Ambient art that responds to its surroundings and the presence of people represents the convergence of technology, creativity and art. We will investigate the design of installations that combine an abstract representation of environmental data with an awareness of users, providing subtle but intriguing interactions with observers. Using mobile devices as interaction tools, users will, intentionally or otherwise, influence the representation that is in turn reflecting their environment back to them. Ad-hoc information gathering through wireless technologies, coupled with explicit information obtained from handheld applications will influence the style and form of the abstractions and their changes.

introduction

Abstract modern art is much more about representing emotions, thoughts and feelings than providing directly representative images of the world. It speaks differently to different individuals, allowing them to interpret it in relation to their own perspectives and the environment in which they see it. The impression generated by the picture is created as much by the individual, their experiences and their environment as it is by the artist. The artist attempts to create a mood and a feeling that resonates with the viewer, providing an emotional image rather than a directly descriptive one. For this reason, it offers an interesting medium for representing ambient information that can be interpreted in multiple ways. In technologically-enhanced modern life, there are many pieces of information relating to the environment, the workplace, the tasks and requirements of users that we can collect, collate and represent - but how do we visualise them? In particular, representations that are aware of individuals and alter their properties according to the relationships between them are interesting. We are not focused on providing a direct mapping between information and representation, but on the creation of a representation of the overall 'mood' of a place, and in the modifications that occur as users interact indirectly with the artefact.

You walk into a shopping mall and notice the large abstract artwork projected onto the wall. Its overall effect is one of tranquillity and calm - simple lines and curves of colour gently hover over a cool blue background. You look around the mall and notice that it too is quiet. As you walk past the picture, one of the red swirls seems to grow slightly in size and shift a little, towards where you are going. You stop and retrace your steps, and it too returns to its former size. While you study the picture some more, a coach party arrives through the doors. The picture slowly transforms, with more colours and longer swirls appearing on the canvas at slightly different heights, whilst the background moves towards a purple colour. It appears a little more cluttered and busier, and you notice that as all the people move past the picture, waves of motion appear to flutter through it.

In a sales office, another picture hangs on the wall; it's early morning and the phones are quiet, no one is working on the computers. Angry blocks of colour and vicious lines dominate the image. It's only when the office has become a hive of activity that the picture is satisfied, offering softer shapes and pastel colours - it clearly prefers activity. It was a present from the management.
These scenarios illustrate how images can easily convey mood, activity, presence, and other ambient information.

There are numerous challenges in this work. The first is in producing acceptable artwork in the first place - modern art is not trivial to produce, and digital art that is responsive, slowly transforming, and evocative is taking artistry firmly into new media territory. However, we have a number of theories based on psychological principles that we can use, tapping into known emotional responses to colour, shape, order and chaos to provide us with some guiding principles. In addition, the novelty of the artefact initially compensates for its potential artistic weaknesses - it can be interesting to see and interact with, but you may not want one in your home for a few years yet.

The second challenge is in producing parametric art. In order for the images to alter in response to environmental changes or to the presence of users, it has to be able to adjust its form. These adjustments may well not be linear, nor even reversible, but nonetheless there has to be a mechanism by which the artwork can respond sensibly to new values in the environment it is monitoring, and making these changes effectively (in an artistic more than a computational sense) is another challenge.

The third challenge is in responding to the user and the ambient environment. The artwork could be purely representative of aspects of the environment such as temperature, network activity or other such features, but it is much more engaging if it responds in some way to the presence of users. There are a number of aspects to this: simply modifying its behaviour based on the local movement of people is one such approach, but alternatives would allow the user to more directly influence the artwork using their PDA or mobile device. Such digitally-enabled users may be more prominently recognised by the artwork, and it may move towards forms that the user has previously indicated that they prefer: more Rothko than Pollock, for example. In addition, users may be able to contribute towards the direction the artwork is evolving towards, or add new constructs to the space that the picture can incorporate in the future.

related work

This work has some relationship to the genetic evolution of art, in which users choose from a number of existing images those that they find the most pleasing. Karl Sims’ Genetic Images is the best known example of this visual aesthetic evolutionary design: it is a media installation in which visitors can interactively "evolve" abstract still images. A supercomputer generates and displays 16 images on an arc of screens. Visitors stand on sensors in front of the most aesthetically pleasing images to select which ones will survive and reproduce to make the next generation. Steven Rookes' current genetic art involves generating video sequences using genetic cross dissolves. Based on Sims’ work, a program called GenCross generates a trajectory (a video sequence) through a series of images resulting in a viewing of previously unseen forms or genetic possibilities resulting from the mating of two individuals.

Former member of the Royal College of Art and IBM Fellow William Latham produced evolutionary art that created organic (lifelike) forms. It spawned a variety of offshoot products such as album covers (SHAMEN), videos (UB40), film work (Hackers) and fashion wear (Daniel Poole). Latham's original inspiration was his early IBM work where he worked alongside Stephen Todd. The original, award winning Organic Art (OA) package was published by The Learning Company in 1996 and went straight to the top of the PC-CD Rom non-games chart, where it remained for a number of years. The product was a direct result of the Latham and Atkinson's pioneering exploration of the realm in which art meets technology, which culminated in the creation of the "Evolutionary Generator" (EG) engine. The "EG" engine propelled the many components of the software in random endless patterns against a host of stunning backgrounds and so enabled the scenes to generate in real-time, continually creating new mutations for the user to discover.

OA was fully interactive letting the user design his own virtual scenes. Space age, marine, cyberdelia fossils and futuristic jewel-like forms were rendered in 3D and generated "live" on any Pentium or 486 PC. Simple shapes such as eggs or cubes were grown into complex organic 3D forms that were then mutated and transformed in real time. Organic Art came with user editing controls enabling the user to take part in the process by selecting colours, objects and ever changing backgrounds - the possibilities were endless yet ultimately the limits were set by the artist. Users lost themselves in endless hours of addictive, creative pleasure. In 1997 Microsoft celebrated the
anniversary of Windows 95 with an Organic Art special edition - downloads currently stand at over 2 million.

These pioneering programs show us a number of useful things. Firstly, the parametric representation of art is possible, and secondly that users like engaging with computer-based art. If we couple this with informal interactions with environmental information, then interactive ambient art becomes an interesting and viable proposition.

**project outline**

The project will develop an ambient art display that will use modern art to represent both ambient features and interact with users.

The system will interact with users on a number of different levels

- Ad hoc networking and information sharing – Bluetooth, wireless LAN and GRPS will be used to exchange information with the user, allowing the artwork to understand more about the people in front of it and respond accordingly. Microsoft CE.net will be used to rapidly develop an application for a handheld device that will contain exchangeable information about the user, their likes and dislikes, and potentially some notion of tasks they are involved with, which can then be used to influence the form of the display.
- User movement: digital video will be processed to identify user movement and hence provide input to the system. This will be done initially via a standard PC, but if time permitted it would be also done via an embedded system (using Embedded XP) and communicated wirelessly.

We will develop a system that is capable of accepting multiple forms of ambient information over a variety of transports. For example, the system can be connected to a LAN and can measure network traffic. It could also receive pressure and temperature readings from sensors around the building via wireless connections or Bluetooth, and remote readings could be accessed via GPRS. We will use the .net framework to develop the generic architecture to accept this information, and will then provide a number of information sources. Some will be relatively simple (such as network activity) whereas others may require the creation of bespoke embedded systems (using Embedded XP) as lightweight information sources.

This work will be innovative in that it will use mobile technology as interaction devices, coupled with the design of installations that combine environmental information (activity, mood, presence) with art.