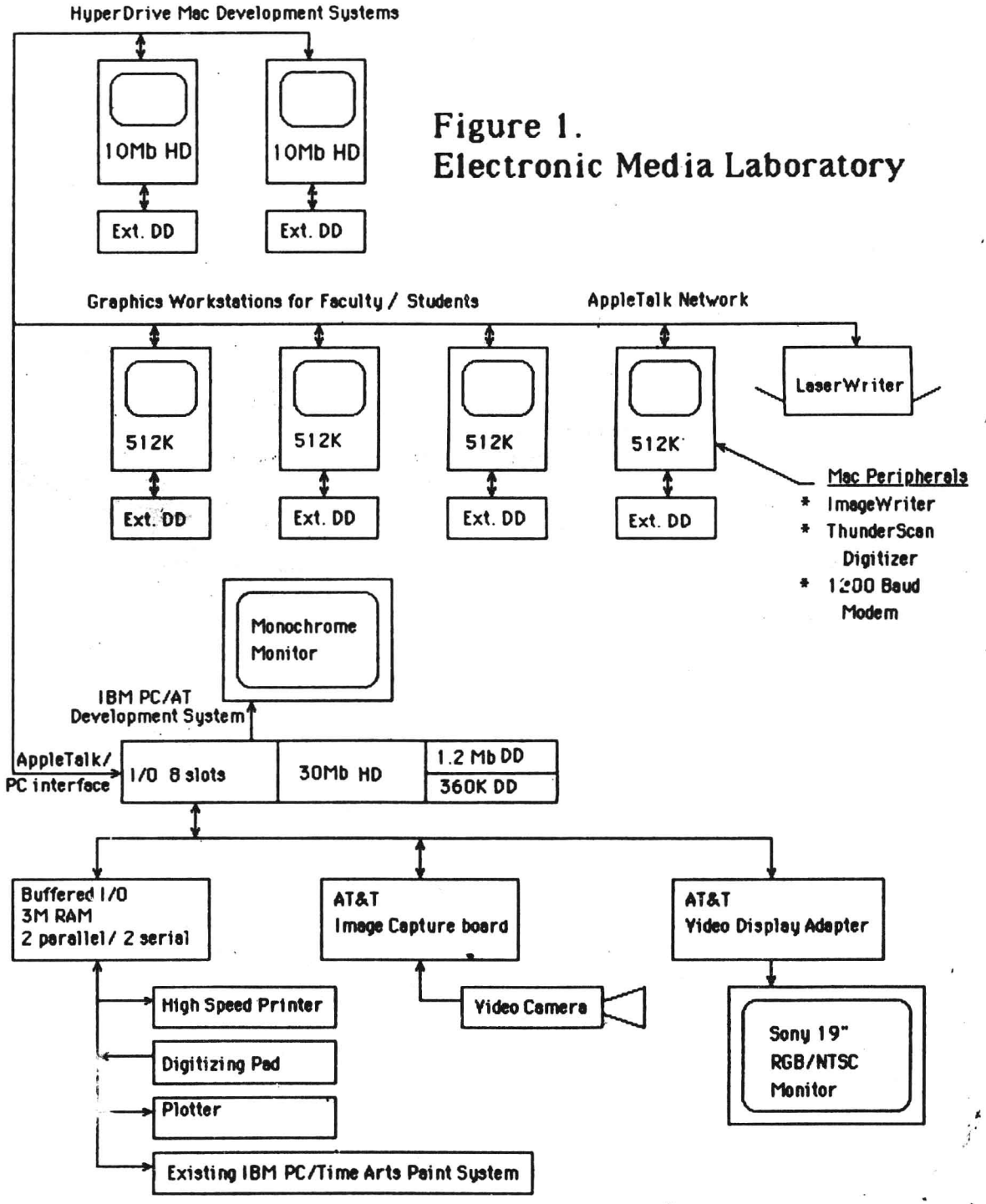

Figure 1.
Electronic Media Laboratory

A Two Phase Plan

In phase one, we have chosen to work with both Apple Macintosh and IBM PC/AT microcomputers and appropriate software. By themselves each machine is extremely versatile. However, by taking both enhanced and off-the-shelf versions of these machines and integrating them into a local area network (LAN) using AppleTalk we feel we can provide a more powerful environment with greater capabilities than individual workstations. With this strategy we can also achieve cost

effectiveness. We will not be using exotic hardware and software. Necessary components, such as AT&T frame buffer and frame grabber, will plug directly into the IBM PC/AT (or other devices into the Apple Macintosh) all of which can be accessed through the AppleTalk LAN.

This initial phase will allow us to begin to explore and develop technology-based applications in the Visual and Performing Arts, to support a multitude of advanced aesthetic applications for the entire college. Pragmatically, the emphasis will be placed on exploring computer graphics and media and technology applications in the Visual Communications and Design area. In this respect the Electronic Media Laboratory would seem to be a logical extension of the existing teaching facility. However, we feel strongly that the Electronic Media Laboratory has potential to facilitate research and development, i.e., a graduate program.

Administratively, the Laboratory is attached to the college Dean's office. This is logical, practical and advantageous. Structured in this manner it will allow any faculty person or student in Visual Arts as well as, Music, Theatre or Dance to have access to the facility.

When we begin to demonstrate what is possible with the resources we have obtained in the first phase of this plan then we will have a foundation to discuss and justify phase two. Phase two is imagined to be comprised of hardware for advanced video, electronic music composition and several graphics workstation configurations: minicomputer or mainframe system, very large disk storage capacity, 24 bit frame buffer and very high resolution display capabilities. A true UNIX/ C environment. We are just beginning the first phase of our plan. When phase one is completed, phase two will be an easy transition.

Strategy for Implementation

The time frame for developing phase one is predicted to be one year. Completing phase one, establishing the EML, is our first major goal. As such it can be divided into a series of objectives, called short, medium and long term objectives. Of course, each objective can be subdivided as well. Broadly stated, these are given below:

Short term objectives.

Acquire key personnel. It's people that make programs not vice versa.

Acquire the hardware and software required by the design.

Check out each component of the system. Check out each individual system. Fill in the warrenty cards and send them in.

Learn how to thoroughly use each system and subsystem. This includes the physical operation of the system, the operating system and the programming languages used in conjunction with the hardware.

Acquire and learn how to use other relevant application software.

Begin development work on the enhanced systems.

Begin digitizing imagery using scanners and digital video equipment.

Develop a file handling strategy.

Medium term objectives.

Network the Macintosh's and LaserWriter with AppleTalk.

Network the IBM PC/AT to AppleTalk.

Establish a network controller using either the PC/AT or the enhanced Macintosh as a fileserver. Begin transferring ASCII files between devices.

Develop and implement data generation, data manipulation, and data display algorithms.

Long term objectives.

Develop and implement an optimal method of information interchange within the network.

Begin transferring binary files (imagery) between devices.

Make each peripheral, especially the frame buffer, a device on the network, available from any CPU.

General Discussion of Components

Without going into specifics it may be appropriate to discuss the components of the EML configuration represented by Figure 1. These components can be grouped by component and type, i.e., hardware or software.

Apple related hardware.

Six Macintosh workstations have been purchased. Four 512K "Fat" Mac's will be designated as faculty/student workstations. Two HyperDrive Mac development systems have been put together from 128K machines upgraded to 512K when 10Mbyte hard drives were installed. Each system will have an external drive. All six systems have an Apple ImageWriter assigned to them; four will be used for output, two will have ThunderScan scanner devices adapted to them for image input capability. Two 1200 baud Apple Modems have been aquired for telecommunication purposes. An Apple LaserWriter will be networked into this configuration via AppleTalk. The LaserWriter will produce high quality output that can be used directly by design students in their traditional assignments. Note: This hardware was obtained at significantly reduced prices through the Illinois Educational Consortium.

Apple related software.

The Macintosh systems come with MacWrite and MacPaint. From Apple we have or will obtain MacTerminal and MacDraw. From Microsoft we have obtained the powerful BASIC interpreter Basic 2.0. For advanced work two C compilers have been obtained: Megamax C and Manx C, the latter having a near UNIX shell. Other Macintosh software has been obtained and more is becoming available on a daily basis.

IBM related hardware.

A major component in our scheme is the IBM PC/AT. We began with a stripped chassis model with a 1.2 Mbyte and 360K disk drive and installed 512K RAM and a 30Mbyte Maynard Hard drive. Input/Output will be directed through an AST Advantage board with the Advantage-pac and a full complement of RAM. A monochrome monitor is assigned to this machine and a mouse was added.

IBM related software.

From IBM we obtained DOS 3.1, Topview End User and Topview Tool Kit. However, the majority of the IBM development software was obtained from Lifeboat, namely a Lattice C compiler, libraries, utilities and Multi Halo graphics.

AT&T hardware.

Due to a technological breakthrough AT&T has marketed two affordable products of particular interest to us; two boards which plug directly into the PC/AT known as the Image Capture Board (ICB) and the Video Display Adapter (VDA.) These two boards are essentially a video frame grabber and a 256 by 256 by 8 bit frame buffer. Both RGB and NTSC video are supported by these devices. Software for the IBM comes with these boards. Both boards are very reasonably priced. With these devices we will have digital video imaging capabilities.

Video.

Video is a major component in the larger scheme of media and technology. Our second major goal is to develop the video component along with the computer imaging effort from the onset. The rudaments of a video program are in place at NIU. Ideally, we can direct our efforts to the point where video and computer become unified into a single program.

To demonstrate our commitment to this end we have used a significant proportion of our resources to purchase a 3/4" Sony U-Matic Video Editing System for the Electronic Media Design Laboratory. This system consists of 2 video decks, 1 editing controller, 2 RGB monitors and all cables. By placing this equipment under the umbrella of the Laboratory we have provided a valuable resource within reach of all faculty and students in the college. In return we have gained access to existing video equipment and, more importantly, gained the support of existing faculty in this area.

Miscellaneous peripherals.

Video will interface to the laboratory network via the AT&T devices and the IBM PC/AT. To display video output a Sony RGB Direct Drive 19" Color monitor has been purchased (Model PVM1910.) Presently imagery can be filmed directly off the CRT screens using 16 or 35mm film. This is not desirable. We will be looking at ways of interfacing existing hardcopy devices and an existing filmrecorder into the system.

Other peripherals that have been purchased are: a high speed dot matrix printer and quality digitizing pad for the IBM PC/AT. Also, an IBM PC/ Time Arts Lumena Paints system exists in the college. An attempt may be made to interface this existing paint system to the EML configuration.

Other important considerations.

We are looking at the present curriculum in our Comprehensive Design, Electronic Imaging program (a BFA Studio Art Emphasis) and suggesting the modification of existing courses or the establishment of new courses to make the best use of the EML facility. We must address the issue of the appropriateness of this curriculum in a single area or as a separate area. We are also looking at areas within the college that use technology outside of the Visual Arts to determine how these areas might best be served by our effort. Our third and ultimate major goal is to integrate the individual efforts of media and technology within the Visual and Performing Arts into a single unified effort.

Conclusion

Media and technology is affecting all facets of the Arts. In both performance and recording electronic media is playing an ever increasing role. Moreover, imagery and sound have been reduced to the common denominator of zero's and one's. This requires those who work in Arts and modern media to be familiar with binary devices and this means computers. Electronic media issues must be addressed by institutions who proport to provide instruction in these areas.

State-of-the-art facilities are a major institutional investment that require ongoing expenditures[1]. Thus, they will always be few and far between. Small computers are a reasonable alternative. At Northern Illinois University we feel that with the increasing capabilities of small computers we can deliver relevant and contemporary instruction in the Arts. In this spirit we have proposed the Electronic Media Laboratory and we have begun to work on making it a reality.

References

[1] Kolomyjec, W]. "Animating at Ohio State: Thoughts on a Graduate Program in Computer Graphics", Small Computers in the Arts Symposium. Proceedings of the 4th Annual Meeting. Philadelphia, PA. 1984.

EFFECTIVE VISUAL REPRESENTATION OF COMPUTER GENERATED IMAGES

Marek Holynski and Elaine Lewis

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Abstract

This paper presents an approach for incorporating aesthetic criteria into a computer graphics system to yield a valuable tool for artists. Through empirical evaluation design standards are discovered. In this experiment, seven picture variables were used to generate a series of visual stimuli. Testing revealed optimal levels variables in terms of viewer preference.

Introduction

There is an almost infinite number of ways that given picture elements can be visualized on a computer screen. Only a few of these, however, can suitably represent a specific meaning within the desired aesthetic criteria of a particular artist. Selection of the appropriate representation from a large number of all possible representations can be cumbersome for human viewers. The burden of this task, a chore shared by the artists of more traditional media, can be lightened through the development of formal criteria for effectiveness and aesthetic quality. We argue that this task should be performed by the computer where decisions are based on aesthetic criteria given in the form of algorithms. To develop a computer system incorporating such aesthetic criteria we propose:

- to discover the optimal levels of picture variables through testing a series of computer images created with a menu-driven program,
- to apply advanced machine learning methods (inductive learning techniques) for the development of criteria for perceptual judgement.

The criteria developed can guide the computer graphics system in determining the perceptually optimal graphical representation of displayed picture variables. These variables include number, size, position of picture elements and other factors such as rotational or perspective transformations, color, complexity, variety, and regularity. We correlated these with perceptual and cognitive factors such as attention and preference. By determining the most effective visual formats for specific purposes and certain classes of individuals, and integrating these with artificial intelligence techniques, we are able to analyze, create, and modify graphics from the standpoint of contextual understanding.

Evaluation Techniques

An intelligent graphics system should contain empirically determined standards used for default values and rules that reflect users' preferences. In more technical areas, some of these display standards have already been defined. For instance, in many CAD/CAM systems, principles of representing an engineering drawing are well established and these production rules are used to guide the system. In order to apply these principles for more artistic purposes, we need to define them in a more generally applicable way. First we must define relevant visual variables which can be used for evaluating user reactions. Then we will have to test these variables for viewer response in order to find optimal levels and establish standards. Finally, these standards can be integrated into the graphics system.

Previous work has begun to address this area by combining traditional design principles with computer generated imaging techniques to yield descriptive variables like regularity, complexity, order, and balance (1,2,3). In some cases, these variables were found to significantly predict over sixty percent of the variance in preference (4,5).

Modular Patterns with Design Variables

In order to explore more sophisticated variables relevant to techniques for generation of computer graphics, we illustrated image form variables through a series of pictures created with a menu-driven program and a graphics tablet.