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Teaching digital creativity

Ten years of Multimedia Technology at the University of Greenwich

Tony Ackroyd and Tony Mann

The School of Computing and Mathematical Sciences at the University of Greenwich has been running its BSc (Hons) Multimedia Technology programme since 1995. From a first cohort of 15 graduates in 1998, to our recent degree show *Inspire* featuring the work of 57 final year students, the programme has changed and developed as the digital world evolved around us and as new technologies came and went. It is now one of a suite at Greenwich which also covers Games and Entertainment Technologies. Teaching our imaginative and creative students has been immensely rewarding, but also challenging and demanding. Ten years on, it is perhaps worth reflecting on our experience.

Our programme was introduced in partnership with our then partner college in Southend, South East Essex College, where it was delivered by the Media department. At Greenwich, it fell within Computing – a difference which perhaps reflects the uncertainties over where the new uses for digital technology in art, music, photography, video and animation really belonged. The Greenwich programme was a collaboration which initially involved the Schools of Humanities, Engineering, Education and Law as well as Computing. Initially it involved DTP, CD-rom authoring, still and video image manipulation, CAD and 3D animation, virtual reality technology, music, multimedia art, and a lot of individual and group project work. The programme leader who conceived the course and took it through its first validation, Peter Smith, handed over to Tony Mann in 1996 and he in turn was succeeded by Tony Ackroyd in 2000.

Why did we start a course in this field? There were several reasons. One was obvious – with the market for straight computing degrees offering limited potential for expansion, we hoped to attract a new kind of student into computing. But there were better reasons. In the 60s and 70s computing escaped from the mathematicians and specialists and became accessible to those who weren't expert programmers: computers were used for word-processing as well as for number-crunching. The 90s saw the beginning of low-cost multimedia, with digital imaging software, video editing tools and authoring software on the horizon. We wanted to be part of this new digital world, although none of us expected that the digital rotoscoping we were teaching students in 1996 would so quickly give us films like *Lord of the Rings*.

The first few years presented problems. The hardware and software were expensive and unreliable. Students certainly couldn't afford to buy the equipment for themselves and so they were dependent on university facilities. The significant rendering time needed for animation and video put pressure on our resources. With no easy means of data transfer in these days before CD-ROMs and memory sticks, students had trouble storing their work. There was a steep learning curve for staff.

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There was also a certain amount of suspicion within the School, partly from those who felt that this wasn't "real" computing, but also from some who, understandably, felt that resources were being diverted from established courses to support this high-maintenance newcomer. And the assessment, with an inevitable focus on coursework, was very different from traditional computer science examinations.

We were helped by our students. In the first few years of the course we were fortunate to attract many able and highly-motivated students whose work encouraged us to believe that we were on the right track. Many were mature students with backgrounds in the creative industries who were seeking to develop new and perhaps marketable skills; others came straight from school. The mix of "creatives" and "techies" has always been important, fostering cross-fertilisation and groupwork. The objectives of the course are discussed in Ackroyd and Mann [1].

In the ever-moving world of multimedia, syllabuses needed to change every year. The web, hardly mentioned when the course was first designed, quickly became its focus. Databases, originally included in a second year module, were quickly dropped as irrelevant and equally quickly reinstated when they became essential tools for web developers. Programming, in Java, came to play a bigger role in the first year, and web scripting modules have been added. HCI issues, although present from the beginning, feature more explicitly in the curriculum now.

The course is now delivered entirely by the School of Computing. This is partly because the School has expanded its expertise in the areas previously covered elsewhere, but it also reflects the institutional pressures (including funding issues, as well as more mundane concerns like timetabling) which make interdisciplinary work problematic in higher education institutions. Collaboration continues: indeed other schools in the University, including Humanities, Architecture and Construction, and Business, offer degrees with different angles on digital technology and the creative industries, and this diversity helps students find the course which is right for them.

A weakness identified early on was the lack of a visual design element, and this was addressed by employing Alison Cross, a painter, who now works half-time for the School and teaches a contemporary art course as well as design and usability. To the horror of many of the first year students, she teaches design with paints and physical materials and they don't use computers at all in her first year course! Cross's most visible achievement is perhaps her contribution to the running of our annual degree show, in which final year students display their work to the public. This was in part a response to employers' comments that students needed to develop more presentational skills if they were to find employment in the multimedia industry.

Since 2002 the degree show has been assessed: previous attempts to encourage students to exhibit their work had been only moderately successful, but marks proved a strong inducement. It is part of a module now called "Digital Creativity and Multimedia Futures", in which we hope to encourage students to think about the nature of creativity and to articulate and evaluate their creative processes. To this end we invite guest speakers, creative people in many different fields, whose brief is to promote creativity in any way they choose (as well as to discuss funding, running a business and such practical issues). These guests have included the artists Vanilla Beer and Steve Johnson, the curator James Hollands, web designer Tania Joyce, actor Judy Gordon, architect Chris Lamb, composer Howard Skempton, documentary film-maker Jonathan Stedall and the novelist Scarlett Thomas. Some of the methods used by Beer in these classes are discussed by Beer and Mann [2].

Multimedia is now an established discipline within computing, and indeed the BCS accredits the Greenwich programme. Most university computing departments offer degrees in the subject, although the content varies significantly between courses (there being no specific QAA benchmark statement). Although the right balance is a delicate issue and has caused much discussion amongst staff and students, we believe that the mixture of technology and creativity that is offered is excellent preparation for the world after graduation. Our students have found work in many fields, technical and creative: they are arts administrators, database managers, graphic designers, film-makers, musicians, programmers, publishers, teachers, web developers. The downturn in the

web economy had a noticeable effect on the job market for graduates but the prospects for talented, creative people with technical skills remain good.

What issues do we face? Software is still expensive, and frequent updates add to the cost, but much of it is also used by mainstream computing students, so the cost is shared. Multimedia is time-consuming, for students and staff alike: software cannot be learned quickly, and a digital video or 3D animation cannot be created overnight, so students can't leave assignments to the last minute! Students now all have powerful multimedia PCs at home: which certainly makes life much easier, but also reduces the sharing of ideas: when everyone had to work in a single university lab they talked to each other more and saw what others were doing.

The tension between creativity and the technical side remains, and can make assessment sometimes controversial: a student may be disappointed by the mark given for a beautifully-worked execution of a poor idea. But a particular source of frustration for staff is that many students, especially at the beginning of their studies, see education as being about learning the latest software: they want to be taught how to use version 9.723 of a package and will complain if the university runs 9.722! If we can persuade them that it is more important to learn general principles and transferable skills, and that their degree offers them the opportunity to experiment, try new techniques, take risks and above all to think, then we feel that we have been successful. This has certainly been supported by past students who have gone into the industry.

Teaching multimedia is demanding: one has to relearn every piece of software following its annual upgrade, and to redesign every course every time you deliver it because the technology has moved on. But the rewards of working with imaginative, talented and ambitious students on the frontiers of a fast-moving technology, and seeing the wonderfully varied and unexpected uses to which they put computers, make teaching multimedia a delight.

[1] Tony Ackroyd and A.J.S. Mann, *Fostering digital creativity: the BSc Multimedia Technology at the University of Greenwich*, in *Greenwich 2000: Digital Creativity Symposium Proceedings*, University of Greenwich, 2000

[2] Vanilla Beer and A.J.S. Mann, *Digital technology, intermediation and the (un)expected outcome: the real, the psychic and the virtual*, in *Greenwich 2000: Digital Creativity Symposium Proceedings*, University of Greenwich, 2000.

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Computational Intelligence, Creativity and Cognition A multidisciplinary investigation

This AHRC-funded project will take place from 2005 to 2008.

The project, which is part of an international collaboration between Lancaster University, the University of Sussex, University of Canberra and the University of Technology Sydney, involves three inter-related, multidisciplinary teams. The first - the Art & Science team - under the direction of Phil Husbands and Paul Brown will use evolutionary and adaptive methodology to evolve a robot that can demonstrate creative drawing behaviour. Simultaneously the AI and Cognitive team - under the direction of Margaret Boden and Ernest Edmonds will provide a theoretical base to the project and examine its implications for the fields of AI, Alife, philosophy, creativity and cognition. A third team - the Art Theory team - under the direction of Charlie Gere and Mitchell Whitelaw will relate to the project from the perspective of art history and critical theory.

For more information about the Institute for Cultural Research at Lancaster see <http://www.lancs.ac.uk/fss/cultres/>

Charlie Gere

Statement from the Chair

It's a great honour to have been elected Chair of the Computer Arts Society. I first joined CAS sometime in the late 1970's when I was a postgraduate student in the Slade School of Art's Experimental and Computing Department. Back then I edited a copy of PAGE and curated a number of CAS exhibitions. More recently, as a member of the CACHe team, I have been involved in the resurrection of the society.

I recently spoke to a friend and colleague, Jon Bird, who helps organise the BLIP art and technology events in Brighton. He said he had the impression that the new CAS was primarily involved in history and preserving the origins of the computer arts. That's certainly a fine ambition and an appropriate one for an organisation that was the single international focus for activity back in those early formative years. But I believe that this new CAS can be more than a custodian of the past and that it has a dynamic role to play in both the present and the future of this exciting and now ubiquitous field.

As you may know I now live in Australia though spend a few months each year in the United Kingdom. So I'm also optimistic that CAS can also rebuild its international links and constituency. Now, with broadband access to the Internet global communication has become so easy – even from the small regional community where I now live. And coincidentally both the Internet and CAS began in that same year - 1969. Licklider and Thomas' 1968 keynote paper **The Computer as a Communication Device** (together with Licklider's prophetic 1960 paper **Man-Computer Symbiosis**) can be downloaded from here:

<ftp://ftp.digital.com/pub/DEC/SRC/research-reports/SRC-061.pdf>

I'm grateful to our retiring chair, George Mallen, who has steered the new CAS through a challenging period of re-formation and pleased that he has agreed to continue in office as our President. I must also thank my fellow committee members who all remain in their roles. We are one less after the untimely death of Robin Shirley earlier this year. Robin was a pioneer of computer poetry and he contributed enthusiastically to both the original and the re-launched CAS.

I'd also like to thank the British Computer Society for their ongoing support of CAS as one of their Specialist Groups, Birkbeck for hosting our web-service, JISC for hosting the CAS e-list, System Simulation Ltd. for hosting many of our non-virtual meetings and all the other organisations and individuals who contribute to our program.

Paul Brown

Sunshine Coast, Queensland, Australia

30 June 2005

Notes from the editor

The CAS was re-formed in 2003 because of the CACHe project at Birkbeck, which comes to an end in September. The next Issue of PAGE, edited by Paul Brown, will mark that end. The close links between the two groups naturally led to many CAS meetings and much in PAGE to deal with the brief history of computer arts. PAGE will in the future deal more with current and future practice. To do this it needs your contributions on what you are doing and what you plan to do in computer arts.

The Digital Art Practices & Terminology Task Force, (DAPTTF) new glossary is a useful resource, particularly for those getting into quality print making.

<http://www.dpandi.com/DAPTTF/>

The partial syllabus apposite was written about four years ago for a school applying to specialise in the arts, and then revised for a school applying to specialise in maths and computing. As well as being incomplete, It needs input from teachers and others in education so that it matches current practice and ideas so as to become more useful to schools and colleges and maybe form the basis of a formal curriculum.

Your contribution is invited.

Towards a Syllabus for the Creative Uses of Computers in Graphic Arts

This outline is structured under these main strands:

- The computer skills that are needed
- Computer use in pure art – art for its own sake
- Computer use in applied graphic arts
- 3D – pure and applied
- 2D animation
- 3D animation
- Internet
- Technical topics

This is not the only way to segment the subject, but it has to be cut up somehow into manageable pieces.

There are also sections on uses to develop conventional graphics skills, on the implications for subjects outside graphic arts, and a note on software provision.

Assumptions

The syllabus is written for possible use in schools but it might have wider applications.

It is unlikely that a school would want to use all the syllabus, or be able to do so in the early stages.

Computers can be applied widely, and do not recognise existing boundaries between subjects. Therein lies some of the excitement. But for a school and a world with departments and specialisms, there are problems in cross-curricular activities.

No one teacher or student will command the whole syllabus. Working in teams of two or more students should be normal, even if it makes assessing individuals difficult.

There is no attempt to relate this outline to any syllabus in the arts, because that might be restrictive and because I know nothing about such things.

A large part of introducing computers in the arts will be to enable students to find their own ways of using them, but there are some aspects that need to be taught.

This document will be more use if it is expanded in detail and in educational aspects by teachers and others.

The use of computers in administration, research, criticism and history in relation to the arts is not included. But there are no clear boundaries: writing a program to make drawings in the style of a given artist could be creative historical research. Doubtful cases should be included.

Whatever it is, this subject is likely to continue its rapid development. That will take some keeping up with, and the syllabus must develop too.

“To measure language, with imagery as a standard, is the function of art in society.”
Herbert Brün in *Music and Technology*, 1970.

Computer skills that are needed

Basic skills

Most students will have learnt, at school or at home, at least the basics of using an operating environment: Windows on PCs and OS on Macs. Similarly for common applications such as word processing and spreadsheets, using help files, email, web use, and so on.

Some people, often adults, will need tuition in these basic skills. A short basic skills course, using an existing syllabus, is needed. I assume that all teachers are at least offered such a course.

Hardware

There will be some graphics devices, such as scanners, digital cameras and camcorders, plotters and high quality printers, that will be new to some students. All students should be able to carry out routine operations, and also know when to ask for help.

Such graphics devices have hardware and software settings and students should be familiar with these up to a point defined by those supporting the systems.

A few students may want to drive a device not through the standard operating environment, for special effects or enhanced performance.

Standard software packages

Much of the work will be done using standard packages such as Corel Draw, Paint Shop Pro, and PhotoShop. Many students will be able to find their way around these packages using help files, manuals and their friends. But these packages have an ever increasing range of facilities, often daunting to a new user. There is need for tuition in their use, particularly for features and facilities that students might not otherwise reach.

Other software

This includes utilities, say for file conversions, demos of new products and complete packages in not so new versions. Using these will often have to be on a DIY basis.

Such software is available from several sources – see the later section on software provision.

Enquiry and self-help

A school might be stretched to provide teaching to meet students' needs in all these aspects.

How to Find Out is a topic that might be taught, based on the use of magazines, books, internet and so on, particularly relating to computers and arts topics.

A library of information sources should be established.

Visits

Visits and work experience placements should be arranged to local enterprises that use computer graphics.

Interface with facility management

Several topics above relate to management and support of the computer facility, particularly in what students are taught to do and what they are told not to attempt.

Computer use in pure art – art for its own sake

Much of what is covered in this section applies to the next one as well.

This is a subject without limits, so here are some possible approaches – assuming that much of teaching art is by example, suggestion and critical comment.

Designs for painting

Take two or three images – photographs, art work or graphics files – and get them into the computer by scanning or other means. Combine or mix them using a package to produce an image which is displayed or printed and used as the basis for a painting or drawing.

Exercises with filters

Filters are processes that carry out transformations on an image. The term comes from sound processing. Most graphics packages have a collection of filters, and others may be added. Many have parameters that can be set to give a variety of effects.

Take an existing image and process it with six or more filters separately to produce a kind of theme and variations. An author in a PC magazine said recently that most of us (computer folk) have spent at least part of an afternoon playing with filters like this.

Take an image and apply at least six filters one after another to produce a wholly new image.

In each case filters from more than one package should be used.

Learn the range and uses of different filters and their limitations.

Drawing and painting

Most graphics packages allow freehand drawing and painting. Painter, for example, allows different sorts of bristles to be defined, and for bristles to be loaded with differently coloured paints.

Use these for the sorts of project that are already used in conventional drawing and painting classes. Use effects like charcoal and crayon to change the image.

Consider the advantages and disadvantages of each approach.

Enhancing photographs

Take a photograph and look at the ways of enhancing the image or parts of it:

- Cropping and resizing
- Removing flaws
- Sharpening the image
- Altering the contrast and colour balance
- Moving and recolouring objects in the picture
- Adding borders, captions and other data

In addition such effects as antique paper, sepia tints and misted edges can be tried.

Writing programs and procedural art

Use a standard language, such as Visual Basic, to produce and modify images.

This is as an option for individuals or teams that can (learn to) do some programming.

A good place to start would be images with lots of fine lines or smooth shading of colours, which are difficult to produce by other means.

This can lead to algorithmic compositions – procedural art is the term I coined around 1970 – where the process not the product is conceived.

It is the area of my own particular interest and has allowed me to produce works beyond anything I could conceive.

This approach can be used for part of a project or a whole work.

“It is one thing to aim for a particular sound and then to search for the means of making such sound and timbre audible. It is another thing to provide for a series of events to happen and then to discover the timbre of sounds so generated.”
Herbert Brün in *Music by Computers*, 1969.

Computer use in applied graphic arts

A syllabus can only sample this vast subject, covering many industries and pastimes, and spilling over into CAD and CAM. Here are some possible modules.

Print design

The first step is to become familiar with the many fonts that are available on computers, and the ways of manipulating them. Learn about guidelines for print design:

- The terminology of typography
- Selecting fonts for a task – not too many
- Clarity not clutter, in message and means
- Appropriate type sizes
- Use of colour
- Consistency in a document – style sheets

A first project is to design a poster for an event using a word processor such as MS Word, making a graphic for the poster, importing it and placing it in the document.

To develop a sense of style, collect good and bad examples of print design. Compare views of what is good and bad.

Modelling the process

There is an increasing number of textile fabrication machines and methods that can be driven by data from a computer, from carpet making to cross-stitch. The software for each type of fabric must model what that machine or method can do, and will normally convert a graphic into instructions for the machine or maker to follow.

In addition to learning something about this area, practical work can be done with computer control of a sewing machine.

Graphics in theatre production

A possible project to produce designs for a school play.

Clothing design

There are packages that help in fashion design. They allow the colours of fabrics to be changed easily and also allow garments to be draped on a model on the screen. The same or similar packages allow fabrics to be draped on furniture.

This suggests that students who are not interested in using computers creatively can be introduced to this type of software as a simple tool to help with their main interest.

Visualisation of data

Data can be displayed in conventional charts and graphs, but devising novel ways of visualising data can improve understanding of the information, and is a valid and creative use of computer graphics.

Take a set of data with more than two or three variables (making it difficult to plot by conventional means) and develop an appropriate way to display it – one that is illuminating and entertaining.

Put design before styling, function before fashion.

3D – pure and applied

This work is in a separate category because it is generally done with different software from that for 2D design, and because it requires knowledge of 3D geometry.

Creating designs in 2D will be familiar to students but creating and manipulating objects in 3D will be less familiar to most.

The following work, and much more, can be done with a 3D package and no programming.

First exercises

Display a horizontal plane and place simple objects on or above it: objects such as a sphere and a cube.

Place further objects on the plane at different distances from the viewpoint/camera. Distort the shapes of some of the objects.

Colour the objects and then render some of their surfaces with textures and graphics.

Set up some vertical planes to form a background. Now you have a 3D scene.

Set up lights to give different illumination effects.

Move the viewpoint and viewing angle to give different views of the scene.

Investigate other effects.

Project 1

Create a simple table and place it in a room. Put a bowl and jug on the table. Place some stylised fruit on the table or in the bowl. Add other features such as a tablecloth, a door or a window. Does this scene have some consistent style? Is it anything like something you or another person might draw or paint?

Add further detail for realism, fun or fantasy. How can this be used for interior design?

Project 2

Create a maze of corridors. Add different textures to the walls and floor to help the visitor learn their way around. Put some pictures on the walls and add other features.

Make controls that allow the user to navigate the maze: move and turn.

Project 3

Build a model of a known or imagined piece of architecture which can be viewed from different positions. Place the building in some surroundings, which could be urban, rural or fantastic.

2D animation

Conventional 2D animation

Make a sequence of simple line drawings on cards showing an object in motion. Flick through the cards to see the animation.

Paint or draw a background for a short animated sequence. Make and cut out small pictures of objects or characters. Take a sequence of (digital) photographs of the objects moving against the background. Repeat this changing the camera angle and position and settings such as zoom and focus. Use an animation package to show these images at animation speed. Try different effects, such as lighting, learning what works and what doesn't.

Note that the scenes may have a 3D appearance, depending on how the drawing is done, but the drawings are 2D.

First 2D computer animation

Repeat the project above but produce all the images in the computer.

Text animations

By repeatedly saving a small piece of text, changing one of its attributes between each save, make a small text animation. Text can be made to fade in and fade out by gradually changing its colour from the background to another colour and then back again. Other effects can be got by gradually changing position, size and spacing. The font can be changed, say one character at a time.

2D Screensaver

Use the package to design a 2D screensaver, a simple, repeating, abstract design that exercises all areas of the screen. (Technical help is needed to load it as a screen saver.)

Programmed 2D animation

Using the graphics commands in a language you know, make simple objects move across the screen. Make them bounce off the edges of the screen. Can you get animation speed of display to give smooth movement of objects?

Computers reduce the need for some skills, allowing us to concentrate more on imagination, once we've learnt a whole lot of new skills.

3D animation

Conventional 3D animation

Build or find a small model of a room. Take a sequence of (digital) photographs of the model, moving some objects in the scene. Repeat this changing the camera angle and position, and settings such as zoom and focus. Use an animation package or video player to show these images at animation speed. Try different effects, such as lighting, learning what works and what doesn't.

First 3D computer animation

Repeat the project above but produce the model and all the images in the computer.

3D Screensaver

Use the package to design a 3D screensaver, a simple repeating abstract 3D design that exercises all areas of the screen.

Programmed 3D animation

Using the graphics commands in a language you know, make simple 3D objects move in 3D. Make them bounce off the edges of the screen. Can you get animation speed of display to give smooth movement of objects?

Typically a user will first use a computer to help with the sort of work they are already doing, but then may find wholly new things to do that previously were not practicable or even possible.

Internet

Emails

Find out what sorts of graphics can be included in emails, and how to do this.

Consider what differences there are designing an email for remote viewing compared to conventional print design.

Design an invitation for an event to be sent by email.

Web pages

Look at a variety of web pages and assess the suitability of each for its apparent purpose. Look at the use of type styles, backgrounds, colours, menus and other navigation aids, graphics, animation and special features such as tables and graphs.

Design 2D and 3D animated icons for a web site.

Design web page layouts.

And so much more: design for internet deserves a syllabus of its own.

Art is what anybody says it is: a word without meaning.

Technical topics

As well as knowledge of computer basics there are some technical topics relating to computer graphics where some knowledge would be useful.

Colour

Colour is managed differently on different types of output device. The appearance of a screen can never be the same as that of a print.

Screens emit light and colours are specified in levels of red, green and blue (RGB). The number of different colours possible at the same time on a screen depends on the number of bits used to store the colour value for each pixel. This in turn may depend on the screen resolution – the number of pixels on the screen. It is possible to rely on the operating environment and package to take care of these variables, but an understanding of the possibilities and their implications is useful. The appearance of a screen depends on settings on the device such as brightness.

Prints reflect light and colours are often specified in levels of cyan, yellow and magenta (CYM). Some computer printers now use more than these three colours. Again this can be left to the system to manage colour but it is helpful to understand what is happening. The appearance of a print depends on the illumination.

As well as this fundamental difference between screen and print each screen and each printer has its own colour space – the range of possible colours.

Graphics file formats

There are many file formats for storing graphics data, for example tiff, gif, bmp and jpeg. These have been developed for different purposes and offer different facilities, such as:

- may be input to or output from a specific package
- allows multiple images to be stored in one file
- allows compression of data without any loss of detail
- allows compression of data with some loss of detail

Some formats, especially those with compression, save space needed for storing an image and the time to transmit an image

Most graphics packages now accept a wide range of file formats, but a word processor may accept only a few types for pasting in graphics.

There are further file formats for storing sequences of images for animation.

Strengthening conventional graphics skills

In the 18th century some artists assessed possible landscape compositions by viewing the scene through a framed piece of tinted glass. Many artists have used lenses to project an image of a scene onto their painting surface to ensure accuracy, as David Hockney has recently shown. Computer technology can be used in similar ways to supplement and develop conventional fine art skills.

Digital photographs, which can be displayed on a computer screen within five minutes of being taken, can be used to assess several views of a scene or subject before drawing or painting, or to assess different arrangements of a still life or a portrait setting.

Digital photographs can be used to capture action shots for drawing or painting (following Maybridge) and this could include studies of water, smoke, clouds, reflections and other transient elements, as well as moving people, animals and objects.

A sketch can be scanned, then scaled in the computer and printed in outline as the basis for a larger drawing or painting, by tracing from the print onto the painting surface.

To help students with the mysterious process of capturing the essence of a scene in a few drawn lines, a digital photograph can be subject to a software filter that detects the major edges in the picture, suggesting where important lines should be placed. Such a filter can be set to produce more or fewer edges so that alternative renderings can be tried.

A similar process can be used to assess the accuracy of a drawing by comparing it with a prior photograph of the scene. This might be done by scanning the drawing, scaling the photograph to the same scene size and overlaying one on the other. The photograph could have edge detection applied to simplify it, making comparison easier. Converting both images to monochrome may also make differences easier to see.

Such means should strengthen, not replace, conventional graphics skills.

In addition, the internet is a wonderful resource for work in art history and appreciation.

Learning in other areas

This section can be greatly expanded for a particular school.

Computers and the arts spill over into many other area and there are benefits for learning of different sorts.

In computing: increased familiarity with standard systems across hardware, operating environments, packaged applications, utilities, data storage and interchange, internet, and for some, programming.

In maths: understanding of 2D and 3D coordinate systems to define objects and movement.

In physics: learning about colour specification – the notion of colour spaces – and the properties of illuminated surfaces: learning in 3D animation about the realistic motion of objects.

In psychology: the perception of colours and surface properties.

In technology: increased familiarity with computer peripherals and other devices.

In business: learning about an important sector of the economy.

In personal and social studies: improved communication skills in print and other media, experience in information searching and of problem solving.

In general: the ability to coordinate diverse resources in a single project.

There are also other creative areas that a student may want to investigate, for example to add sound to a piece of animation, to a web site or to a presentation of graphics.

Software provision

A selection of mainline graphics packages is needed. These provide different facilities and show different approaches: there are courses devoted to teaching a single application, but use of more than a very small part of this syllabus implies the use of several graphics packages.

A selection of other standard applications is assumed, but one of each type is enough – one word processor, one spreadsheet, and so on.

Around each major software product clusters a small industry providing extras. For graphics packages there are extra filters, different types of control, improvements to the user interface, links to other packages and media, tutorials and samples. There are also more general graphics facilities such as collections of photographs and other images.

Many of these items and many more are available at little or no cost:

- as downloads from web sites
- on CDs that come with magazines and books

It is possible to get earlier versions of packages – available free as a come on for the latest version, libraries of graphics functions for use with a programming language, and lots of help from other users.

Some people see the internet as a way to make money: others see it as a way to make their work freely available. Just like print.

Remember that the main cost of a piece of software is not what you pay for it but the time you spend learning to use it, which is also part of the learning process.

Acquiring and maintaining these resources need to be managed in an installation.

Using this document

Some aspects have hardly been mentioned:

- producing graphics for the internet
- related media such as sound
- use of other hardware such as tablets and pens, projectors and textiles machines

For use in a particular context this syllabus needs to be altered in at least the following ways:

- remove unwanted parts
- expand what's left
- relate to the National Curriculum
- relate to the requirements of examination systems such as GCSE and A levels
- relate to the entry requirements and subject matter taught at particular places of higher education which offer some of these topics
- relate to the rest of the school's submission

You may also wish to remove some expressions of opinion.

- Computers have a place in the art room just as paints and brushes do.

Why have a syllabus?

At this stage its first purpose is to support the school's case for Arts or Technology College status, showing a well prepared outline of course topics, the advantages for other subjects and for conventional graphic arts skills and general computer skills.

This case for special status needs to be made not only in the application but also to staff, students and their parents. Versions of the document, perhaps together with demonstrations, could be prepared for these audiences.

After that it can be used for more detailed curriculum development.

Alan Sutcliffe alansut@ntlworld.com

CAS Meeting

Tuesday 26 July 2005

Robotics in Art

Open discussion

Led by Dr Alex Zivanovic, Imperial College

Discussion evenings are relaxed informal conversations about topics of immediate interest or anything really. All welcome

System Simulation Ltd
Bedford Chambers The Piazza
Covent Garden London WC2E 8HA

Tel: 020 7836 7406

Directions at: www.ssl.co.uk/content/map

Alex Zivanovic will lead a discussion on the use of robotics in art. The scope will include both robots used to generate art, such as Aaron, and robots as art, including cybernetic sculpture, for example The Senster.

Alex will give a brief overview of both past and contemporary work, leading to an open discussion. The particular topics will depend on the interests of those taking part but could include:

- how can we use robots to explore art?
- how can robots be used to examine contemporary issues such as surveillance, personal space, and so on?
- what are the constraints in producing such works: cost, complexity, insight?
- who would produce such works: artists, engineers or collaborations, and how would a collaboration work?
- where should cybernetic sculptures be installed: art galleries or science museums?
- possible future projects

Sex in Venice

There is currently a pair of robots on display as part of the Welsh Pavilion in the Venice Biennale 2005.

The work, by Paul Granjon, consists of two autonomous wheeled robots fitted with nylon genital organs, one male and one female. They are programmed to explore their environment, occasionally entering a "in heat" mode, where they will try and locate a partner in the same state. If a partner is located, the robots will attempt to mate. More information, including photos, is at

<http://www.zprod.org/zLab/sexedRobots.html>

For more about the Welsh Pavilion visit

<http://www.walesvenicebiennale.org/>

Meanwhile at Greenham

Tuesday 8 to Wednesday 30 November 2005

Theatre of the Restless Automata

Greenham Arts Centre, Berkshire
Monday to Friday 10am to 5pm
Saturday 10am to 4pm
Entrance is free

According to <http://www.boredomresearch.net/>

2 x randomSeed systems starts from one coloured cell and the audience can watch the abstract mechanisms produce patterns free from our aesthetic control.

Each of the **8 x biome systems** is a closed computational universe containing uniquely evolving machines that populate a virtual space of about 1 acre.

Ornamental Bug Garden is a colony of simple mechanisms that inhabit a formally arranged space. Colonies of objects catapult around a garden with algorithmically composed plant life.



COMPUTER ARTS SOCIETY

British Computer Society Specialist Group

Bringing together artists and technologists
Exchanging techniques and ideas
Formulating needs for support
Helping to get works known
Exploring new forms

ABOUT THE COMPUTER ARTS SOCIETY

Aims

The Computer Arts Society (CAS) promotes the creative uses of computers in the arts and culture generally

It is a community of interest for all involved in doing, managing, interpreting and understanding information technology's cultural potential

Membership & fees

Membership is open to all who are interested in the aims and activities of the group

There is an optional annual contribution of £10 (€15 or \$20 overseas) for which members receive a printed copy of each issue of PAGE

The British Computer Society (BCS)



The CAS is a Specialist Group (SG) of the BCS

The CAS receives funding from the BCS

Each CAS member who is not already a member of the BCS automatically becomes an SG Affiliate member of the BCS

Website

www.computer-arts-society.org

Publication

PAGE the Bulletin of the Computer Arts Society appears quarterly and can be downloaded from the CAS website

Archiving computer arts

The CAS was active from 1968 until the mid 1980s

There are significant archives of material from this era, mainly stored in homes and offices of people then active in the group

The CAS is working closely with CACHE, a project in the Art History Department of Birkbeck, University of London, which is documenting UK computer arts in the years to 1980

The collection, identification, collation and handing over of material to the CACHE team will continue in 2005 & beyond

This leads to a wider interest in the archiving, study and presentation of computer arts from earlier years

Present & future computer arts

With so many novel and exciting developments in the creative uses of computers in the arts the society will continue its original aims of bringing together those active in this area

Collaboration

The society plans to hold joint events with other BCS Specialist Groups and hopes that this might develop into wider collaboration

Education

The CAS plans to have an educational role in making students more aware of early work in computer arts and in helping artists to use computers creatively

CAS Committee

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