Computer-Related Design at the Royal College of Art: 1997 Graduation Projects

This month my husband and I left London to work from Venice. We had our dial-up numbers and software and it all looked very simple. Anyway, we thought, we're seasoned computer users, we've done Applelink from Hawaii, so Venice to London should be dead easy. It wasn't.

We tried everything from logic to prayer: we checked the cabling, swapped the connectors, switched the modem, reinstalled the software. We'd heard of someone whose printer stopped working when the bells in a nearby campanile started ringing, so we tried moving the computers to another spot. We just couldn't get through, or we'd get through and the computer would hang. Perhaps the computer was getting too hot? What did those noises mean? Was it London answering, or just the sound of our own modem? Could British telephones not understand Italian tones? Or American software European ones? The problem was, we didn't know what the

Gillian Crampton Smith
Computer-Related Design
Royal College of Art
Kensington Gore
London SW7 2EU,
United Kingdom
Fax: +44-171-590-4290
http://www-crd.rca.ac.uk

DESIGN COLUMN EDITOR
Kate Ehrlich
Senior Research Manager
Lotus Development Corporation
55 Cambridge Parkway
Cambridge, MA 02142
+1-617-693-1899
fax: +1-617-693-8383
Kate_Ehrlich@crd.lotus.com

problem was. And because we had no real model of what was going on, we had no way of reasoning about it. We were left with magic—which didn't always work.

Reflecting on our experience I was struck by our dogged attempts to interpret what was happening and to *construct* a model that would match our experience. It struck me that the design of representations of interactive systems—for ordinary people to use and enjoy—is central to what the Computer-Related Design (CRD) course I teach is all about. In CRD we teach students to use the languages of design to suggest, explicitly and implicitly, what a system is and how it should be interpreted. Every kind of interactive system, from software packages to computer games, from ticket machine to art installation, needs this kind of design. Too often it is done badly or not at all.

CRD at the Royal College of Art

The Computer-Related Design course is one of 26 courses (programs) in art and design at London's Royal College of Art (RCA)—Britain's only wholly postgraduate college of art and design.

Despite its lively interaction with industry—collaborations with engineering companies worldwide—CRD is very much a product of the British art school tradition, strongly influenced by the Arts and Crafts movement of Morris and Ruskin, with its emphasis on craft, intuition, and learning through making. In common with all the design programs at the RCA, the backbone of the course is project work, the main vehicle for gaining skills, knowledge, and understanding.

Early Days

The course began as an offshoot of the Industrial Design course, which was concerned with the potential of computer-aided design (CAD) for designers. Naturally designers sitting in front of complicated systems started to think: why do they have to be like this? Couldn't they be designed differently? And so, instead of concentrating on how to design *with* computers, they started to think about designing the computers themselves, particularly the software—both what it does and how it is represented to the user.

In 1990 The College decided to make the program more broad-based, and that I should take six students from a range of different design disciplines and concentrate on interaction design. My background had been graphic design and I'd cut my teeth on interface design in the early 1980s, designing and coding a program to do magazine layout on the screen. So the new program had a strong bias toward both product and graphic design: most of the students were designers of 3-D materials, and the staff came from graphic design, product design, and engineering.

We could see that designers could make a contribution, but we didn't really know quite how. I felt that the elements of surprise and creative tension brought by working with designers from many different design disciplines would inform us all and stop us from getting too cozily focused in our own disciplines. A graphic designer building an interactive installation, for instance, gets an insight into the nature of interactivity in another dimension and on another scale, which is a refreshingly different perspective from that of pure screen design.

At that time there were few places where work was being done from the artist-designer perspective rather than that of the engi-

This year's graduation projects and themes

An important aim of the student projects is that in addition to being able to design and craft designs for other people's needs and desires, students should also find their own interest within the field and pursue it systematically. Having to choose a theme forces one to step back from purely responding to a brief, and to generalize one's work and interests in the context of an emerging discipline. Many of the students' self-directed projects were exploring the new possibilities that could be offered by new technology: new things it could be used for, new qualities of experience that might be crafted. Not all were completely successful: experiments like these are inherently unpredictable. For their final project, students were asked to make something that would demonstrate aspects of their theme and would be engaging to the wide range of visitors to the College's end of year exhibition—most of whom know nothing of interaction design and may never have used a computer.

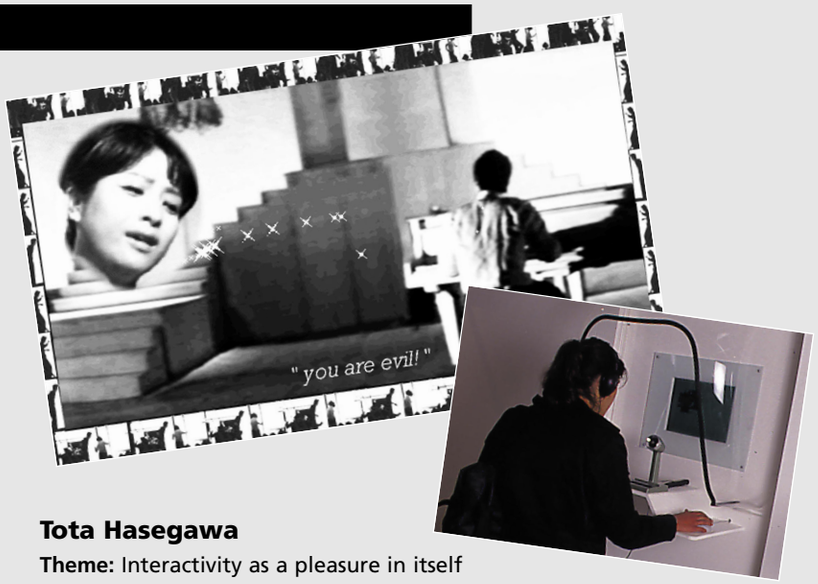
neering-designer: Joy Mountford's Human Interface Group at Apple was one, Moggridge Associates (now IDEO) another. In the early years both were generous supporters of the course, providing equipment, expertise, and internships for students and staff.

CRD Research Studio

Three years ago CRD started an important collaboration with Interval Research Corporation of Palo Alto. Their support of ten researchers allowed us to start a research group of people from a wide range of disciplines: product and graphic design, psychology, architecture and music, software and hardware engineering, cybernetics, and fine art. The group is now growing; has also done projects with LG Electronics in Korea, Apple Computer, Japan Airlines, the London Science Museum; and is part of a European consortium investigating intelligent user interfaces that address the needs of the elderly.

The Master's Program

Today the master's program at RCA has 24 students from widely differing disciplines (including some from engineering and psy-



Tota Hasegawa

Theme: Interactivity as a pleasure in itself

Product: 9 games on CD-ROM all controlled by blowing or singing through the microphone.

Tota's aim was to design on-screen "capricci" (games don't really describe them), where the quality of interactivity and the emotion it sparks—surprise, laughter, pathos—is what they are about. The idea is not that interactivity is a front or handle on something else, some "content" inside, but that its qualities alone provide meaning and enjoyment. So in Tota's work the emphasis has been mostly on craft and exploring what is possible with the medium: designing beautiful and quirky graphics; working on the mappings between blowing as input with graphics and sound as output; working on the feel and responsiveness of the feedback—so that when you play you really feel a precise and delicate control of what you see on the screen.

Anatomy Of A Pressure Project

UNDERSTAND: observations, empathy, research

- Conduct user observations and interviews
- Conduct background research
- Understand stakeholders
- Examine resource and technology issues

Outcome: summary of users, problems, opportunities, issues; videos, photos, sketches of users, their situation, their tools and materials

ANALYZE: abstract, structure

- What are the key elements?
- What do people want to do with them?
- What are the relationships between them?
- How can they be ordered to be useful to users?

Outcome: lists, sketches, diagrams; design brief (mission, goals, assumptions, questions, design issues)

EXPLORE AND GENERATE: scenarios (people, activities), alternative concepts (metaphors, products, functions)

- Develop scenarios—what kinds of people, what kinds of situations?
- Brainstorm alternative approaches.

Outcome: lists, sketches, diagrams, storyboards, performances; best alternatives

REPRESENT: metaphors, models of the system

- Develop alternative user conceptual models
- Develop alternative representations—visual/auditory/physical

Outcome: sketchbook of alternatives; sketch prototypes, animatics, screen shots, storyboards

CRAFT: perception, experience:

- Explore different aesthetic possibilities
- Design exactly how the system will look, feel, and sound

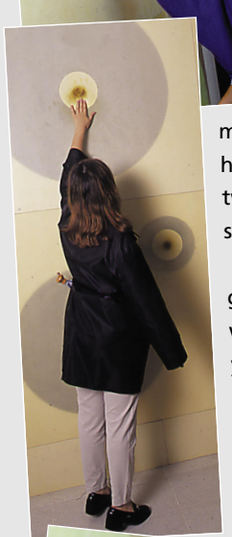
Outcome: sketchbook of alternatives; finished prototype/animated walk-through/screen shots, as appropriate

chology). Three interest groups are emerging, which we plan next year to confirm more formally in the program:

- **Virtual information worlds** were the first things we were interested in—though they weren't called that then. We use this label to refer to things that exist only on screen: software and all kinds of virtual tools, Web environments, collaborative spaces, games, information, entertainment, and so on.
- **Tangible computing** is concerned with the relationships between the physical and virtual worlds. Our interest in this area has undoubtedly grown because of the course's roots in industrial design but also because of the strong influence of the work of Durrell Bishop, who was first a student and then a researcher. His *Answer Machine* of 1991, in which messages were represented by marbles, has remained for us an icon of this line of imagination and inquiry.
- **Intelligent spaces** covers interactive and communicative environments in exhibitions and buildings, as well as the relationship between real and virtual spaces. The work of Bill Gaver on collaborative spaces is one strand; other influential work has been Fiona Raby and Tony Dunne's work, "Fields and Thresholds," which explored how nonverbal communication might be subtly represented and mediated through telecommunications channels.

Structure

The course lasts 2 years, divided into six terms of 11 weeks. The first two terms are a



Dominic Robson

Theme: Handles on sound: tangible interfaces for non-musicians

Product: Sound wall for several players. Made in latex rubber, responsive to people touching it in different ways. Sensors linked to a Macintosh control sound samples through the music program Max

Dominic explored his theme through a very coherent set of projects: as a sound engineer he worked both on the design of the sounds and on tangible interfaces that would enable nonmusicians to have fun with sound. His first project was a simple interface using a pair of tilt switches in each hand. The first test-rig worked but there was an awkward lag; Durrell Bishop suggested attaching them to two jars of golden syrup: the slowmoving feel of the syrup was just enough to suggest subliminally that slow movements were appropriate—which gave the computer time to catch up.

However, there were considerable problems with the mapping of the way you tilted and the result you got—and what was worse, there was little consensus about which were the right mappings among people who tried it. The second project in the series, jointly with Mark McCabe, was a bulll-roarer (an instrument you play by whirling round your head). Fashioned from rubber bands, petentiometers and string, and linked to the Macintosh running Max, it was possible for several people to play together, changing the samples by adjusting the speed and moment of the whirling instruments. It wasn't making music in the conventional sense, but it was good fun to do together, somewhere on a spectrum between playing music and dancing. Trying it out with a group of students from other departments they realized that people never see things as you expect them to—you are always surprised.

The third interface they designed was a large board with a hole in the center and latex stretched over it. Pushing into the latex allowed you to control a wide range of combinations of sampled sound. This interface was developed further for the final show, so it could be played by several people together.

Dominic's series of projects centered around exploring and generating. He started from the observation that most interfaces to music programs were very difficult to use; and through generating a series of experimental interfaces he was able to learn from each as he went on to the next. The major part of the craft was in the design of sounds—making samples that were sufficiently complex to be interesting and could also combined in any way without too much discord.

highly structured introduction to the many aspects of interaction design; there is then a progressive movement toward self-initiated projects. In the second year students choose a theme and develop a body of work exploring it. In the final term this culminates in a long project that is exhibited at the end-of-year show. The course aims to strike a balance among four different kinds of skills:

- **Communication:** Can students design something that communicates itself to people in the way they intend?
- **Problem-solving:** Can they use the means they have to design something that does what users need or want or would enjoy and also could be implemented elegantly and economically?
- **Expression:** Can they design something expressive, something that makes people respond emotionally and aesthetically?
- **Craft:** Can they use the tools and media to shape an experience for users that achieves these goals?

Not every project exercises all these skills and students will often choose to concentrate on some more than others.

Emphasis is on the development of imagination, first to explore the space of possible ways information technology might be used by people in their everyday lives, and second to develop what is possible with the medium—new ways of representing ideas and information, new ways of crafting the visible, tactile, kinesthetic, and auditory qualities that make up the users' experience.

We also expect students to relate their work to current issues in cultural and critical theory and hope they will develop a healthy skepticism in their approach to new technology and its effects on society.

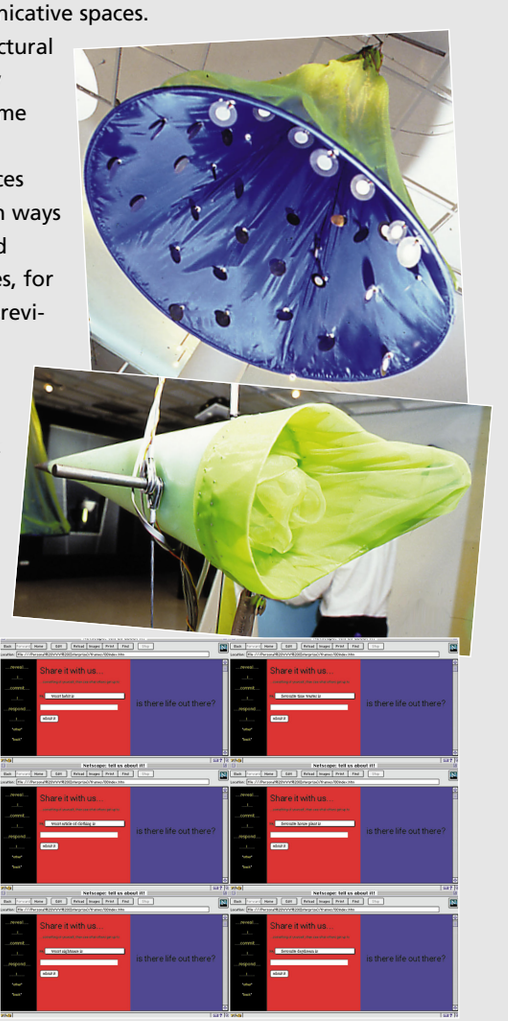
Because the medium of interactivity is new to most students, they inevitably spend much time exploring the medium itself, to see what they can make it do, before applying their experience to particular problems or opportunities. The course encourages this kind of experimentation because it is often difficult to find the space for it later within the constraints of a job.

Sally Barton

Theme: Spaces inbetween

Product: Interactive installation; sounds collected and sorted and replayed through several channels via tiny disk speakers.

Sally's work was about communicative spaces. She spent a term with an architectural student observing people as they moved around the city. She became interested in the relationship of strangers and in the kinds of places where they could watch others in ways that were acceptable but avoided unwelcome involvement—in cafes, for instance, or escalators. She had previously worked on a CRD research project looking at airports—another sphere in which people wait and watch. Her final project was an installation: a virtual space in which people could eavesdrop without embarrassment—a kind of audio trace of people passing. In one part, the trumpet, you were asked questions and could record your answers; in another, the hood, the answers left fleetingly by previous visitors could be sampled and enjoyed. Having tried to understand through observation, Sally tried to abstract some of the qualities of real spaces, such as places to look and watch and pass the time, or places inbetween, like underpasses or airport corridors, where everyone is on their way somewhere. She then explored how those qualities might be translated to new kinds of spaces mediated by information technology. She became interested too, in how much people are prepared to divulge of themselves in order to remain "in play," to see what others will divulge of themselves in return. An early experiment was a website that traded other people's indiscretions for your own—to see what people could be bothered to do, and what people were prepared to do. Sally's project concentrated on understanding and exploration—understanding people's interactions with each other and exploring ways new technology might encourage different kinds of interaction that parallel rather than copy more traditional forms. She also wanted to consider a different kind of aesthetic, using color and fabric, to represent a softer face of information technology, more conducive to gentle relations between people.

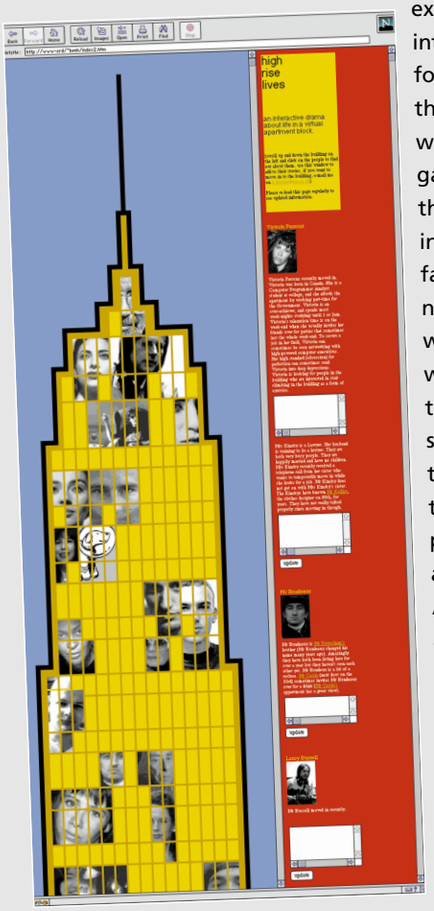


Ben Hooker

Theme: How form affects content and viceversa—what new forms technologies such as the web generate and what different types of cultural activities ("content") these might allow.

Product: An experimental website written in HTML, designed also to provide material for an animated film.

Ben's website used simple graphics to construct a virtual skyscraper—the framework for an interactive narrative. He then invited the authors of interesting and slightly exhibitionist web sites to "move in" and contribute to his ongoing narrative. He was interested both in content—exploring ways of generating interactive narratives—and in form—how you could use the things that are easy and fast to do on the web, such as block graphics, in elegant and effective ways. He found that the website, which was intended to be self-generating, in fact needed a lot of cultivation—it needed weeding and fertilizing with encouragement if the tenants were to be persuaded to keep contributing. There were several strands in this project: one was to try to understand what made things engaging, what made people want to contribute initially, and then to continue or stop. Another strand was to try to make a self-generating an interactive narrative which, because it was being generated by many people might have qualities of surprise and interest that it would be difficult for one person to generate. The structure needed to be light enough to allow variety and invention but strong enough to give coherence to the potentially very disparate contributions. A third strand was to do with craft: of the web graphics, carefully tuned to the web's limitations, and the final animated film—with its own contrasting set of conventions and possibilities.



Other projects this year included an authoring environment to control the movement of a robot; "Fickle Furniture"—furniture that gets to know and respond to you; network games; the CRD show catalog linked through rub-off codes to on-screen information; responsive jewelry that gave its wearer a different, sometimes provocative, public face; an interactive film running on three TV channels in parallel; and a household message center—in a fridge that takes your picture as you reach in for the milk.

Languages of Interaction: the Designer's Palette

I believe interaction design builds on several existing design languages, namely, typography, graphic language, the language of 3-D form, sound, animation, film narrative, and a new one: interaction and response—those qualities of interactivity that have only become possible with the advent of the microprocessor.

These topics form the basis of the taught course. Students do short projects, usually exploring one or two of these topics at a time. The aim is to lay out the designer's palette of means, not so that all students will become expert in all of them but so that they will appreciate their possibilities and develop a sensibility to their refinement.

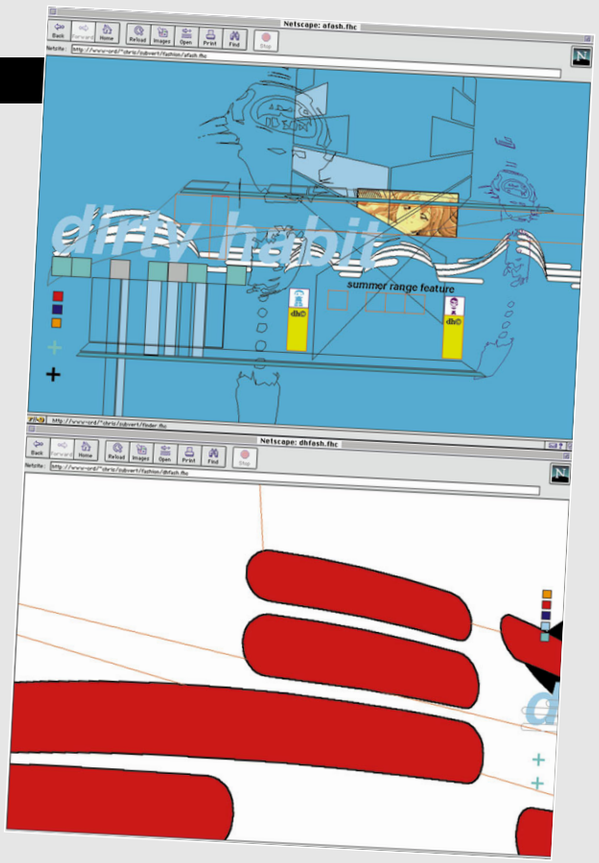
One type of project we set is the short "pressure" project, typically 10 days to 2 weeks long. The aim is for students to do very focused projects quickly and make a model or interactive demo of their ideas. These projects are of the kind they might be expected to cope with in their first job.

I think of projects as spiral rather than as linear. Although one can isolate different types of activity, it is wrong to think of them as stages: designers will move between them or work them in parallel as they try to reconcile all the competing requirements. (See sidebar page 25.)

Many of these short projects do not cover the whole gamut of process: a project for an on-screen calculator designed to entertain as well as calculate, for instance, was only about representation and craft, particularly about the kinesthetic "feel" of the calculator (all in the mind, of course, as there was only a clunky old mouse to use).

Other examples of pressure projects have been to redesign the Suitcase™ desk accessory, propose new uses and scenarios for a watch-pager, consider better ways of "selecting" things on a Newton™, and design an e-mail program for a particular user. Many of these projects, though short, covered the whole range of activities in miniature, from user observation to careful craft.

Pressure projects also provide a welcome change of pace from personal projects and an



Chris Francis

Theme: New ways of structuring magazine-type information

Product: Working structure made in Shockwave under Netscape.

Chris Francis explored new ways of representing the content of a webzine, using Shockwave to make an environment in which you can move around by panning and zooming rather than scrolling and jumping from page to page. His work started as a critique of what he saw as the unsatisfactory way that the conventions of print—particularly the idea of the page—had been transferred to the world wide web without exploiting its potential for other more interesting, useful or appropriate structures. He was also interested in the idea of lean design: rather than pumping bloated bitmaps over the internet, he liked the idea of tiny vector-based files, responding rapidly as the user moved about his 'zine. The qualities of physical interaction were not unlike a computer game—particularly when it was transferred for the show from the traditional mouse and keyboard commands provided by the browser to a version with big buttons and a joystick you could flick and push. Chris's body of work included other attempts at two-and-a-half-D spaces which give the impression of moving about a three-dimensional space without the need for the computation to support it. The next stage in this project would be to take the basic structure and try it with a substantial amount of real material—to get a feel for the way form and content might interact.

opportunity for students to work together on the same brief.

Models, Demos, Prototypes

All the students learn to program in Macromedia Director™ and to make interactive prototypes. They have their own computers, usually Macintoshes, and a wide range of peripherals to experiment with.

Everyone learns how to control a physical device with the Macintosh; people working in the area of tangible computing develop this further using the Parallax Basic Stamp™ microcontroller to interface to digital and analog devices such as switches, lights, speakers and pententiometers.

Programming does not suit every designer's temperament, and some find it difficult. Qualities of interaction can really be felt only through interactive prototypes, however, so it's quite a handicap not to be able to use Director reasonably well. We realized this when we saw that students demonstrating their projects did not communicate the important qualities of their designs: to appreciate them you needed to interact with them. Just watching was like reading descriptions of music—you get the idea but not the experience.

An interactive prototype is just not possible or appropriate in every case: sometimes a walk-through demonstration shows the ideas better; sometimes it's not possible to prototype all aspects of the design in one. One project, a mobile phone that you squeeze and flick like a joystick to move through your database and make calls, needed to be prototyped using four media: an on-screen interactive prototype for interaction with the software, a rough test-rig for physical interaction, a blue-foam model for the exterior form—and a video to bring together the whole.

No Man is an Island

Today's CRD course is the result of many people's collaboration: the 50 or so students who have graduated, many staff and visiting critics, the research studio, colleagues in other universities, and collaborators in industry—particularly our main sponsor, Interval Research.

Three tutors were particularly important to the course's development: Charlie Hill (now at Apple); Colin Burns (now at Interval); and Martin Locker, at times tutor and student, now course leader.