# Ambient Art: Information Without Attention

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## Abstract

Art explores and expresses our aesthetic relation to our environment and ourselves. However, since the rise of photography, the value ascribed to art's representative power has waned and in its place are explorations of the poetics of each piece, the way in which an object's materiality intervenes in the space (and time) in which it is sited, authorship, the role of the viewer and so on. In 2D media, these subjects have been explored in many ways. Mark Rothko, concerned with the search for the sublime, created vast modernist works than aimed to stupefy the viewer into a response to the hidden 'divine'. Picasso's light paintings subverted the photograph's modus operandi by generating an image over time, rather than in a single snapshot instant. Many artists working in video explore directly the way in which time and image can interact.

These concerns offer themselves uniquely to the development of a 'new' medium – an exploration of the way in which ambient information can be represented in a visual, 2D (or perhaps 3D) format. 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, 2D 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 what might be termed the 'mood' of a place, and in the modifications that occur as users interact indirectly with the artefact. This brings the viewer into direct interaction with the artwork, something that has been carried out by digital artists within a gallery or studio environment, but which has not yet transgressed the boundaries of the gallery walls. This defines ambient art: representations of complex environmental and user information that reflect their surroundings as well as simply being displayed in them.

This paper presents the rationale for exploring ambient art, details the basic technical infrastructure, and discusses our experiences with using the system.

## 1 Ambient art: setting the scene

Ambient art is art that in some way represents elements of information from the environment and from the user.

Picture this: 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.

This scenarios illustrate how images can easily convey mood, activity, presence, and other ambient information.

# 2 Related work

Relevant work in the fields come from both an artistic and a technical background. From an art theory perspective, it could be said that the artist is successful in her intervention to the extent that she manages to engage the viewer's intuition and allow them to experience something new. Although the intellectual aspect of the experience of the artwork is undeniably important, it can be said that a piece will not 'work' unless it engages on more than the intellectual level. In this sense the artist must also allow the 'lapse' in the intellectual to occur within their own practice, creating the potential space in the work that then allows the viewer to experience the work stripped of its intellectual significances. The viewer creates their own *qualia* of experience in the face of any artwork. The ambient art intervention is complex and takes place at a remove from the piece itself. However, the intervention that the artwork makes on the viewer (and the viewer makes on the artwork) allows an 'experience of experiencing' within the viewer's own embodied response. Interaction with the proposed pieces will make the viewer aware of their own process of viewing, prolonging their experience of art by harnessing the process of the experience itself.

In the case of the artist, there is a physicality to the process of creation that requires the existence of a corresponding temporal component to the work. In works that are more conceptual than concrete (such as Martin Creed's 'Work No.88' – a piece of A4 paper crumpled into a ball), the temporal component of the work also seems to be slight, a fact that illuminates the quality of the experience of temporality, of duration itself. At the other end of the scale, in terms of the physicality of the act of creating the work, a piece such as Richard Long's 'Ten days walking and sleeping on natural ground' (a text work depicting a walk Long made in Scotland in 1986) has a temporal component that almost outweighs the conceptual. The work is delivered by a fragile skein of text, but its temporal component is present nonetheless. Jackson Pollock's 'process' oriented work provided the starting point for much of the movement towards the focus on the 'performance' element of art. Pollock's paintings are more the 'residue' of the art (his act of making) than the art themselves.

The artist Anya Gallaccio produces work that frequently evolves over time(Gallaccio, 2003) and her intervention very much initiates a process, the viewing of which is a participation in a chain of events, rather than a viewing of the evidence of the outcome of a chain of events. Her work *preserve 'beauty'*, which was reprised recently in an exhibition at the Ikon Gallery in Birmingham, UK(24hourmuseum), is an example of this. In discussions of Gallaccio's work, there are questions raised about the extent to which her work is 'successful', whether it 'works'. These terms are used regularly in discussion on artworks, and, though nebulous, seem to describe the extent to which the viewer can find coherence between their own (intuitive) response to the work and the cultural 'ground' from which they approach it. Gallaccio's work is well-documented and well presented (not least in her publicity materials) but it is possible that it eludes the intuition to some extent and appeals too readily to the intellect. Writings about the artist herself often refer to this as a critical component of her strategy saying that she probes the gap between expectation and reality, exploring situations where our fantasies fail and we are thrown back onto real-time experience.

In works such as '20:50' and 'Watertable', the artist Richard Wilson intervenes in the gallery space rather than in the viewer's temporal experience. This is also an important component of the ambient art programme. Wilson's interventions radically alter the relationship between the space and the viewer and the reconfigured space acts upon the viewer rather than allowing them to observe the work within it. Wilson's pieces produce a dislocation between the eye and the brain, a lapse between the sensory, embodied, intuitive experience and the intellect. In fact, because his work does not draw on the intellectual (historical, social etc.) background of the viewer, but deals with the space in which it is situated, it has an immediacy that invites an experience that is oriented around the present moment. In doing so, he contracts the gap between the intuition and the intellect, inviting a strong experience of the lapse or suspension of the objective perception of time and space. The work resists objectification and prolongs the 'process' of interaction with the viewer.

Ambient art combines interventions in time and the 'exhibition' space (virtual or otherwise) with a response to some aspect of the presence of the viewer (e.g. their movement, speech or the colour of their clothes). The viewer cannot view the work without changing it in some way – just by being in the room the piece is changed, by speaking, by turning around to look at another view of things – there is destruction of what was originally there and creation of something new.

Hiroshi Ishii, from the MIT Media Lab, leads interesting work that is close to ambient art. Whilst focusing on tangible interfaces(Ishii & Ullmer, 1997), he has developed an installation that uses powered versions of children's windmills to represent the state of the stock exchange, thus giving rise to an overall impressionistic conveyance of complex, multidimensional information streams (Dahley, Wisneski, & Ishii, 1998; Wisneski et al., 1998). This reflection of information in imprecise but aesthetically pleasing forms is also echoed in (Weiser & Brown), who illustrate the activity of a network by animating a hanging string as bits pass by on the ethernet cable.

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* (Sims) 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 computer generates and displays 16 images on an arc of screens, and visitors stand on sensors in front of the most aesthetically pleasing images to select which ones survive and reproduce to make the next generation. Steven Rooke's current genetic art involves generating video sequences using *genetic cross dissolves*. Based on Sims' work, a program called *GenCross* generates a video sequence trajectory through a series of images, resulting in previously unseen forms 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(Latham, 2001), originally inspired by his earlier collaboration with Stephen Todd at IBM. It spawned a variety of offshoot products such as album covers, videos, film work and fashion wear. The original, award winning Organic Art 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 Mark Atkinson's pioneering exploration of the realm in which art meets technology, which culminated in the creation of the "Evolutionary Generator" engine. This engine propelled the components of the software in random endless patterns against a host of backgrounds and so enabled the scenes to generate in real-time, continually creating new mutations for the user to discover.

# 3 Creating art from information

There are numerous challenges in this work. The first is in producing acceptable artwork in the first place – digital 2D images with an aesthetic that 'works' are 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 art theory and concepts, as well as sound psychological principles that we can use, tapping into known emotional responses to colour, shape, order and chaos to provide us with some guiding principles. To work in this way has a precedent in the artistic work of James Turrell (Turrell), although his work was not digital and its interactive element is linked to the physical movement and physiological response of the viewer rather than a feedback process within the work itself. 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 image 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. It clearly is achievable, since this is the approach taken by the evolutionary artists.

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, as in the attentive display work of Holman et al.(Holman, Vertegaal, Sohn, & Cheng, 2004). 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(Vogel & Balakrishnan, 2004). Such digitally enabled users could 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 Pollack, 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. This may be explicit, through engaging in some form of dialogue with the art, or implicit, in which colours, textures and shapes are combined with digital information gleaned from their devices to shape the representations.

One of the aims of the work is to discover whether we can provide effective ambient information to people who can then absorb it without realising it (Merikle & Joordens, 1997; Merikle, Smilek, & Eastwood, 2001; Rock, Linnett, Grant, & Mack, 1992). One example of this is the sound given off by a modem dialling in to an internet service provider – users are often able to infer the status of the connection by the tone and nature of the sounds produced, without consciously listening to it. We want to achieve the same by presenting useful information in an understandable yet often abstract and aesthetically appealing manner – one application produces a series of blobs that represent the arrival times of the next few trains, and reports that users become rapidly adept at understanding the abstract art produced and timing their departure from the office based on the state of the image (Skog, Ljungblad, & Holmquist, 2003). Information visualisation in general has not often focussed on creating aesthetically pleasing visualisations as a priority – it aims to present abstractions and representations of complex data in a manner that is as easy to understand as possible (Card, Mackinlay, & Shneiderman, 1999) – though some beautiful structures have often emerged e.g. (Hendley, Drew, Wood, & Beale, 1995). However, most information visualisation work assumes that the users are paying full attention to the system, not having it exist in the background, and there is a question as to whether we can effectively represent anything to inattentive users, given the abilities of the human visual system (Simons & Chabris, 1999).

# 4 System Architecture

The architecture for the ambient art has been developed based on a web services model(W3C, 2004). The rationale for a web service architecture is that it offers a standard, extensible, scalable set of protocols, and places no geographical or hardware constraints on the ambient system. Any type of sensor (or application) can be connected to the system, as long as it provides a data stream or responds to a request. The sensor is treated as a service that is accessible via the web, with the content encoded as XML and encapsulated in a SOAP message (W3C, 2003) and passed to the ambient server. This means that we can access remote as well as local information, and can utilise both wired and wireless networks.

We have developed a lightweight implementation of a SOAP messaging architecture, allowing messages to be created, sent, parsed and recreated with very little computational overhead, and without the need for a full web server (e.g. Apache) or Tomcat installation. In our current prototype, written in Java, we have a two servers; one server takes care of accessing ambient information, from local and remote sensors, and creating a set of accessible inputs: the other focuses on generating artwork from the available datastreams.

The system can receive inputs in numerous formats, divided into three conceptual formats; numeric, textual and multimedia. These inputs can be provided by varied sources, notably SOAP web servers and web sites, as well as local sensors that produce data streams which are wrapped up into SOAP messages. Inputs can be sent from numerous sources simultaneously, and are then collated to form a model of the environment to be represented by the art. The system responds using parameterised, predetermined behaviours to generate art to represent the environment presented to it, which can be flexibly displayed in multiple concurrent locations.

The implementation is not designed to be all-inclusive, but to provide a framework for artists, and other developers, to be able to easily create substantial and adaptive ambient art. The architectural approach has benefited from earlier work on communicating software agent architectures in the onCue system(Beale, Dix, & Wood, 1999; Dix, Beale, & Wood, 2000; Wood, 1996).

## 4.1 The Distributed Approach

The system was divided into three main parts: sensors that collected data, a collating server that processed the disparate data sources and created a set of parameters to adjust the artwork, and an art server that took in the parameters and produced the art. This enables inputs to be gathered, processed and displayed in different locations. The advantages of this are intuitive; firstly, it enables new plug-ins to be added to the system easily, essential to enable both further work and a combination of inputs, and it also enables the display and processing to be in entirely different locations, allowing display applications to be active using minimal resources, while processing is done centrally elsewhere. This flexibility allows us to develop art based on data maintained elsewhere, perhaps reflecting an environment other than the one the art is based in.

This system uses four concurrent components which interact with each other and outside systems using Simple Object Access Protocol. SOAP(W3C, 2003) is communications protocol which uses XML as its foundation. This protocol is commonly adopted by web services, allowing the system to directly interface with local web services to obtain current environmental data. As a subset of XML, it proves both flexible and extensible during the development and as a feature which enhances the ease of future development. Each of the components connects to the others by sending SOAP messages to specified ports for each of the other components. On receipt, the SOAP message is parsed by the individual classes and a return message sent.

The first component is an application that enables all SOAP messages passed throughout the system to be uniquely defined. It consistently maintains a continually changing identifying number that can be requested by any part of the system. Inputs to the system require unique identification to prevent the accidental creation of multiple representations of a single input. Similarly, each element of the created art sent to the display server is uniquely identifiable to prevent multiple instances of the same art being created. A SOAP message from any source with the tag '`request ID`' causes the distribution to reply to the port the request came from with a SOAP message containing the current unique value, which is then incremented.

The next component (sometimes called input server) is the input managing facility. Conceptually, this creates a model of the environment the art is to represent based upon the inputs it receives. Technically, this distribution correlates all inputs sent to the system from various sources, and extracts the data from the original SOAP messages. This data is then parsed into differing objects to represent elements of the environment. These are collected into a
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