Contemplative Interaction in Mixed Reality Artworks

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Abstract
We propose a method of approaching contemplative interaction through an understanding of affect and embodiment that is multi-layered and multi-sited across the physical and the virtual. Such an assemblage may be found in so-called mixed reality artworks that we define as software-driven works that engage with a specific physical environment and explicitly mediate the boundary between physical and virtual space.

Notions of contemplation have traditionally been associated with the viewing of static visual art rather than an engagement with interactive media, although a number of researchers and artists have recently articulated connections between these two ostensible opposites. We further develop an understanding of how contemplative interaction operates with mixed reality artworks.

Through a critical analysis of several contemporary mixed reality artworks, we identify the nature and quality of the affect cycle in relation to a distributed and hybrid expression of embodiment and its role in contemplative interactive experiences. We also examine the role of reflection, engagement and meaning in this assemblage. Finally, we assert that a meaningful experience of contemplative interaction is constituted when an interactor engages in a collaborative feedback cycle of affect between themselves and the artwork.

Introduction
Simon Penny has identified an historical transition from the decade of ‘virtuality’ in the 1990s to the decade of ubiquity in the 2000s [1] with computing becoming embedded, augmented and distributed within our physical environment. While Penny claims this is not a clear break from, or antithesis to, the concerns of the 90s around virtuality, he highlights how these developments have challenged traditional modes of interaction. This proliferation of ubiquitous and pervasive interactive technologies has seen artists explore enacted relations between physical capacities and informational operations for creative expression. This paper examines the role of contemplative forms of interaction that can connect these spaces, codes, locations, technologies and data in mixed reality artworks, focusing on Reproduction - an artificially evolving performative digital ecology created by co-author Adam Nash and collaborator John McCormick.

Fig 1. Reproduction, 2011, John McCormick and Adam Nash, mixed reality artwork.

Contemplation and Interaction
Andy Polaine has observed that, until recently, approaches to interaction have been dominated by industrialised models which have prioritised functionality, usability and utility and “bogged down in behavioural response analysis and tool-based thinking.....devoid of much acknowledgement of emotion or phenomenal experience”
[2]. Similarly Alex Soojung-Kim Pang has echoed concerns expressed by authors such as Linda Stone [3] Brenda Laurel [4] and Nicholas Carr [5] by asking how interaction can be designed to encourage more reflective and subtle modes of engagement rather than reactive or distracting approaches [6].

To address this question, the above authors draw attention to notions of contemplation - a practice usually associated with religion but also prevalent across philosophy, psychology, education, architecture and art. As noted by Pang there is a pronounced interest in the wide variety of strategies and activities of contemplative practices that he defines through notions of calmness, engagement and attention [7]. Rebecca Krinke similarly moves away from escapist or passive connotations of contemplation arguing that it involves deliberate and deep attention stating, “rather than being mindlessly entranced, we are actively involved.” [8].

In considering these practices of contemplation authors such as Krinke and Pang respectively draw attention to how this engaged and reflective experience can inform interactive media. The relationship between interaction and contemplation is a relatively recent and somewhat disparate area of investigation, and different approaches have been described variously as “contemplative play,” [9] “contemplative computing,” [10] “slow gaming,” [11] “zen games,” [12] “interactive contemplation,” [13] “slow technology” [14] and “calm computing” [15]. Researcher Lone Koeford Hansen challenges an understanding of contemplative distance, in which our consciousness is transformed through a Kantian aesthetic contemplation of artwork, moving towards a more dynamic and embodied engagement within interactive artworks. Presenting a model for designing and evaluating how contemplation is staged through interaction, Hansen notes how artworks engage participants through degrees of physical activity or passiveness while alternating between states of immersion and reflection. She asks if the participant has to be physically active to interact or is their presence sufficient? Is the participant immersed in the experience of the artwork or are they reflecting on their interaction? [16]. Here we can see that the dynamic relationship between the subject and object via contemplative interaction opens up new opportunities for experience.

With contemplation shifting from a mode of distant spectatorship to one of agency with the artwork itself our argument is that the contemplation itself has the potential to enter into a mutual cycle of affect in which both artwork and interactor are changed, if not constituted, and any definition of contemplative interaction needs to take this into account.

**Related Practice**

Over the last decade a number of Australian artists have created artworks that consider contemplative forms of interaction. Although Polaine says “the interactive experience may be difficult to analyse, residing as it does inside the consciousness of the interactor” [17]. Timothy Morton’s ‘speculative sublime’ describes a move away from such a Kantian idea of experience as purely a human subjective phenomenon towards a Longinus-inspired co-existence in relation to an “alien presence” [18]. Similarly, these artworks can be analysed in terms of their operating as sites of the capture and escape of affect [19]. While there are a number of theories of affect, Brian Massumi emphasises its relational potential rather than its emotional capacity, positing that emotion is only a partial expression of affect and a pre-individual event that occurs before consciousness [20]. Referring to Spinoza’s account of affect, in which he describes the body in terms of its capacity for affecting or being affected, Massumi says that all bodies, including the natural and artificial, enact these affects. Likewise, Deleuze uses Spinoza to assert that a “body can be anything; it can be an animal, a body of sounds, a mind or an idea,” [21] which allows us to concentrate on bodies’ capacities for affecting and being affected, which Deleuze defines as “compositions of relations” [22]. Following this line, Anna Muster and Mark Hansen have examined affective experiences that emerge from the digital. Munster claims that the intersections “between information and the materiality of our bodies involves a multiplication of affect, of the capacities of conceptualising, perceiving and feeling embodiment” [23]. Mark Hansen's affective body-in-code is “not a purely informational body or a digital disembodiment...but a body whose embodiment is realised, and can only be realised in conjunction with technics” [24] and recently extending his earlier phenomenological focus towards a more “distributed field of prehensions” [25]. Concepts of code remain central to this understanding: the social codes of interacting with artworks that are partially informed by centuries of human interaction with physical environments; the ‘actual’ code itself in terms of the components of the artwork; and the digital virtualization of those codes to construct the modes and forms of interaction.

With reference to Lone Koeford Hansen’s model, discussed above, the following analyses of artworks attempt to demonstrate how these notions of both affect and embodiment might produce contemplative interaction. The analyses are based on the authors’ direct experience with the artworks, interviews with the artists, personal communication with visitors and reference to critical literature on the artworks.

*Plasticology*(1997 - 2000) by Patricia Piccinini is an interactive installation which "embodies a sincere attempt
to construct a contemplative space out of the stuff of the
media” [26]. Experiencing the work at the Melbourne
International Biennial Signs of Life exhibition in 1999, the
installation consisted of over fifty screens displaying
gently swaying, computer-generated, glossy plants and
trees. Transforming the gutted gallery space of the ex-
telephone exchange building into a lush “garden of the
parallel worlds of the virtual or the media” [27], this
synthetic environment did not attempt to imitate nature but
was a world with “its own climate, its own principles of
life, its own nature” [28]. This could be seen in not only
the vivid forest of digital ‘ferns’, ‘trees’, ‘sprouts’ and ‘oak
trees’, but in the timid ‘bird’ that inhabited these
surroundings. Placing visitors simultaneously in its
artificial world and the physical space of the gallery, the
‘bird’ acts as a liminal entity that connects these spheres
through its simple but enigmatic interaction. With the use
of motion sensors the ‘bird’ appears fleetingly on one of
the screens before flying away if approached. Although
agency is limited, this playful and reflective relationship is
significant as it affords a contemplative engagement with the
space as a ‘living’ forest. This foregrounding of action
when a visitor attempts to follow the bird transcends the
fabulation of the forest simulacra, evoking what the artist
describes as a striking but unsettling sublimity. Visitors are
immersed in the light and movement of the garden, the
‘wind’ surging through the synthetic plants and the
illumination of the glossy and fluorescent foliage altering
the gallery space into a uncanny habitat of human and non-
human entities. While Plasticology does now rely on
interactivity – with more recent iterations removing this
element, its first manifestation was an early exploration of
the interplay between contemplation and interaction that is
further expanded in the projects below.

Oribotics [2003 - ongoing] by Matthew Gardiner is “a
field of research that thrives on the aesthetic, biomechanic,
and morphological connections between nature, origami
and robotics” [29]. This investigation has manifested itself
in a number of Oribotic installations, each iteration
featuring delicate flower-like origami robots the artist
terms oribots. In an early version of the work interaction
with this oribotic garden was described as fostering a
“contemplative relationship,” [30], where visitors’
interactions with a touch-screen interface caused these
physical constructions to ‘grow’. With the material
fragility of the folded-paper ‘blossoms’, visitors were left
pondering the limited lifespan of these transient forms,
where each ‘bloom’ also caused them to wither. Oribotics
(Atom Generation), exhibited in 2005, was similarly
described as “encouraging exploration, communication and
contemplation” [31]. with Gardiner continuing to “explore
a loss of nature” [32] through the creation of robotic
flowers. A later iteration, described by Gardiner as “a cross
between gardening, messaging a friend, and commanding a
robot” [33] developed this simple mechanic into a more
complex relationship between the oribots, the visitors and
the physical and virtual environments in which they
interacted. This culminated in Oribotics (network) installed
within Federation Square, Melbourne, in which oribots
were ‘planted’ on the glass panes of the Atrium to
transform the public space into a greenhouse-like
environment. These oribots could be ‘fed’ with news and
information such as weather, stock prices and scientific
data by people either in the physical space of the Atrium
using their mobile phones or remotely, via a website.
Affecting the oribot’s movement and colour as a 'real' plant
might be affected when watered, this local and global input
of modulated data was intended to create an intricate
feedback cycle between the oribots, the human visitors and
their shared environment. While Gardner attempted to
foster a reflective engagement through this interaction, the
artist acknowledged that a number of visitors were
confounded by the interface, finding “the complex details
of the interaction…a mystery,” [34] and this mystery, in
practice, prevented rather than facilitated a contemplative
interaction. In observing how “people intuitively placed
their hand in front of the bot, in the hope of getting a
physical reaction,” [35] he then set about designing a more
immediate form of interaction in a later iteration titled
Oribotics (the future unfolds). Here, people gently move a
hand in front of the oribot’s ‘mouth' to actuate its folds, the
petals delicately retracting when the hand is removed. This
gesture triggers not just a single oribot, but also others near
it to create a complex ripple effect as the oribots ‘bloom’
and light up to form a luminous flowering field. This
assemblage of delicate paper ‘flower bots’ and digitally
enabled physical interaction reconstitutes the notion of the
garden, mentioned above, within the urban digital context
attempts to facilitate a contemplative interaction.

Colony (2008) is an urban art project by Troy Innocent
situated within the Digital Harbour, Melbourne. Consisting
of an artificial ecosystem that has been integrated into the
physical site of the Docklands, Colony is designed as a
public garden. However, this contemplative environment is
invoked not through the picturesque but via emergent and
evolving behaviours and processes. Giuliana Bruno points
out that many traditional gardens were anything but static
by drawing attention to the pleasure gardens of the
sixteenth and seventeenth centuries, which featured
“automata, sculptures and playful fluid mechanisms.” [36]
Likewise, Colony is “alive” with dynamic interactions that
lead visitors movement through it’s space. Featuring forty-
two sensor-equipped totems made of weathering steel and
translucent acrylic dispersed through the location, the
‘organisms' of this eco-system are made of light and sound
effects that emanate from the totems. Innocent explains
that these effects act as a non-verbal code, with the
interactivity between Colony and its visitors counteracting
“many of the more popular forms of interaction common in digital entertainment...typically tied to the binary states on or off; true or false...for more subtle and contemplative forms of interaction.” [37] Rebecca Solnit has linked gardens to ‘reading’ the landscape, with paths being seen as threads of a story or spatial elements equivalent to the time structure of a narrative [38], and Colony is a ludic version of this. The artwork reveals itself through playful exploration, where the act of walking becomes a dérive-like [39] drift. First immersing the visitors through their observation of the autonomous interaction between the agents, the walk transforms the observer into an interactor, their bodies directly acting as a type of instrument as the totems respond to visitors’ movement through the space. These emergent light and sound responses are also influenced through mobile devices and smartphones, with a downloadable app allowing the visitors to playfully manipulate the totems’ glyphs and sounds. Moving away from reactive cause and effect approaches, these multiple levels of interaction subtly intertwine the digital agents, the material environment and human navigation through the space to facilitate a contemplative experience.

Reproduction

Reproduction similarly features layers of interaction that facilitate deep and complex behaviors, agency and affect across its multiple physical and virtual sites. The first mode of interaction operates between the digital entities that populate the work, which, although influenced by human interaction, are not dependent on it. These digital entities ‘live’, ‘die’, ‘reproduce’ and ‘evolve’ in response to their interactions with each other, with their digital environment, and with human interactors in both the digital environment and the physical environment of the gallery space.

Each entity is governed by a simple set of audiovisual algorithmic parameters, manifesting in emergent behaviour and complex aesthetics from the interaction of very basic elements. Featuring both xenophiles and xenophobes the entities attempt to organise themselves as species by attracting or repelling others. Similar to a rock-paper-scissors game, there is no 'superior' entity, the rules keeping the ecosystem in a constant state of evolution over thousands of generations. As the entities evolve, combinations of colour and sound are generated which help determine how they behave with other entities. There are nine broad 'species' that are 'bred' from various combinations of visual (red, green, blue, opacity) and sonic (melody, harmony, rhythm, timbre) parameters. For example, a purple entity will need to find red and blue properties to survive and will attempt to seek these through other entities. If it isn’t able to find these properties, it becomes progressively grey, ‘singing’ less and less, eventually becoming unable to reproduce and finally becoming inert and ‘dying’ by fading away completely. This plays out moment-to-moment, their modulations creating a gently shifting environment in a constant state of flux. Visitors to the installation sometimes lie down in the gallery space and contemplate the environment as they might the night sky, or actively move around experimenting with the changes, and through all these interactions the work further evolves, every participant – physical and digital – tracking and interacting with the permutations as they occur.

Traversing the physical and virtual habitat of this ‘ecosystem’ evokes a speculative pleasure as we move through, seeking sites and moments of interaction. Building on co-author Adam Nash’s practice in virtual 3D environments that have been described as "virtual emotional geography...immersive, contemplative spaces,” [40] Reproduction investigates this form of engagement within a navigable mixed reality. Designed to be explored slowly, the work rewards reflective interaction. As noted previously by the co-author [41] games scholar Bernadette Flynn discusses this contemplative mode of consciousness in her research on the semiotics of spatial practice arguing that navigation operates as a central organising principle “around which ludic and aesthetic experiences take place.” [42] In Reproduction, this engagement is across both the gallery space and the digital world, our navigation forming a close symbiotic relationship as both the human interactor and entity learn from each others’ movements and behavior.

Fig 2. Digital entities of Reproduction, 2011, John McCormick and Adam Nash, mixed reality artwork.

This relationship is formed as soon as visitors enter the physical space of the gallery, their presence, detected by motion-capture devices, causing a digital entity to spawn. Joining other existing entities of the ‘ecosystem’, this newly created entity is closely linked to that person,
following them in the space and adjusting its audio and visual characteristics according to their movement. This creates a close association, not only in terms of visual tracking, but also in establishing an emotive connection. Nash uses a similar device in an earlier work titled *The Moaning Columns of Longing* (2007), where a relationship is cultivated with an emotionally needy and manipulative digital agent, in that case a swaying white column, that responds to a human avatar’s presence in an online multi-user digital environment. This geometric artificial ‘life-form’ exists only in relation to a specific avatar; in a similar way, a visitor’s virtual entity is spawned as they enter the installation of *Reproduction*, and associates itself with the visitor, but is also ‘aware’ of its relationship with other digital entities in the environment. The entity ‘sings’ to the visitor, trying to learn and anticipate the sounds it believes the person likes. If they are standing still the entity interprets this as an indication the person is enjoying the composition. If they move, the entity will follow and sing to them in an attempt to entice them to stay, all the while remaining ‘wary’ of its surrounding digital environment and any potential ‘danger’. Our engagement with *Reproduction* deepens as the subtleties of the entities are gradually revealed, interactors forming a bond with ‘their’ entity as they observe and influence its behaviour and life cycle. This is further nurtured on the web by users who access the online environment of the entities. The ability to simultaneously interact in real-time across a range of persistent and portable platforms engenders an intimate relationship with the entity as we come to know it, and the complex world it inhabits, over time.

This interaction of *Reproduction* involves an affective-contemplative relationship between human and non-human entities. We argue this contemplative engagement with the visual, spatial and sonic relationships of the work can be understood via the feedback cycle of affect that initially occurs between human interactors and the artwork. As flagged earlier, Deleuze’s “compositions of relations” [43] and associated theories of affect is a useful way of thinking about the affective capabilities of the emergent digital entities of *Reproduction* - between themselves, between them and the virtual environment, and between them and human interactors.

Although we are in no way attempting to analyse the subjective experience of the digital entities, or even submit that such a thing exists, we are suggesting a diminution of the privilege of the human subjective experience in such a contemplative interactive artwork, and we do this, as discussed earlier, via a Deleuzian reading of Spinozan bodies and a concern with an expanded sense of embodiment as laid out by Anna Munster and Mark Hansen. Jane Bennett similarly draws on Spinoza and Deleuze to discuss ‘vital materialism’ [44] which explores human-non-human assemblages and distributed agency. In *Reproduction*, the human and non-human come together into a composite feedback system and form a shared role in assembling the work.

**Conclusion**

This paper has proposed a method of analysing contemplative interaction by examining notions of affect that relate bodies, locations, spaces and codes across the physical and virtual. We have investigated and described the affective relationships that operate within the mixed reality artwork *Reproduction*: the affective relations between the digital entities and other digital entities; the affective relations between the digital entities and their human interactors; and the affective relations between these and their physical and digital environments. We contend that a symbiotic feedback cycle is established that facilitates reflective responses in human interactors that mediate our relationship with digital media and each other in subtle and profound ways while interacting with the artwork. These experiences are described as contemplative interactions.

**References**

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