Temporal hybrids: using augmented reality to re-imagine the affordances of natural objects

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Abstract

This paper discusses two practice-based research projects produced during 2018 that explore how augmented reality (AR) can be used to re-imagine past and future possibilities of the natural world. The two artworks discussed use an innovative approach to the technique of image target detection in AR to transform natural objects into hybrid entities of static and dynamic components comprising both natural and digital elements. *Second Nature/Wasteland* (2018) is an AR installation with a virtual reality (VR) counterpart, that imagines a world where nature emits digital signals. *Sediments* (2018) is a site-specific artwork of augmented rocks in the natural landscape. Both works investigate how image target detection can be manipulated to enliven objects in ways that inform imaginative considerations of the complex temporal scales and potential affordances of natural objects in the context of environmental change.

Keywords

Augmented reality, media art, animation, climate change, temporality, installation art, site-specific art, moving image, hypernatural.

Introduction

This paper presents two artworks that experiment with image detection in augmented reality (AR) to animate natural objects by compositing layers of material and immaterial components.

This work draws on the contextual framework of contemporary art using AR to explore environmental concerns. AR has been used by artists to imagine future landscapes, for example in *Gardens of the Anthropocene* by Tamiko Thiel [1]; to recreate parts of the environment that have disappeared, such as *Exit Glacier Terminus Proejct* by Nathan Shafer [2]; and to broadcast political messages, such as *Climate March Skywrite* by Will Pappenheimer and Zachary Brady [3].

While these works activate entire spaces by placing 3D models into geolocated sites, I use AR to layer two-dimensional animation onto textures found on specific objects such as trees, rocks and leaves. I suggest this creates an unusual aesthetic through which to re-consider the unseen qualities of individual natural objects, and that this has the potential for imaginative interpretations of environmental change.

The two artworks discussed in this paper do this in different ways. *Second Nature/Wasteland* (2018) is experienced in a gallery and uses AR to create hybrid objects that are seamlessly augmented to give the impression that the animated components become part of the object themselves. *Sediments* (2018) is encountered outdoors, where the augmentation of rocks is used to emphasise the multiple temporalities at play in the natural landscape. This work employs 'seamful interfaces', where the animations are deliberately separated from the rocks to exaggerate the difference between natural and introduced elements. I will discuss the process, concept and outcomes of the two works and conclude with a brief summary of future pathways for this research.

Part 1: Second Nature

Second Nature/Wasteland consists of a series of augmented objects (*Second Nature*, Figure 1) and a virtual reality (VR) experience (*Wasteland*) that imagines a world where natural objects emit digital signals. In this paper, I focus on the AR component of this installation. In *Second Nature*, cut pine trees emanate potential Wi-Fi networks, glitchy Bluetooth connections hover over the leaves of potted plants, autumn leaves search for lost mobile data, and we become tethered to rocks like we do a personal hotspot.

Figure 1. Anna Madeleine Raupach, *Second Nature*, 2018, augmented reality app, 2 artificial plants, 2 pine logs, 3 rocks, autumn leaves. Installation view, Verge Gallery, Sydney. © 2018 Anna Madeleine Raupach

These physical objects are encountered in an installation surrounded by pink walls, where viewers engage with them through a mobile device to search for their hidden digital signals. The static and contained environment of this setting suggests that these natural objects have been removed from their natural habitat and transformed into specimens of a futuristic or alternative world. This denaturalized scene is calming yet sinister, and both unsettling and meditative.

The communicative abilities of plants have been scientifically proven. [4] The recursive relationship between humans, nature and technology is increasingly explored through contemporary art, for example through sensing technology that allows for plants to become participants in digital art. [5] I use AR and animated motifs symbolic of telecommunications services to visually imagine communicative abilities of plants and rocks, as another way that nature can become re-animated through digital technology.

Figure 2. Anna Madeleine Raupach, *Second Nature* (detail), 2018, artificial plant, digital prints on paper, augmented reality app. © 2018 Anna Madeleine Raupach.

Creating *Second Nature* involved investigation into how a camera reads image textures of natural objects. After initial experiments with printed image targets, I sought out textures in nature that emulated printed surfaces. Certain textures were nevertheless only detected as a digital print of the physical object. The resulting objects are therefore manipulated for computer vision: the potted plant has fake paper leaves attached to its stem due to the software better recognising the printed version instead of the organic leaf (Figure 2). While the rocks, tree stumps and autumn leaves could be detected in their original form, modifications to the lighting and surface quality were made to assist with their detection and augmentation, such as applying oil to the tree stump to retain clarity in its texture.

This treatment of the objects to comply with AR technology prompted new conceptual underpinnings to the work. The objects became hybrids of artificial and organic components made through both material and digital intervention to instigate a new pathway of communication between the plant and its imagined digital affordance. The interaction in viewing the AR elements of the work reflects this process of its construction. Using the AR app, participants activate a dialogue between physical object and its virtual counterpart, where human agency is situated within a call and response exchange between nature and technology (Figure 3).

Figure 3. Anna Madeleine Raupach, *Second Nature* (detail), 2018, tree stump, augmented reality app. © 2018 Anna Madeleine Raupach.

Second Nature presents a scenario that reconfigures the sender-receiver channels of communication between humans, nature and technology. It demonstrates that creatively working with image detection in AR has the effect of altering the appearance of natural objects, and that this holds potential as an expressive format through which to envision imaginative scenarios of human and non-human interactions.

Part 2: Sediments

Sediments is a site-specific artwork located at Bundanon Trust, NSW, Australia. It extends the model of AR used in *Second Nature* into the natural environment, by using the surfaces of rocks in the landscape as image targets (Figure 4). The *Sediments* app superimposes three layers of animation over nine individual rocks, specific to the shape and texture of each rock. The layers consist of a painted map of the local Shoalhaven River that flows from one rock to another, a layer of animation evocative of microscopic images of sandstone, and a moving drawing that traces the growth of lichen on the rock surface. These subjects relate to natural elements that may have shaped the rocks over time, on different scales.

Following previous writing about this work [6], in this paper I focus on its attributes in the context of research into using natural features for AR detection.

In *Sediments*, the animations appear as horizontal layers, spaced out to create gaps between the rock and animation to highlight the multi-dimensional aspects at play. Working with image targets in the natural environment involved technical issues and conceptual advantages. In an uncontrolled setting, the lighting fluctuations in harsh or soft

sunlight altered how the rock surfaces were detected. However, this increased the sense of unpredictability and discovery when searching for the AR components (Figure 5).

Figure 4. Anna Madeleine Raupach, *Sediments* (detail), 2018, augmented reality app. Screenshot from the work at Bundanon Trust, NSW. © 2018 Anna Madeleine Raupach.

The use of rock surfaces as image targets has been researched through cultural heritage projects that use AR as a digital preservation tool. Examples include Blanco-Pons et al.'s study of natural feature tracking for prehistoric rock art site at Cova dels Cavalls [7], and Gutierrez et al.'s investigation of AR as a didactic tool for visitors to learn about historical graffiti in Temple of Debod. [8] These projects both demonstrate the strength of AR in allowing viewers to experience an enhanced version of an important cultural artifact that is subject to degradation and erosion. Revitalising the original markings of ancient forms of expression, AR brings gestures from far in the past forward to the present day.

In *Sediments*, I worked with this ability of AR to illustrate different layers of time. I augmented the natural surface of rocks – that inherently encompass an immense geologic time scale – with animations that draw attention to the existence of multiple temporalities operating within the natural environment. I aimed to evoke the sense that human perception of time only allows us to experience a small section of the rate at which the environment changes.

Timothy Morton's writing on temporality in the context of global warming supports this idea. Morton conceptualises global warming as a 'hyperobject' – something that is "massively distributed in time and space relevant to humans". [9] Furthermore, 'phasing' in hyperobjects suggests that the environment is made up of multiple intersecting temporal scales, and that humans can only perceive one part of a hyperobject at one time. [10]

Adding animated AR components to rocks (that appear static), draws them into a relationship with other moving counterparts that operate on different temporal scales. This shows that using AR to alter specific objects in the natural landscape can be a powerful way to re-imagine aspects of climate change that are difficult to comprehend, for example its extended time scale. [11]

Figure 5. Anna Madeleine Raupach, *Sediments* (detail), 2018, augmented reality app. Participants interacting with the work at Bundanon Trust, NSW. © 2018 Anna Madeleine Raupach.

While the augmentation in *Second Nature* aimed to present animated counterparts as seamlessly becoming part of the physical objects, the use of AR in *Sediments* instead draws on the idea of 'seamful' interfaces relevant to both ubiquitous computing and experimental animation. Paul Roquet suggests that forms of animation and AR can both benefit from emphasising the mismatch between fabricated and physical elements in their compositions. [12]

Rather than attempting to create a seamless convergence, seamful interfaces highlight that the construction of these modes is made up of several different intersecting components that work together to express alternative temporalities and spatial experience.

Returning to the context of works by Thiel and Pappenheimer, Rewa Wright conceptualises AR artworks as 'software assemblages', where participant involvement and the capacity to self-organise presents conceptual advantages beyond the role of AR as information overlay. [13] I suggest that the two artworks discussed in this paper demonstrate that creative use of the limitations of AR image target techniques can contribute alternative ways of drawing participants' attention to dynamic relationships between physical, virtual and human components.

Conclusion

These artworks build a framework for how image targets in AR can be an expressive format through which to consider past and future affordances of natural objects. Current work in progress is exploring how spatial dimensions and live data can be incorporated as well as temporal layering. *Second Nature* uses AR to seamlessly embed digital behaviours into natural objects to create futuristic hybrid entities. Extending AR image target detection into the natural environment, *Sediments* uses seamful interfaces to highlight the geologic time scale of rocks as one of multiple temporalities in the natural landscape. Both works explore how AR

is effective in creating and conceptualising co-evolving relationships between nature, humans, and technology.

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