Augmenting the White Cube

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Introduction

This chapter addresses the theme of digital artworks as innovative forms, looking at how they are conceived, constructed and evaluated. This is discussed from the perspective of my own professional experience as a practitioner researcher. In this chapter, I will explore the idea that ‘mixed’ or ‘augmented reality’ art is emerging as the latest term to describe a set of technologically enabled works that sit under the rubric of interactive art. This analysis of augmented reality art is discussed through the description of a practice/thesis research model and contextualised through the twin lenses of digital technologies and contemporary art history. This contextualization places augmented reality art in a line of digitally enabled creative practices that have already become an accepted part of the fine arts canon, a practice that is prefigured by the media forms of interactive art, net art, computational art and other digitally enabled forms. I will make the claim that augmented reality can be seen as a predictable next generation response to the ongoing interweaving of digital technologies and art, a preference that is increasingly occurring in contemporary western culture. This argument will also be played out through the description of a piece of my own work from the field. The description of this work will form the basis for a set of reflections on the practice of making augmented reality artworks. It will include observations on the curatorial considerations of augmented reality in a gallery context, and the participatory role of the audience in activating these types of works. I will also explore the phenomenon of augmented reality art from the perspective of the audience and their expectations and experience of such works. Finally a practice/thesis research model will be discussed that will describe my personal approach to research in this field, which will be framed through an analysis of the relationship between practice and writing in the context of postgraduate university study.

The Augmented Reality System

From a technical perspective the term ‘augmented reality art’ can be seen as part of a set of new media/interactive art practices. Computer-based augmented reality has been made possible by the development of enabling technologies such as, image recognition and tracking software, wireless location and sensor detectors. These technologies have become more commonplace through the development of video enabled mobile devices such as the iPhone and image-processing gaming interfaces like the Xbox Kinect and Nintendo Wii games.
platforms. In general terms, augmented reality can be described as the use of digital technologies, which combine computer-generated, digital content with physical environments. By extension, augmented reality art can be considered as the application of these technologies and systems in the creation of artworks, seen in the context of a gallery or creative venue.¹

By using augmented reality technologies, it is possible to enhance the video image of real objects, people and spaces, to build stories and add layers of digital content to physical environments. A typical augmented reality scenario might be constructed as in the following example: if we were to visit an art gallery and look at a physical sculpture through the digital screen of a mobile phone camera we would be able to see pre-authored computer-generated content, overlaid on the screen image of the sculpture. Importantly, the digital content is seen in relation to the physical object as if mapped onto Euclidian space. This visual connectivity helps to establish a perceptual link between the digital content and the actual object being viewed. The layered digital content might for example, take the form of a graphically annotated diagram, which reveals the author of the work, how old they were when they made the work, where it was made and so forth. Additional content in the form of text, audio narration or video sequences could also be presented to the audience, to relay information on related works in the collection, associated art movements or other contextual material. In short, augmented reality technologies allow the audience to gain an extended or augmented insight in to a particular physical setting, situation or object. Moreover, this additional digital content is revealed while the viewer is in (and aware of) the actual physical environment, or in the vicinity of a real object. As described in the example above, the augmented material may take the form of factual information or it may consist of more expressive content, which can be used to add colour, texture or emotion to the physical experience. Later in this chapter I will illustrate how it is possible to incorporate both these approaches into a creative work. In general terms the potential for augmented reality to add extra content to real-world situations presents a variety of opportunities for the augmentation of cultural objects, buildings or environments. Augmented reality technologies can be considered as advanced communication tools, which can be applied to an assortment of social, communal and economic scenarios. However, in this chapter, I will concentrate on the use of augmented reality in the creation of artworks.

**Prefiguring Augmented Reality**

It is important to briefly go into the developmental history of augmented reality art as both a concept and set of digital technologies. This will enable us to place the phenomenon of augmented reality in relation to recent computing and art histories. Augmented reality as a technology is acknowledged to have grown out of the area of computer-generated Virtual Reality (VR) and the application of VR in creative practice in the mid-1990s. One of the first
and most prominent art/technologists to experiment with VR as an art form was the Canadian artist, Char Davies, who is credited with making some of the most important VR artworks undertaken during this period. Davies produced a number of immersive VR artworks, which attempted to wholly place the audience member in a virtual environment/experience. This was achieved through the use of Head Mounted Displays (HMDs), data gloves, and biometric, location and motion sensors, which were important emerging technologies at this time (Paul 2003:126/7). Although cognisant of the embodied experience, these VR artworks demonstrated a common interest from this period in experimenting with the different kinds of transcendental experiences that could be enabled through the potential of VR technologies (Popper 2007:217).

There were other technologies developed in this period that also attempted to create an immersive experience for the audience. This included the concept of whole-room video projections, or CAVE constructs. Within these installation spaces video content could be projected on to the walls, ceiling and floor of a gallery or exhibition space, surrounding the audience in a room of video projections.ii

However there has been a recent shift away from the types of immersive VR environments developed in the 1990s. This shift has moved from the VR scenario, where the audience is purposefully placed in a technologically mediated space, towards the development of ‘located’, augmented reality environments, where the audience is consciously connected to a specific physical space. This way of thinking represents a paradigm shift in the relationship between the digital and physical and the way we in which we interact with these spaces, which are traditionally consider to be entirely separate. Although VR continues to develop today as a creative practice, it is more commonly associated with multiplayer online computer games and virtual, social networking worlds. Nevertheless, there are a number of artists still working with these media forms.iii

Certain artworks, which today we might consider to be examples of augmented reality were developed before the realisation of VR art. From the late 1960s onwards, artists such as Myron Krueger, Jeffery Shaw and Perry Hoberman were experimenting with works that creatively explored the potential for interaction between digital (or video) content, and physical spaces or objects. These early interactive artworks shared a common conceptual ground with contemporary augmented reality, through an interest in combining the physical, with a computer-generated/digital experience.

As suggested previously, many augmented reality projects were originally developed for use with HMDs similar to those used in early VR environments. However, the current trend in augmented reality is towards the use of mobile devices, such as camera-enabled smart
phones or hand-held computers. This shift from HMDs to mobile devices crucially achieves two things: firstly, it moves the technology into an increasingly accessible public platform, and secondly, the use of hand-held mobile devices dramatically lessens the restrictions on the user’s awareness of physical space (as is the usual case with immersive VR technologies). In augmented reality the layering of the digital alongside the physical, as opposed to the attempted replacement or simulation of the physical (a trait of VR constructs), enables relationships to be formed between computer-generated/digital content and physical environments or objects (Gwilt 2008). This ability to establish a cognitive and spatial relationship between the physical and digital is, according to Anders, the key to the successful use of augmented reality (1998:171).

In the following section I will describe a piece of my own augmented reality artwork that uses a combination of a physical object, mobile technologies, and computer software, to establish a relationship between a sculptural artefact and digital content in a gallery context.

**Case Study: Save_as (2007/8)**

In this augmented reality artwork, the video facilities on a mobile device are used in conjunction with image recognition computer code, to visually place digital content in direct relation to a physical object in a gallery space. The object being augmented in this instance is an acrylic model of the typical folder icon seen on any contemporary computer desktop. In the work a large-scale model of a desktop folder can be seen attached to the gallery wall. The folder is partially open and turned upside down (See Fig 1). The audience is encouraged to approach and observe the physical folder. Audience members are also invited to view the folder with the aid of a hand-held mobile device, which is supplied as part of the installation. When observing the wall-mounted folder through the hand-held screen, the viewer is able to see ‘virtual content’ superimposed over the image of the physical object. The artwork is programmed so that when the camera of the hand-held device is held up to the physical object, the image software within the device recognises the object, and the location of the viewer. In this case, the image of the wall-mounted folder is overlaid with digital texts that appear in the viewing screen of the mobile device. These digital texts appear to sit in front of the physical folder (see Fig 2). In the screen, the audience sees a computer-generated graphic consisting of a pair of words, these words are drawn from two different lists; one list is comprised of common software command words including: ‘save’, ‘cut’, ‘paste’, and ‘delete’. The second list is made up of a set of personal pronouns including: ‘him’, ‘her’, ‘them’, ‘our’, etc. The software randomly selects one word from each list and combines these on the screen to create statements such as: ‘save them’, ‘cut me’ and ‘delete her’. Every six seconds a different word combination is displayed (Gwilt 2009).
Fig 1 (left) Ian Gwilt *save_as* (2007/8) acrylic model, wall mounted 220mm x 180mm x 90mm.

Fig 1 (right) gallery installation view *save_as*, in the exhibition *Image Ecologies*, University of Technology, Sydney, (UTS) Australia 2008.

Fig 2: *save_as* (2007/8) acrylic, digital model, wall mounted object, software, hand-held device.

Conceptually, the *save_as* augmented reality installation attempts to address our collective relationship with computers and digital technologies. Borrowing from the visual language from the computer graphical user interface and the operational language of a ubiquitous software menu system, the work attempts to decontextualise these commonplace devices. It invites the audience to think about their own relationship with technology and the role it plays in everyday life. By combining personal pronouns with terminology taken from generic computer interface actions, the intention is to make a link between people and technology, analogue and digital. These word combinations question our personal engagement with the domestic computer and the graphical user interface. Although the augmented digital content is textual in form, it is not instructional, but intended to engender an intriguing or emotive response in the audience. In this case, the augmented reality technologies were developed
specifically in the context of an artwork, not as a piece of information design. The artwork demonstrates how augmented reality overlays can provide provocative/emotional content as well as factual information.

As with other augmented reality artworks, save_as is an amalgam of digital and physical cultures. It combines computer-based modelling with sculptural plastic forms and computer software. Moreover, it uses media-making techniques, concepts and qualities from both digital and physical art practices. In terms of the underlying computer-based technology, the artwork represents an innovative application of augmented reality, which was realised through the use of bespoke object recognition software written specifically to run on a hand-held device. At the time the work was made the majority of augmented reality systems used a printed marker or symbol as a visual trigger to map digital content onto. When placed in the physical environment, these two-dimensional markers are easily recognised by image processing software and this technique is still popular today. Conversely, the save_as artwork was an experiment in developing software that would recognise three-dimensional physical objects as triggers for augmented content, thus replacing the need for graphical markers in the environment – the physical artefact becoming the trigger in itself. It was also important that the digital component of the work could run on mobile technologies to allow for freedom of movement to escape from the immersive qualities inherent in HMDs.

The save_as augmented reality artwork speaks to the different perceptual and cultural values that we assign to the physical and digital. It attempts to reveal the cultural qualities we often ascribe to material form, such as: weight, texture, spatial volume (as seen in the sculptural folder), and to the preciousness of the art object itself. These material qualities are read alongside the qualities, which we expect from the digital dynamism, data density, replicability, morphology and so on. In terms of my own practice this artwork also represents an attempt to combine an interest in material art making techniques with the potentials of digital technology, using the visual language of the computer desktop as a point of creative reference. I will expand on this idea later in the chapter, but firstly I would like to consider the role of the audience in augmented reality art, and touch on the formal implications for the gallery when curating these types of works.

**Augmented Reality Art and the Active Audience: Enacting Augmented Reality Art and Curatorial Concerns**

I have described how augmented reality art is based on building a relationship between digital content and physical places, objects or actions. It is equally important to recognise that these desired relationships are only activated by the engagement of the audience. This recognition allows us to make a link from augmented reality art to the broader realm of interactive art and the active audience as discussed in this publication. Let me illustrate this
need for an active audience in augmented reality art by describing a pioneering work by the artist, Jeffery Shaw. In Shaw’s work, *the Golden Calf* (1994), the audience is presented with a conventional, white painted gallery plinth; attached to the plinth is a hand-held computer monitor, which can be seen resting on top of the plinth. On first viewing there appears to be nothing else in the gallery space. However, by picking up the computer monitor and looking at the plinth through the screen the audience member is rewarded with the view of a computer-generated model of a golden calf. The golden calf appears to be sitting on top of the physical plinth. In a public, almost ‘performative’ dance, the audience member holding the screen can move around the virtual calf to observe the virtual sculpture from different angles and viewpoints, as if walking around a physical sculpture. In this way, the artwork is enacted in space and time, materialised through the use of technology and by the actions of the audience. The artwork can only be fully realised when an audience member interacts directly with it. In contemporary versions of mobile-based augmented reality art, audience members will often perform a similar set of movements when accessing the digital content of an artwork. In this way, the gestures and salutes of the contemporary mobile phone user become an integral part of these augmented reality art enactments (Gwilt 2009).

The notion of a hidden artwork, which is only realisable through audience engagement, is also a concern from a curatorial perspective (as it is for many of the other types of interactive works discussed in this book). However, with augmented reality artworks the emphasis on combining digital content with material form or a physical environment means that there is ordinarily a visible or tangible component to the work on view in the gallery space. Although this physical manifestation, by definition only represents a part of the augmented reality creative story. The physical component of an augmented reality artwork can act however, as a point of reference or indicator to the presence of a work.

Beyond the question of partially hidden content or the partially hidden experience, the active relationship between system and audience necessitates other curatorial considerations. For one, the issue of ‘inviting’ audience engagement and interaction highlights the need for robust technologies and objects, which can be intuitively used and explored (see Deborah Turnbull and Matthew Connell’s chapter). In addition, the increasingly common practice of using hand-held technologies dictates that the primary experience of the work is based around the individual or is restricted to a small group. A gallery exhibiting augmented reality art must consider how to mange the different activities available to the audience member. As the role of the audience member can move between passive observer to proactive initiator, and from the public/communal, to the private, individual experience.

Let us now briefly reconsider the augmented reality artwork, *save_as*, in the light of the curatorial considerations outlined. The artwork *save_as* was achieved through the specific
development and application of image recognition software to allow for the augmentation of physical objects with digital content, requiring robust technologies. Utilizing the material qualities of the acrylic folder, together with computer-vision processing software capabilities, an augmented reality experience was made possible by combining the physical and virtual elements in the work. In the work, an audience member triggers the experience as they move the mobile device forward and backward in space to activate the augmented content. This can be observed by other members of the audience as they moving between personal/active and communal/passive audience modes. The save_as work can be seen to contain the key elements of augmented reality art as discussed above. In the next section, I will concentrate on the description of a practice/thesis model for engaging in augmented reality art, in the context of postgraduate research.

**Intentions and Methodology: a Practice/Thesis Research Model for Augmented Reality Art**

A key tenet to this publication is to reveal a set of ideas around the relationship between practice and research, and as an academic, creative practitioner and a former PhD student, I have been engaged in an attempt to thread together these disciplines and their associated expectations. In the following section, I will describe a personal approach to the problem of combining research and creative practice in the context of augmented reality art. For me, the need to consider creative practice and research in the same basket became a necessity when I enrolled on a hybrid practice/thesis doctoral programme. This research was to be embarked upon while continuing to work as an academic and creative practitioner. In addition, my studies were to be undertaken in a university school of art history and theory and this context was to have an important influence on my approach to the research activities. Central to this approach was an attempt to understand the notion of art practice as research (Macleod and Holdridge 2006). This concept shifts the emphasis on research as a set of preparatory exercises to the creation of a piece of work, towards a set of activities wherein the work or the development/making, documentation and reflection on that work has the potential to become research in itself. This premise is at the core of a hybrid practice/thesis research model, which necessitates both a text-based and creative output. A fundamental requirement of this model therefore, is the need to resolve the relationship between these two activities. For me, this was achieved in the following ways: first by defining a site of research/enquiry; second through the outlining of methodologies, and third, by describing a personal position/hypothesis which could be articulated through both the written and practice-based aspects of the work.

In terms of a research agenda, my hybrid practice/thesis examined the phenomenon of mixed-reality, or augmented reality art, which was discussed through the lens of the graphical user interface as an emergent site of creative practice. The graphical user interface
acting as the defined site of research/enquiry. As Scrivener points out, the strategy of working from a site of enquiry, in what he terms a ‘creative production based study’, is a useful one as it allows for a creative response to emerge from a set of concerns or issues that arise from an on-going investigation (Scrivener 2000:4). This tactic is fundamentally different to a problem-based approach to research, which presupposes an existing question or problem that needs to be resolved. By taking the site of enquiry approach a more freeform set of responses can be made in answer to emergent concerns or issues from an on-going research activity. This is particularly useful when the responses made take the form of an open-ended, practice-based outcome.

In my case, I identified three methods to be used to respond to my site of enquiry. These were: the documentation of existing practice, a conceptual framing and a series of personal experimental artworks. The research into existing practice consisted of the documentation of artworks, which explored the visual language of the graphical user interface in virtual, physical and augmented reality art constructs. Identified in the following three terms as: a computer-based interface, a material artefact, and as an augmented reality construct. In support of these definitions the thesis built a position around the idea that through an exploration of the differing manifestations of the graphical user interface aesthetic, an epistemological enquiry into contemporary creative digital media and the enfolding of art and digital technology could be undertaken (Gwilt 2008). Furthermore, that by exploring these shifts in representation and form it was possible to reveal metaphoric ambiguities in our understanding of the visual language of the computer interface. These ‘questionable’ readings could then be used as a lens for considering our relationship with computer technologies and the role they have taken in our social, cultural and creative environs. This proposition formed the basis for the philosophical framing of the investigation.

In broad terms, the thesis component of the research was broken down into three main areas: a historic, technical account of contemporary augmented reality, and augmented reality art, and artists (art history); a philosophical framing built around the notions of reality, technology, creative practice and contemporary social cultural readings of these terms (philosophical framework); and an exegetic documentation and interpretation/reflection on my own practice (exegesis). In this exegetical section, I described in some detail a selection of my own works created over a six-year period between 2002 and 2008. Importantly these works related conceptually to the overall investigation and were developed along with the writing of the thesis. Accompanying the written text was a CD-ROM, which contained additional audio-visual material associated with the practice. Although these three ways of thinking (historical research, philosophical positioning and documentation/reflection on practice) were separated out in the thesis, for the sake of clarity and order, there was a concerted attempt to weave them together through rigorous interlinked referencing.
As a whole, the personal creative works/visual experiments and their documentation in the written thesis, represented an original attempt to draw together, write about, and reflect upon my practice and investigations based around the computer desktop interface as a creative site of enquiry. From which emerged a proposition that framed the computer desktop interface as a conceptual trigger for thinking through notions of augmented reality art and the role of computing technologies in contemporary society (ibid). The argument developed in the thesis proposed that contemporary new media has renounced the exclusivity of the virtual space of the computer, and moved towards the creation of hybrid constructions, which combine elements and properties from both digital and material cultures; and that this paradigm shift could be observed through the computer graphical user interface, which, when repositioned in the context of art practice, could be seen as a syncretic agent between the material-real and the digital-virtual. This argument was supported through the documentation of existing practice, and by the analytical break down of the terms augmented reality and augmented reality art from historical, technical, philosophical and creative perspectives. The new creative works generated during the course of this research fed into and reflected upon this argument.

Reflections: Some Thoughts on this Strategy

By initially defining a site of enquiry/research it was possible to allow a research question or proposition to emerge from investigation. This proposition can emerge through cultural theory, historical and scientific research where the unfolding issues, concerns or questions are additionally explored through creative practice, in which the artefacts of this creative practice can add an experiential consideration to the debate, described by Scrivener (2000) as a creative product based approach to research.

One of the most challenging aspects to this approach to research is addressing how to write about personal practice, alongside a critique of the existing body of knowledge, which includes the recognition of salient points of view and key works in the field. Finding a voice with tones of authority, critical distance, personal insight and or documentary neutrality (even assuming there is such a thing), and knowing when to use these tones is a challenge. Independent of tone, it is also important to establish a consistent internal logic for the relationship between practice and writing. In my case, I described my practice as a 'parallel investigation' to the findings outlined in the thesis, supported by a common theoretical and philosophical underpinning (see the section above for a description of this). With this approach the practice becomes a tangible manifestation of the ideas discussed in the written thesis and the making of practice intern, is reflected back into the research discussed in the written text. For me, the tone of writing shifted by degree, from historical documentary, to establishing a philosophical position, to the description and reflection on personal practice, and how this supported the arguments developed in the thesis. According to Schön (1983)
and Scrivener (2000), this approach of reflection on practice can be problematic as it is often tacit and not properly formalised or documented by the creative practitioner. Establishing a personal strategy to realise reflection in action then, is a critical tenet of a practice/thesis research model. Setting aside designated time slots to engage in writing, then practice, back to writing and so on, in my case established a pattern where the practical work, reflection on this work, and thesis writing was progressive, referential and emergent. The practice was not completed at the start or end of the research but integrated along the way. Furthermore, in terms of practical output the emphasis was not put on the production of finished works but on experimentation.

**Reflections: the Main Outcome of this Research**

The overarching premise of the practice-based creative work discussed in this chapter is that augmented reality art can be seen to engender cultural ‘transliteracies’, wherein what we commonly recognise as the visual and perceptual languages of both digital information and physical/material artefacts can be reconsidered through a blended space. These readings are prefigured through a combination of ontological and epistemological interactions, seen from both a personal perspective as an active audience, and in more communal terms. Examining the properties of the physical object alongside the immateriality of digital data in the combined space of augmented reality allows us to reconsider our understanding of, and relationship to, these two different states. It also allows us to question the knowledge we have in how to interact with these entities. Moreover, the blended space of augmented reality can be seen not only as something different in itself, but also as something which can elicit changes in the way that we think of the digital and physical. Augmented reality art reveals the potential for a more fluid interplay between the digital and physical, and begins to break down the perceived binary opposition between these states. These technological, philosophical and artistic notions of augmented reality art outlined above, support Levy’s belief in the on-going acceleration of techno-cultural heterogenetic change (Levy 1998:17). In the augmented reality artwork save_as the context of the graphical user interface is shifted from technological tool, into an art-based augmented reality practice. This allows us to imagine a more complex cultural image ecology in the mundane icons of the computer desktop, above and beyond their convention role of providing human computer interaction.

The cultural theorist, Andrew Murphie (2003: 66), contends that the importance of the digital aesthetic lies in its ability to change the way we perceive the world, create and communicate. The practice of augmented reality art firmly places the digital aesthetic in the world. By adopting a practice/thesis research model, which examined the notion of augmented reality art through the language of the common computer interface, my intention was to give an insight into an evolving technologically informed visual culture. From the perspective of a practitioner researcher, the activities of writing and making were used to
generate a set of creative, reflective and propositional statements around this idea. The use of these self-referencing practices was designed to allow for a much richer set of insights to be generated, beyond the capacity of an exclusively text, or practice based enquiry. In terms of our future expectations of the ‘white cube gallery’, this chapter hopefully demonstrates how a combination of augmented reality content mapped to the location of a specific physical object can be used to engender cross-media experiences, narratives and layered readings in the next generation of creative spaces.

i There are a number of already established definitions of augmented reality in more general terms, see, Azuma (2001); Bimber and Raskar (2005); Gwilt (2009), Veltman (2006).

ii For a detailed explanation and example of a CAVE artwork see the work of Maurice Benayoun World Skin, A Photo Safari in the Land of War (1997) http://www.benayoun.com/projet.php?id=16
And the work of Jeffrey Shaw ConFIGURING the CAVE (1996) http://www.icinema.unsw.edu.au/projects/prj_configcave.html


iv The software for the save_as project was developed by Sun-Kyoo Hwang a visiting technologist from The Human Interface Technology Laboratory New Zealand (HIT Lab NZ) (Hwang, Gwilt et al. 2007: para 6, Gwilt 2009).