Abstract
The iEAR Studios at Rensselaer Polytechnic Institute are an attempt to build a unique creative environment — one that draws together technical tools for the creation of computer music, video, and computer imaging and animation. This report outlines the design philosophy behind the iEAR Studios, and in particular the experimental Integrated Suite.

Integrated Electronic Arts at Rensselaer

In the Fall of 1991, the Arts Department at Rensselaer inaugurated a Master of Fine Arts program in Integrated Electronic Arts. The program combines theoretical, practical, and artistic aspects of Computer Music, Video Art, and Computer Imaging and Animation into a single pedagogical and artistic framework. In order to facilitate this program, the existing electronic arts studios underwent major renovation and expansion.

The iEAR (Integrated Electronic Arts at Rensselaer) Studios now comprise:

- undergraduate music workstations: Macintosh-based MIDI workstations with Ensoniq VFX synthesizers, Ensoniq EPS 16+ sampling synthesizers, and a variety of software. Each workstation also has a Tascam Portastudio for acoustic multitracking.
- undergraduate graphics workstations: Amiga-based graphics workstation with digitization, color printing, and video output, with a variety of 2D and 3D software.
- undergraduate video: a number of 1/2” (VHS and S-VHS) editing systems, VHS and S-VHS camcorders and related equipment
- graduate music studio (see Appendix I)
- graduate graphics workstations (see Appendix II)
- graduate video studios and production equipment (see Appendix III)
- the Integrated Suite (see below)
- dedicated performance equipment (see Appendix IV)

Design Philosophy

The design philosophy behind the iEAR Studios deliberately makes both high end and “real world” equipment available to students and visiting artists. To this end, the studios are essentially realtime in nature, and contain many off-the-shelf commercial products such as Macintosh computers and com-
mercial music synthesizers by Ensoniq, Yamaha, Digidesign and Emu. On the other hand, it is essential that students have access to state of the art equipment, and we have installed Grass Valley video editing with A/B/C roll, Grass Valley digital video effects (DPM700), 8 channels of digital audio (Digidesign's ProTools (in beta test)), and we are currently investigating graphics workstations from Silicon Graphics (Indigo), and digital videotape formats (DII or DIII).

For a program in which artists are encouraged to work collaboratively as well as individually, existing studio design paradigms do not necessarily work very well. Commercial studios, not surprisingly, reflect the worlds from which those who have designed them, and those who work in them, come. The apartheid that exists, for example, in the traditional post production suite, is a function of the specialized individuals who go to making a finished, professional product. This is the natural order of things, reflecting many realities of commercial life: time, efficiency, expertise, history, money. But it also reflects the way that the individual "experts" who are part of the production team have been trained — as specialists. Academic studios are often built along the same lines, but usually without the crushingly expensive online finishing suites. Electronic musicians and composers within an artistic or academic environment are unlikely to have access to more than the most basic video or computer imaging capabilities, and visual artists are unlikely to have access to more than the most meager audio resources.

A decision was made at an early stage to duplicate as much equipment as possible in the various studios, and to have another set of the same equipment available as dedicated performance equipment. This supports easy transportability of files from studio to studio, and will allow for easy file sharing once the studio network is in place. The dedicated performance equipment is a specific response to the pedagogical design of the MFA program, the core of which is dissemination and performance. Students are required to use live elements in at least some of their work, rather than just working with tape as an output medium, and they perform with live electronics on a regular basis both on and off the campus.

The Integrated Suite

iEAR's Integrated Suite comprises the Integrated Studio, a production studio/black box performance laboratory, and an offline editing room. The Integrated Studio, the intellectual and artistic core of the iEAR Studios, takes an entirely experimental approach to combining high end music, video, and graphics work areas. Each work area is a complete studio in its own right, but all are capable of speaking to one another, and all can share timing and data information as far as current technology allows. It is possible in this studio for one, two, or three artists to be working simultaneously, and collaboratively, on a project using entirely integrated hardware and software, and working with elemental materials, rather than with finished, predefined products — a model that moves significantly away from existing commercial or non-commercial paradigms. In designing this studio, we constantly hit the same barrier: equipment designed for a traditional post production environment was just not suitable or flexible enough to work in an environment where production and post production become one and the same. We needed a large audio mixer that could accommodate the requirements of a traditional analog and digital audio workroom, and we needed it with the ability to be directly slaved, in a configuration known as audio follow video, to the Grass Valley video editor. Soundcraft was ultimately persuaded — after much questioning and disbelief — to custom fit a series 6000 board, a mixing console considerably more sophisticated than those usually found in online suites, with an audio follow video capability. The company does, of course, offer mixers with audio follow video as a standard option, but only on its less sophisticated, less flexible models. A problem we are still grappling with, in the limited space we have available in the control room, is just where the "center of attention" really is. Avoiding a proliferation of video monitors and stereo audio monitors is very hard, yet very undesirable from many viewpoints; but ultimately this is the direction we may have to take. If there are any brilliant alternative
design concepts out there, we would love to hear them. In its first design incarnation, the video editing station has become the focal point, with near field stereo audio monitors placed on either side of the 19" video program monitor. This is fine for many purposes, particularly if there is only one person working in the room, and everything is being controlled by the video editor. It is less than ideal if a major live mix is being performed, or if a composer is performing complex tasks at the computer. Then the center of the stereo field needs to be available to him or her, as does the video signal. Is the answer to provide an additional stereo monitoring setup? Probably not, but it may be the only compromise available. Because of the long, narrow shape of the room, it is also very difficult to provide audio monitoring other than near field. Near field monitoring has significant drawbacks when used for experimental music — the lack of sense response, and the lack of an ability to gauge how the sound will work in a larger environment are major problems. Compounding this, the level of mechanical noise in the room is at present intolerable. High-end video equipment has a proliferation of fans, as do all the computers and large hard drives in the room. Critical listening is almost impossible. At the time of writing, we are pursuing two solutions to this problem: as much of the "noisy" equipment as possible is being moved into an adjoining machine room that is sound isolated from the control room; and we are investigating the possibility of mounting a pair of large speakers, and a video monitor in the production studio so that critical listening can take place in a large, quiet room that comes closer to a performance space. With the reduced noise level in the control room, critical listening in that space should also be much improved.

Usage Patterns

As of May 1992, the Integrated Studio has been in use for just five months. According to the rules of Murphy's Studio Law, in which the newer and more expensive the equipment, the more it breaks down, there have been a significant number of occasions in which at least one major piece of equipment has been down, often crippling key parts of this interdependent studio. The DPM700, the Grass Valley Digital Video Effect Generator is a brand new model, and has had many teething problems (all fixed very quickly and efficiently by Grass Valley), and Orpidesign's 8-channel version of ProTools, still in beta release, has also had some significant problems, mostly software related, and almost all of which were fixed in later releases.

Despite that, students were able to complete major projects, and we began to see the kind of use of the equipment that we originally envisioned in its design. At least four collaborative projects have taken place, with a composer and a visual artist working together on a finished product, working simultaneously on sound and image in the Integrated Studio, as well as working separately in each of the specialized studios. There was at least one project in which one person "did it all", producing a video using digital audio stripped from his original field footage, processed, and mixed live from 5 channels of digital audio, under control of the video editor.

Summary

Even after such a short time, it is quite clear that there are extraordinary advantages in this unique studio design — and unique problems. The ultimate test, however, is the final product that comes out of the studio. Will we indeed see new art forms emerging from this facility? On the evidence to date, there is a strong possibility that artists will learn to work in entirely new ways, and produce work that expresses a level of understanding of the different media involved far beyond the norm, and that collaborations between artists will be far more informed and truly collaborative in nature. It will take a few years to observe patterns of use, and understand how such a facility can best be used, and, as the technology moves closer and closer towards an all digital future, the technologies themselves will become increasingly integrated, allowing the development of new languages by artists trained to deal with multiple media.
Appendix I: Graduate Computer Music Equipment
(includes Integrated Studio)

- Marantz SD
- 7" monochrome monitor
- Sony/QCXM monitor
- Marantz CD-860
digital receiver
- Pacific Coast Technologies 2GBye SCSI Drive
- Pacific Coast Technologies 4GByte SCSI Drive
- Marantz 4GByte SCSI Drive
- Panasonic PV-3750 DAT
- Sony TC-970 Walkman DAT
- Tascam DAT recorder
- Sony SV525 DAT recorder
- Nakamichi 96i cassette recorders (2)
- Dari 5008 8-track recorder
disk mixer
- Tascam 401 CD players (2) w/digital io
- numerous other cassette machines
- Dangerous SEQ-4 sampling synthesizer
- Dangerous VX synthesizer
- Yamaha TG7 synthesizer
- Peavey Synthesizer
- JL Cooper Synagogue MIDI switcher
- Studio 700 MIDI interface
- KAT Drums DRM percussion
- mixer
- Yamaha SP-3000 multi processor
- Yamaha SP-5400 audio processor
- Lexicon LXP-15 multi processor
- Lexicon PCM70 multi processor
- Eisen CP16 pitch to MIDI converter
- Symetrics S25 compressor/expander
- Synetric S3080 quad headphone
- amplifier/driver
- Focus 4800BAY powered monitor
- AKG 240th headphones
- JVC L-A4140amplifier
- Sennheiser 2108 phone preamp
- Alesis AT-34 1/2 track ATX
- Soundcraft 9000 MX882 console
- Tascam M-354 96CH mixing console
- Marantz 9x 9VCR
- Sony 3" Trinitron monitor
- TT pitch bender
- JL 4650 audio monitor
- Tascam PBM 4 monitors
- Crown DC 8061A amplifiers (2)
- QSC 150 amplifiers (6)
- Orange Studio Viewer
- Orange Max
- Odyssey Galaxy Plus Editor
- Corgi MIX system
- Digitalis Touchscreen
- Digitalis ProDeck
- Digitalis Pro Ed
- Cyma Piano
- Second (4)
- Digitalis plug-in Call Editor
- DATs
- other non-MIDI software

Appendix II: Graduate Graphics Workstations

- Compaq Presario 300 (2)
- Compaq Presario 100
- Compaq 386 SX (2)
- GVP Impact 4MB color monitor +
- SC54 + RAM (2)
- Colorbase 24-bit display
- Nec_E Plus 24-bit display
- Impulse FineCanvas 24-bit display
- Silicon Graphics (4)
workstations
- Macronix Quatro 700 (2) 670

Appendix III: Graduate Video Studios (includes Integrated Studio)

- Sony EVO-4000 HD/SD recorder
- Sony YCC-4000/3400 recorder (2)
- Sony YCC-4000/3400 recorder (2)
- Panasonic AJ-400 S-VHS recorder
- CVC VPS-131 Production Editor
- CVC EP-M16 digital video effects
- generator
- CTV Production Switcher
- Dolby 2 ch character generator
- Tektronix 205 waveform monitor/
- vectorscope
- Tektronix 1380/1380 waveform
- / vectorscope (2)
- POMA FA-112 time base corrector ch
- Fast Forward SMPT/E
- generator/reader
- Son Pyramate 2020 monitor (2)
- Son Pyramate 2020 monitor (2)
- audio monitor by Sony and JVC
- Bogen tripod
- various lighting kits

Appendix IV: Dedicated Performance Equipment / Spaces

- Earsiq VFX synthesizer
- Dangerous SEQ-4 sampling synthesizer
- Yamaha TG7 synthesizer
- Prosonic 2 synthesizer
- Mackie 1404 mixer
- AKG 410 microphones
- Electro Voice microphones
- Neody 90 FM microphone
- Microphone stands
- Panasonic WV-MX-12 video
- switcher/premix
- Parrotie lighting
- Parrotie 2400 S-VHS camcorder (2)
- Sony EVO-950 1/2 camcorder

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